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Handling Soundness and Quality to Improve Reliability in LPS - A Case Study of an Offshore Construction Site in Denmark

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COBRA 2011

Proceedings of

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12-13 September 2011
School of the Built Environment
University of Salford

Editors: Prof Les Ruddock; Dr Paul Chynoweth
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PREFACE

Dear Conference Participants
It gives me great pleasure to welcome you to COBRA 2011 - the Royal Institution of Chartered Surveyors International Research Conference - hosted by the University of Salford.
When Cobra was first held in 1995, its aim was to be a fully refereed conference targeted at those whose research fell into the broad scope of the Quantity Surveying and Building Surveying Divisions of the RICS. Since then the scope has expanded to cover research associated with most of the Professional Groups within the RICS.
The Conference was formed to encourage synergy between the professional and academic sectors of the construction and property industries and to act as a forum for the dissemination of this activity. The papers in the conference proceedings of this, the Seventeenth COBRA Conference, show how well this objective has been achieved.
COBRA is a high level research conference:

- Presenting the best of construction, building and real estate research worldwide
- Stimulating debate and discussion between researchers from around the world
- Providing the basis for new areas of research

The Editors are indebted to the members of the Review Committee, who reviewed the papers and whose comments assisted authors in the development of their papers.
All the papers accepted for the Conference Proceedings were selected on the basis of double-blind peer review by the scientific committee members and paper reviewers to ensure a good quality standard. I hope that delegates will obtain useful feedback to their ideas, gain insights from the work of others and forge connections that will endure.
Finally, I express my gratitude to those individuals, who played an important role in the organisation of COBRA 2011. In any endeavour of this sort, there are a few individuals who are absolutely crucial to ensuring the successful running of a conference.
The Theme Leaders (Dr. Paul Chynoweth, Prof. Charles Egbu, Dr. Monty Sutrisna and Prof. Ali Parsa) and the University of Salford Conference team (Clare Forster, Vicky Beckett and Daniel Fenby) must be mentioned. Dr. Kaushal Keraminiyage performed the essential tasks of building and supporting the web pages and the paper reviewing system. But particularly special thanks must go to Mrs. Karen West for her never-ending work in managing the papers (and their authors) in a tireless yet astonishingly cheerful manner!

Prof. Les Ruddock
Conference Chair

KEYNOTE PRESENTATIONS

Clients want performance!

Prof. Ger Maas

Ger holds the posts of Director of Strategy at Royal BAM Group and is also Professor of Construction Management at the School of Architecture, Eindhoven University of Technology.
He is currently the President of ENCORD (European network of large construction companies for R&D) (www.encord.org) and the Chairman of the High Level Group of the European Construction Technology Platform (ECTP).
Ger's presentation will refer to his work for ECTP and ENCORD and the different subjects or developments that are on the agenda at European level.

The changing nature of real estate as an investment asset and the implications for property professionals.

Prof. Paul McNamara

Paul is responsible for the overall direction of property research within PRUPIM, a top twenty global real estate fund manager, where he heads up the Global Property Research Team.
A Visiting Professor at Oxford Brookes University, he is also a former Chairman of the Investment Property Forum and Chairman of its Research Steering Group. Paul was awarded the OBE for services to the property industry in 2003 and received a lifetime achievement award by IPE in 2008

REVIEW COMMITTEE

All papers submitted to COBRA 2011 were subjected to a double-blind (peer review) refereeing process. Referees were drawn from an expert panel, representing respected academics from the built environment research community. The conference organisers wish to extend their appreciation to the following members of the panel for their work, which is invaluable to the success of COBRA.

Prof. Carl Abbott, University of Salford, UK
Prof. Paul Bowen, Cape Town University, South Africa
Dr. Paul Chynoweth, University of Salford, UK
Prof. Charles Egbu, University of Salford, UK
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Dr Clare Eriksson
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Alternative Dispute Resolution

Utilizing ADR to resolve Construction Disputes: A quantitative survey of Scottish legal practitioners' awareness and experiences

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Abstract:

It is widely documented that legal practitioners perform a gate-keeping role, advising clients on the most appropriate form of dispute resolution for particular cases (Agapiou & Clark, 2010). It would be interesting to ask whether the attitudes of the legal fraternity in Scotland creates a real limit on what could be implemented by a government that seeks to promote novel means of dispute disposal as part of its civil justice reform agenda. Drawn from questionnaire - based research, the aim of this paper is to establish lawyers' awareness, attitudes and experiences of Alternative Dispute Resolution (ADR). Despite the small sample used in this study, there is evidence that more education in ADR procedures and their application could provide further opportunity to develop them as settlement tools in Scotland by building on more positive aspects of responses within the survey. Only some in the legal fraternity have embraced the challenge of what the study has found to be regarded widely as an opportunity. Further education, training and publication of successful execution may be necessary to convince doubters that ADR needs to be part of the menu of methods of dispute resolution for the modern practitioner.

Keywords:

alternative dispute resolution, lawyers, Scotland

1 Introduction

There is no doubt that ADR has experienced growth over recent years. The Eversheds' survey found 41% of litigants had used ADR in 2000, compared to 30% in 1998. However, it has been concluded 'that over 96% of the respondents in a 1997 survey by Brooker and Lavers had never used any form of ADR (Brooker and Lavers, 1998). 70% of those respondents who have never used ADR said they would consider doing so, although a surprisingly large proportion (27%) said they did not know…Only 3% (6 of the 229 respondents) said they would not use ADR'(Gould et al, 1998). By 2001, it would seem that matters had moved forward in respect to the use of mediation. In a postal survey, Brooker and Lavers (Lavers and Brooker, 2001) reported that 66% of respondents had used mediatory techniques to resolve disputes. Similarly, in a 2010 survey of

construction lawyers in Scotland, 58% of respondents had working experience of representing a party in at least one mediation case (Agapiou & Clark, 2010). The government has also influenced growth over time. For example in March 2001, the Lord Chancellor pledged that standard government procurement contracts would incorporate clauses to promote the use of ADR to resolve disputes as an alternative to litigation. By 2008, the figure had increased to 314 referrals (Lynch, 2010). Despite the fact that much has been written about lawyers' role in and experiences of ADR in commercial disputes in Scotland, and construction matters in other jurisdictions such as England and Wales and the USA (see for example, Povey (2005)), little is known about lawyers' interaction with the process with regard to disputes in Scotland. While recent research has focused on Scots construction lawyers' experience of and attitudes to mediation in construction disputes (Agapiou & Clark (2010), the research presented in this paper covers a wider and more in-depth investigation of lawyers' opinions encompassing early neutral evaluation, conciliation and min-trials. This paper seeks to establish the level of awareness of, interest in and concerns regarding Alternative Dispute Resolution among Scottish legal practitioners, and to assess the implications for the resolution of disputes within the construction industry.

2 The growth of ADR in Scotland

Seemingly, the Commercial Court in Scotland does not have the power to direct the use of ADR without the consent of the parties. The enthusiasm of the English courts for the use of ADR to resolve disputes was driven by the Woolf Review, and the subsequent introduction of the Civil Procedure Rules (Gould, 2009). The ability in the English Rules to encourage the use of ADR has been backed up by comment and orders from judges in a series of cases since 2000 culminating in the decision of the Court of Appeal in *Halsey v Milton Keynes NHS Trust* decided in May 2004. Further examples where the English courts would not tolerate the unreasonable refusal to take part in mediation where the parties have contracted to mediate or where the courts consider it might achieve a settlement outcome include *Burchell v Balland* in April 2005, *Wethered Estate Limited v Michael Davis and Others*, and *Earl of Malmesbury v Strutt & Parker* decided in March 2008. Nonetheless, it is difficult to trace similar judicial enthusiasm in Scotland, according to Clark (2008). There does not seem to be an equivalent rule in Scotland that encourages the use of ADR in either the Court of Session rules or the Sheriff Court rules. The only exceptions to that are contained in the rules for conduct of Commercial Actions in the Court of Session introduced in, December 2004, and the rules for Commercial Actions in the Sheriff Court which were introduced in March 2001 Although these rules have been introduced there is little evidence of the use of ADR being encouraged to resolve commercial disputes either by Court of Session judges or by Sheriffs. Nevertheless, pilot schemes involving in-court mediations were established by the Scottish Government in Sheriff Courts across Scotland. These were designed to test different models of provision to help inform discussions about future sustainability of mediation services. However, according to Clark (2008) these were confined to low value claims involving individuals rather than commercial disputes. Many commentators (e.g. Clark, 2009) have suggested that there is little demand for ADR in Scotland, citing judicial attitudes; change resistant legal profession;

absence of an ADR body and lack of client awareness, as barriers to the further development of ADR within the Scottish arena.

2.1 Legal Profession

In most cases, when clients bring their disputes seeking advice, lawyers automatically enter into litigation: the adversarial process they are familiar and comfortable with, without any thought to possible alternatives. Not only is ADR an 'unknown quantity' to many in the legal fraternity, they also appear unwilling to view it as an opportunity to expand their dispute resolution business rather than a threat to their fee income. This is true notwithstanding the fact that 94% of court actions generally settle (30% of these within one week of proof) (Brooker and Lavers, 1998). Surely the Scottish legal profession should be more enthusiastic in their promotion of alternatives to avoid such 'door of the court settlements', if for no other reason than to attain reduced client costs? There was some interesting research on this matter conducted by Agapiou & Clark (2010). The authors surveyed Scottish construction lawyers and, amongst a series of interesting results, found that almost three-fifths of respondents (58%) had working experience of representing clients in mediations; with 57% citing reduced client costs as by far the most important determining factor in recommending mediation to a client.

2.2 ADR Body

Prior to the establishment of Core Mediation in Edinburgh there was no accreditation body with the necessary infrastructure to supply appropriate mediators and manage disputes from initial enquiry through to a concluded mediation. Whether the existence of such a body will allay any fear judges may have regarding responsibility for the conduct of mediation cases before the courts remains to be seen. In a response to the Scottish Civil Courts Review Consultation Paper, Core Mediation highlighted that they had conducted over 200 mediations since 2002 (Sturrock, 2007). Although this may seem a small number on face value, it is interesting to note that of the total mediation many have taken place within the last few years.

2.3 Client Awareness

With ADR being little used in Scotland and lawyers reluctant to promote it, commercial clients are on the whole unaware of its possible benefits which have led to a resultant lack of demand. However, many large commercial disputes in Scotland involve international companies. Perhaps the greater use of ADR in other jurisdictions may well lead to a better appreciation of its benefits within the Scottish construction context, resulting in similar growth in Scotland as has been seen in England. Ultimately, such demand may force Scottish legal practitioners to expand their dispute resolution portfolio, or risk losing their clients' base (Clark, 2008).

2.4 Prospect for change in Scotland?

Scotland has not been as radical in its reforms of the civil justice system. In spite of calls and measures to encourage ADR, including the introduction in 2001 and 2004, respectively, of rules governing Commercial Actions in the Court of Session and to rules for Commercial Actions in the Sheriff Court, there is little evidence to suggest that ADR has been widely embraced north of the border

(Clark, 2009). Indeed, is there any prospect that ADR will ever gain credibility and acceptability amongst the judiciary, legal professionals, clients and government in Scotland? Interestingly, there has been plethora of government reviews and consultations focusing on reform of the civil justice system in Scotland since 2001, cumulating in the publication of the Gill Review of Civil Justice in 2009. All the reports are, to a certain extent, critical of the status quo and have been instrumental in moving the ADR agenda forward by advocating a move away from litigation towards more consensual approaches to dispute resolution, particularly from a value for money and access to justice perspectives (see for example, Scottish Consumer Council (Civil Justice Advisory Group), 2002) In 2007 the then Scottish Executive [now Scottish Government] published a report entitled 'Modern Laws for a Modern Scotland – A Report on Civil Justice in Scotland'. The report itself was a response to the Scottish Consumer Council's call for a review of the Civil Justice System in Scotland. It compares and contrasts the range of dispute resolution options available to disputing parties, but rather than describing them as either consensual or binding methods, the authors of the report suggested that options should be viewed as being on a continuum ranging from least [court] intervention at one end to most at the other. The Scottish Executive report seems to endorse the Sheriff Court Rules Council and the Court of Session Rules Council governing the use of ADR in the court process, while suggesting that ADR, and especially mediation, should be an integral part of civil justice system in Scotland following Lord Gill's Review (Gill, 2009). Nevertheless, it seems unlikely that the proposals in the Gill Review will lead to a rapid adoption of ADR in Scotland, as compared to the proposals within Woolf Review within England and Wales. Notwithstanding the recommendations of the Gill review, the power to make an order for ADR to take place already exists in the Sheriff Court rules, so can we presume that this power will begin to be used in appropriate cases?

3 Data Collection & Analysis

The aim of the research was to establish the level of awareness of, interest in and concerns regarding ADR relative to legal practitioners in Scotland. Having defined the framework for the survey, the next step was to develop the necessary data collection tool in accordance with the research objectives. The questionnaire was distributed via the internet to 600 legal professionals randomly selected from the membership lists of professional associations for Solicitors & Advocates (Advocates are Barristers in Scotland) based and operating in Scotland.

3.1 Data collection process

Since the questionnaire was self-administered, there was a need for it to be self-explanatory. In order to achieve this, a covering letter and an introductory page describing the aims and objectives of the research was attached to the questionnaire. The questionnaire was structured into 3 sections: Firstly, a number of variables from the survey were selected from the questionnaires as the basis for assessing the use of ADR including the background and experience among Solicitors and Advocates, their training in ADR and organisational policies and practices towards ADR. Secondly, in terms of experiences of ADR, respondents were asked to rate the extent of their and their firms' involvement within civil disputes cases over the last 12 months as well as the extent to which ADR

procedures were actively used to resolve these disputes. Thirdly, as part of the study the respondents were asked to rate their perceptions of dispute resolution and ADR. The purpose of the questions was to ascertain an understanding of the barriers to the use of ADR more generally and for construction disputes in particular. The attitudes were measured by asking the sample frame to rate their responses to 11 statements on a Likert scale (strongly agree =1; moderately agree = 2; neither agree nor disagree = 3; moderately disagree = 4; strongly disagree =5).

3.2 Survey Results

A total of 600 questionnaires were distributed among legal practitioners in Scotland. Of the total, 191 were returned by post wholly or substantially completed, which represents a response rate of 32%. According to Andrews et al (2002), this a relatively high response rate for web-based surveys. McAdoo et al (2003) concur that a 32% response rate is relatively high for and social science-based surveys of legal practitioners.

1.1.1 Background of the respondents and their organisations

A number of variables from the survey were selected from the questionnaires as the basis for assessing the knowledge and use of ADR including the background and experience of the respondents in the legal profession, their training in ADR and organisational policies and practices towards ADR. Of the total numbers of practitioners who responded, 57 % described themselves as Partners, 20 % as Associates, 15% as Advocates and the remainder as QCs and Assistants. In terms of numbers of years within the legal profession, almost 80% of respondents had practised law for more than 10 years, with 20% having more than 30 years' experience in practice.

1.1.2 ADR training

A number of questions focused on formative training in ADR methods among legal practitioners at pre and post qualification stages. In terms of whether respondents had training in consensual forms of dispute resolution prior to entering legal practice, the figures were consistent among legal practitioners. It seems that 95% of those who responded had not received training in ADR techniques. Perhaps this is a reflection of the relatively novelty of ADR as a dispute resolution mechanism within Scotland per se and the lack of taught provision within the respective Law Schools more specifically? However, this finding is consistent with to Clark & Dawson's 2007 survey in which only 4% of respondents had any exposure to mediation at Law School (Clark & Dawson, 2007). It seems that training in ADR techniques increased after respondents had entered legal practice. Around 22% of respondents had received some formal training in ADR techniques. It is widely recognised that post-qualification training had undergone significant reform in recent years. The reforms developed and introduced through organisations such as Core Mediation & the Scottish Mediation Network have been instrumental in promoting more consensual forms of dispute resolution in Scotland such as mediation among newer members of the profession, especially (Sturrock, 2007).

Client representation in Civil Disputes

The questions asked respondents to indicate their and their firms' involvement in civil dispute work over the previous 12 month period. It seems that civil dispute work comprised in excess of 50% of the total workload of 42 % of the practitioners who responded to the survey (see Table 1). However, it seems that only 17 % of their firms had a workload in which civil dispute work comprised more than 50% of overall activity. Thus, it would appear that 83% of practitioners who responded worked in firms whose civil dispute work comprised less than 50% of their firm's workload (See Table 1).

Table 1. Client Representation in Civil Disputes

Percentage of time representing client in civil disputes	Individual practitioner' Response %	Respondents' Firm Involvement %
None	15	11
Less than 25%	29	42
Between 25% and 50%	13	30
Between 50% and 75%	12	8
Between 75% and 100%	31	9

1.1.3 Methods of dispute resolution employed

The question sought to ascertain the methods of dispute resolution employed by legal practitioners in Scotland. It was in three parts on each of the surveys. Firstly, it dealt with legal practitioners generally in Scotland in part (a), then focused on the respondent's firm in part (b) and then the firm in the last year in part (c).

Litigation, Negotiation & Arbitration

It seems that litigation and negotiation were almost universally recognised as means of dispute disposal employed regularly by practitioners in Scotland. It would appear from the survey that Arbitration received wide support as a means of resolving disputes although it was noteworthy that of 109 lawyers who identified it as a method of dispute resolution only 36 had actually used it within the last 12 months. These figures seem to reflect a decline in the overall use of Arbitration more generally (Kennedy et al, 2010), and are consistent with several studies on the Arbitration in Scotland, specifically (Dundas and Bartos, 2010).

Adjudication, Mediation and Conciliation

Around two-thirds of the total respondents recognised Adjudication as a means of dispute resolution employed by legal practitioners in Scotland. Nevertheless, it seems that only 8% of those who responded to the survey were actively involved with the process. These figures may reflect the increasing involvement of other professionals in adjudication procedures, and are consistent with the findings of the recent studies of the Adjudication process (Kennedy et al, 2010). The respondents also seem to have recognised Mediation as a means of dispute resolution involving legal practitioners with responses almost mirroring the support for Arbitration. Around 57% of the total number of those who responded

to the survey recognised Mediation as an ADR process employed by Scots legal practitioners. As will be seen later in the survey, these figures perhaps reflect the fact that mediation is viewed as a prominent method of dispute resolution in Family, Matrimonial and Employment matters (Lynch, 2010). These are both specialist areas and they would therefore have many fewer practitioners active in them. Around two-thirds of lawyers who responded recognised conciliation as a method of dispute resolution in Scotland (see Table 2). However, the level of active involvement is much less in this case with 21% of respondents actively involved in the procedure. While conciliation is a term used particularly in the area covered by Tribunals, it is often used as an alternative expression for mediation and indeed the terms are often interchangeably within legal texts (Clark, 2009).

Table 2. Use of ADR

	Legal practitioners in Scotland (N)	Your Practice (N)	Your Practice within the last 12 months (N)
Litigation	112	102	100
Negotiation	113	104	101
Arbitration	109	45	36
Adjudication	79	22	21
Mediation	108	48	38
Conciliation	18	10	6
Neutral Evaluation	15	10	6
Mini Trial	5	3	3

Nevertheless, while conciliation may not have any legal standing, it differs from mediation in that parties are not required to meet as part of the process.

Neutral Evaluation & Min-trials

It seems that Neutral Evaluation was recognised by only 8% of respondents as a method of dispute disposal used in Scotland. Even fewer respondents recognised mini-trials as a means of dispute resolution in Scotland, and had been involved with it to a large extent over the last 12 months. It seems that while the procedures are being used to suit particular situations and needs in dispute disposal, their identification and use is only marginal. Unless a particular method was specified in contracts for dispute disposal as happens with arbitration and adjudication, or was the known industry method e.g. conciliation in employment disputes, then there appears to be little use of ADR to settle disputes. Most disputes appear to be resolved by either by negotiation or litigation, generally.

1.1.4 Recent experience of using ADR processes

In terms of respondents' most recent dispute experience, it seems that litigation was, overwhelmingly, the most common method for resolving disputes in Scotland according to the figures in Table 3).

Table 3. Recent experience of ADR processes**

	0	1-5	5-10	10-20	20+	50+
Litigation	16	11	4	14	68	68
Arbitration	45	49	4	4	2	1
Adjudication	60	21	4	2	4	1
Mediation	56	35	9	7	2	2
Conciliation	60	15	6	6	3	2
Neutral Evaluation	60	4	0	0	2	0
Mini-trial	65	4	0	1	0	0
other (please specify)	40	0	1	1	2	3

**The total minimum number of procedures in each category group is added up then on the basis that respondents represented clients on each side of the same dispute

The question sought to ascertain the level of use of litigation and alternative means of dispute resolution among the sample of respondents. The respondents were asked to indicate the total number of cases dealt with by type of means of disputes resolution ranging from 0-50+ for all practitioners. It would appear even on the most arbitrary level of assessment taking the response at the bottom of the range, that litigation was used on 4931 instances (see Table 3), whereas other means of dispute resolution were used on 1208 occasions: ligation accounting for over 80 % of the total number of total number of cases resolved. In fact this figure itself could be a gross underestimate of the actual number of litigations being handled by respondents as, for instance, one lawyer stated that that he had handled over 400 cases involving litigation. This certainly may be an exception but may also be indicative of much higher levels of involvement with litigation as compared to the volume of cases calculated through an arbitrary assessment of cases.

1.1.5 Appropriate use of ADR

This question proved the most challenging for most respondents. Many of the respondents made numerous entries identifying that many of the ADR procedures were appropriate means of resolution given the nature of the dispute. A few respondents made only one or two entries with still others making no entries that may suggest that none of the procedures were appropriate. There seems to be a clear consensus among the respondents that mediation was appropriate for family and matrimonial disputes. Of the lawyers who responded to the survey 94 considered mediation appropriate for family and matrimonial disputes (see Table 4).

Table 4. Appropriate use of ADR

	Arbitration	Adjudication	Mediation	Neural Evaluation	Mini-Trial	Other
Construction	70	75	51	28	12	8
Family or matrimonial	12	9	140	25	8	13
Medical negligence	22	21	42	32	11	16
Employment	45	26	35	25	12	11
Other Civil	45	29	57	22	12	13

This figure equates to 49% of the total respondents. There also seemed to be a consensus among respondents, albeit to a lesser extent, that mediation was appropriate in resolving employment-related disputes. It would seem that respondents considered binding procedures to be the most appropriate for resolving construction disputes. Indeed, around 58% of those who responded to the survey acknowledged Arbitration and Adjudication as standard methods of resolving such disputes. It was possible that some of the respondents reserved their position regarding the use of adjudication for the resolution construction disputes. The question sought means of resolution, implying permanence, and while pragmatically adjudication often was, in fact, resolution of the dispute, technically it is only temporarily binding (Dundas & Barton, 2010), and many of the respondents would be familiar with that particular paradox. There did not seem to be significant support for any particular ADR procedure for disputes involving medical negligence matters although mediation and ENE were identified as most appropriate among legal practitioners. Indeed, 5 % of those who responded identified mediation as the most appropriate means of ADR, while ENE was identified by 8% of respondents as most suitable in medical negligence cases. It would appear that Mini-trial was the procedure that seemed least understood by respondents. Many of those who responded to the survey considered all other means of ADR appropriate to many of the disputes ahead of the mini-trial process.

1.1.6 Legal practitioners' attitudes to ADR

ADR and business relationships

It seems that the majority of those who responded to the survey considered that dispute resolution avoiding judicial or quasi-judicial methods would better preserve business relationships, with 52 % of respondents in strong or moderate agreement with the proposition (see Table 5).

Table 5. Legal practitioners 'attitudes to ADR

	Strongly agree (%)	Moderately agree (%)	Neither agree nor disagree (%)	Moderately Disagree (%)	Strongly disagree (%)
Dispute resolution avoiding judicial or quasi-judicial methods better preserves business relationships.	13	39	22	16	10
Dispute resolution avoiding judicial or quasi-judicial methods are less expensive and less time consuming for clients	17	40	29	9	5
Dispute resolution avoiding judicial or quasi-judicial methods would reduce the workload in the legal community	9	24	47	15	5
Dispute resolution avoiding judicial or quasi-judicial methods would add to the workload in the legal community	2	10	55	24	9
Compromise and settlement are the most effective means of dispute resolution	31	48	14	5	2
Legal practitioners should routinely encourage clients to choose the dispute resolution process most appropriate to their business	39	37	12	3	9
Training in the whole range of dispute resolution processes should now be a core part of a legal practitioner's university education	37	33	19	6	3
A dispute resolution approach avoiding the formal legal process should always be tried in order to avoid if possible formal proceedings	13	38	21	15	13
A structured set of legal guidelines defining these terms and their parameters would be a useful reference for application to contracts	26	49	18	6	1
The use of other means of dispute resolution as an initial approach preceding the formal legal process should be included in the Rules of Court. Time bar and prescription issues would thus have been accommodated	13	30	29	13	15
On the basis you saw it as a threat, if your views on the financial consequences were suspended, would the use of ADR be a social benefit	9	43	40	4	4

This acknowledgement however does not necessarily suggest support for consensual means of dispute disposal in itself. A number of the respondents made the point that settlement prior to formal legal proceedings was the most common outcome for litigation and their response to the question was recognition that litigation would have a detrimental effect on business relationships between parties involved in a dispute.

ADR and Clients

In terms of whether dispute resolution avoiding judicial or quasi-judicial methods are less expensive and less time consuming for clients, the majority of those who responded to the survey, 55%, supported the proposition with 17% in strong agreement (see Table 5). This finding may suggest that in some circumstances respondents would recommend mediation to clients as an alternative to more traditional methods of dispute resolution. Perhaps, where the speed and cost of settlement are important determining factors? It would be interesting to ascertain whether ADR does indeed have an overall effect by reducing the number of cases that would ultimately go through the formal tribunal process or whether by conducting a mediation or other ADR procedure during the tribunal would shorten the process; or reduce the scale of the dispute; or mitigate costs in some other way over what would have been achieved, in any event, by negotiation?

Legal practitioners and Workload

The respondents were asked whether dispute resolution avoiding judicial or quasi-judicial methods would reduce legal practitioners' workload. Around 55% of those who responded to the survey held a neutral stance of the impact of ADR on their workload, with the balance 45% strongly agreeing that their workload would be reduced (see Table 5). The informal nature of ADR procedures and the reduced barriers to entry may allow more players, outwith the legal fraternity, to participate in provision of the service, so it could be argued that there would be a reduction in workload for the legal profession. The view being expressed was perhaps an acknowledgement of the Scottish Government's objective of reducing time to settlement and process costs that may be more readily achieved by the removal or reduction of input by legal practitioners (Lynch, 2010). There is of course a counter argument that if the average cost a dispute declined access to justice would be easier thereby allowing more disputes to be processed and workload maintained at current levels. In terms of whether dispute resolution that would avoid judicial or quasi-judicial methods would add to the workload of legal practitioners, there was no clear consensus from respondents either way. It seems only small proportions of respondents held the view that it would add work, with 9% of respondents in agreement with that proposition. A significant number of respondents, 47% of respondents, took a more neutral stance when posed with question as compared to previous questions. Perhaps, this finding reflects the profile of respondents relative to their level of seniority within the profession.

Effective means of dispute disposal

The respondents were then asked whether compromise and settlement are the most effective means of dispute resolution. It would appear that 80% of practitioners in agreement with the proposition, with only 7% holding a contrary view (see Table 5). This may reflect the experience of legal practitioners in

Scotland, that most cases involving litigation settle before formal process begins. The respondents also agreed with the proposition, 51%, that practitioners should routinely encourage client to select dispute resolution process most appropriate to their business.

ADR knowledge and training

The majority of respondents considered that training in the whole range of dispute resolution processes should now be an integral part of a legal practitioner's university education. This would seem to concur with Mackie's suggestions for increased education in consensual methods of dispute disposal (Mackie (1991)). It seems that 70% of those who responded to the survey agreed with the proposition. These responses may reflect a greater interest and desire to be better acquainted with ADR procedures than previously thought. On a related issue, findings from the survey underlined the need for the Government and others involved in the promotion of ADR to better explain procedures and to a wider audience, at least within the legal fraternity: this is consistent with the recommendations of the Gill Review (Gill, 2009). Indeed, respondents agreed, 76% of respondents, that a structured set of legal guidelines incorporating terminology and parameters would be a useful reference document for the application to contracts.

Effective use of ADR

A question was posed on whether dispute resolution approach avoiding the formal legal process should always be tried in order to avoid if possible formal proceedings. The results of survey were far from conclusive with only around 50% of respondents in agreement with the proposition (see Table 5). This may reflect self-interest and to a certain extent self-preservation of those who responded to the survey. Patterson and Seabolt (2001) suggest that 'ADR adds an extra layer of doubt and intrigue to situations where there may already be considerable disagreement' (pg 391), in which case ADR may in fact exacerbate matters further worsening an already fraught state of affairs. Nevertheless, most construction industry commentators disagree with this view asserting that ADR is indeed an adjunct to other forms of dispute disposal (CIC, 2002).

ADR and the Courts

It seems that 29% of respondents to the survey strongly disagreed with the proposition that ADR should be included in the Rules of Court (see Table 5). The proposition could be read as going beyond the Woolf Reforms to the civil procedure rules in England and Wales and this may have contributed to the negative view from some of the respondents.

The opportunities and threats from ADR

In response to a question as to whether ADR constitute an opportunity or a threat to legal practitioners within Scotland, the majority of respondents, 52%, agreed that ADR was an opportunity rather than a threat; only 7% of respondents identified ADR as a threat to the legal profession (see Table 5). Interestingly when asked the question 'on the basis you saw it as a threat, if your views on the financial consequences were suspended, would the use of ADR be a social benefit?' 52% of respondents agreed with the proposition. Perhaps a more tellingly finding was that only 7% of respondents disagreed that the use of ADR

would be a social benefit (see Table 5). It could be that the perception of the legal fraternity as inherently conservative towards non-court sanctioned dispute resolution is unfounded, or that perhaps this was the most socially-acceptable response?

4 Conclusion

While a significance body of case law does exist, proceedings involving ADR are not widely disseminated seemingly amongst legal practitioners according to the survey sample. The study has also shown that Scots legal practitioners overwhelmingly agree that binding forms of dispute resolution such as adjudication and arbitration remain the most effective means of resolving construction disputes, albeit opportunities for mediation are emerging. The survey findings will hopefully provide added impetus to the debate surrounding ADR more generally, and the development of a strategy for the greater use of consensual means of dispute disposal for resolving disputes with particular reference to the construction industry in Scotland. Such a strategy will require further education & training in ADR processes among legal practitioners in addition to the wider dissemination of case law relative to the use of ADR in construction disputes.

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Analysis of recent amendments made to security of payment legislation in New South Wales

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Abstract:

The *Building and Construction Industry Security of Payment Amendment Act 2010* (NSW) ('the 2010 amending Act') was assented to on 29 November 2010. The 2010 amending Act makes changes to the operation of the *Building and Construction Industry Security of Payment Act 1999* (NSW), and is designed to enhance the ability of sub-contractors to recover payment by allowing claimants to attach moneys payable to the respondent by the respondent's principal. Currently, when, in response to a payment claim, the respondent fails to provide a payment schedule, the claimant can elect between recovering the unpaid portion of the claimed amount as a debt in any court of competent jurisdiction and making an adjudication application. If the claimant elected to recover the debt in a court, the claimant could commence proceedings in a court and apply to the court for an attachment order under s 14 of the *Contractors Debts Act 1997* (NSW). This is unchanged by the 2010 amending Act. However, if the claimant elected to go to adjudication, the claimant could not require the 'principal contractor' (i.e., the respondent's principal) to withhold payments to the respondent. The 2010 amending Act plugs this gap by establishing that a principal contractor can be required to retain sufficient money to cover the amount claimed against the respondent without requiring the claimant to go through the courts. This paper provides an analysis of the amendments introduced by 2010 amending Act and addresses the main implications of the amendments for the three parties affected, namely, the claimant, the respondent and the respondent's principal.

Keywords:

adjudication, amendments, New South Wales, security of payment

1 Introduction

1.1 Sub-contracting and security of payment

The Australian building and construction industry is a project-based industry and consists of a large number of small private firms (ABS, 2004). In project-based industries like the building and construction industry the delivery of projects to

clients typically requires a head-contractor to purchase 'sub-projects' and expertise from a large number of external trade suppliers. Consequently, head-contractors in the construction industry often act as 'systems integrators' and take responsibility for actively coordinating a network of sub-contractors (Martinsuo and Ahola, 2010).

According to Harris and McCaffer (2001), the practice by head-contractors of sub-contracting the works under the head-contract has been on the rise in Australia since the 1980's. However, Uher and Davenport (2009) place the shift to sub-contracting as early as the late 1960's, which was about the time when most Western economies began to experience periodic economic downturns when head-contractors' economic capacity as direct employers of tradespeople began to diminish. Harris and McCaffer (2001) and Uher and Davenport (2009) agree that sub-contracting has now become widespread in the construction industry and is an essential component of the project procurement structure and delivery process.

To appreciate how prolific sub-contracting is in the construction industry in Australian, the National Electrical and Communications Association in Australia indicates that about '95% of the labour content' on construction projects, and '75% of the total project value', is undertaken by sub-contractors (Cole, 2003). As at the end of June 2003, there were about 340,000 construction businesses operating in Australia with employment of just over 700,000 people. Trade service businesses accounted for about 270,000 (or about 80%) of all construction businesses and employed just over 500,000 people, which represents about 75% of the total construction employment. The majority of trade service businesses (about 70%) were earning an annual income of less than AU$100,000 (ABS, 2004).

The reasons for the widespread use of sub-contracting in the construction industry are many. However, according to Goldfayl (1999), one notable advantage to head-contractors of sub-contracting relevant here is the ability of head-contractors to divest much of the financial risk of delivery of the works under the head-contract to sub-contractors – the advantage for head-contractors being improved cash flow through the effective up-front financing of the bulk of a project by sub-contractors (Maqsood *et. al.,* 2003). This reduces head-contractors' need for interim borrowings and so reduces head-contractors project costs. This, of course, makes good commercial sense for head-contractors and their clients. However, it is the systematic abuse of sub-contracting that appreciably contributes to the security of payment problem in the construction industry – the abuse being to wrongfully delay and devalue payments to sub-contractors due under the sub-contract to further enhance the financial position of the head-contractor.

Typically, construction projects are characterised by a hierarchical chain of contracts involving cascading payment obligations (Commonwealth Government, 2002). Under this hierarchical chain the Principal (sometimes called 'the Employer' or 'the Owner') pays the head-contractor, the head-contractor then pays the sub-contractor and the sub-contractor then pays sub-sub-contractors and suppliers. While money flows smoothly down the construction chain, all is well. However, all too often one party in the chain does not pay the other party for work done contrary to the contract between them. If the head-contractor wants to reduce its overdraft or is short of money, there is a temptation to delay or withhold

passing on payments down the chain. Sometimes the head-contractor will simply not want to part with money to project participants down the chain. Sometimes the head-contractor is dishonest and, in effect, takes the sub-contractor's money with no intention of ever paying the sub-contractor. Sometimes, instead of passing money down the chain, the head-contractor uses the money to pay other creditors. In any event, a delay or failure to make payments by one participant higher up in the contractual chain can create significant financial strain on many more project participants lower down in the chain. Ongoing delays or failures by a head-contractor to pass money down the chain can reduce sub-contractors' cash flow to zero. If this happens, a sub-contractor may be forced to carry bad debts, and in extreme cases, may be forced into some form of insolvency (Commonwealth Government, 2002).

The problem is not new. More than 100 years ago, the NSW Government enacted the *Contractors Debts Act 1897* as a means of providing some security of payment to workers and tradespeople during the construction of the NSW railways. The *Contractors Debts Act 1897* has since been replaced by the *Contractors Debts Act 1997* (NSW), but it has not materially altered the scheme under the *Contractors Debts Act 1897*. Section 14 of the *Contractors Debts Act 1997* (NSW) provides that if court proceedings are commenced by an unpaid sub-contractor against a head-contractor for recovery of money for work carried out or materials supplied, the court may make an 'attachment order' against the Principal. The Principal served with the attachment order has to retain from progress payments to the head-contractor sufficient money to cover the debt due to the sub-contractor. If, while the order is in effect, the Principal fails to withhold the money, the sub-contractor can sue the Principal for the amount.

If under an attachment order money is retained by the Principal, the sub-contractor upon obtaining judgment against the head-contractor asks the court for a 'debt certificate' under s 7 of the *Contractors Debts Act 1997* (NSW). If the sub-contractor serves on the Principal a copy of the debt certificate and a 'notice of claim' the effect is that the money owed by the Principal to the head-contractor is assigned to the sub-contractor. However, the *Contractors Debts Act 1997* (NSW) has been rarely used. This is because, to obtain the attachment order, the sub-contractor had to commence litigation and satisfy the court that the head-contractor owes the sub-contractor money for work carried out or materials supplied. Litigation is costly, time consuming and requires engaging a lawyer. The money is frozen in the hands of the Principal until the litigation is complete, which may be months or years. In the meantime, sub-contractors may be forced into insolvency through lack of cash flow.

1.2 Security of payment legislation in New South Wales

Following the introduction of the *Housing Grants, Construction and Regeneration Act 1996* (UK), the *Building and Construction Industry Security of Payment Act 1999* (NSW) ('the NSW Act') was introduced by the Carr Labour Government in an attempt to counter the security of payment problem in the NSW construction industry. The NSW Act was assented to on 5 October 1999 and commenced on 26 March 2000. New South Wales was the first Australian jurisdiction to introduce this type of legislation.

As a consequence of a formal review undertaken at the end of the NSW Act's first three years of operation, the NSW Act was significantly amended by the *Building and Construction Industry Security of Payment Amendment Act 2002* (NSW). The NSW Act (as amended by the *Building and Construction Industry Security of Payment Amendment Act 2002*) commenced on 3 March 2003.

The object of the NSW Act:

> is to ensure that any person who undertakes to carry out construction work (or who undertakes to supply related goods and services) under a construction contract is entitled to receive, and is able to recover, progress payments in relation to the carrying out of that work and the supplying of those goods and services.[1]

To achieve this objective, the NSW Act has introduced new statutory rights for claimants, such as: a right to progress payments;[2] a right to interest on late payments;[3] a right to suspend work;[4] and a right of lien.[5] The NSW Act also renders void 'pay-when-paid' clauses in construction contracts.[6] The parties cannot contract out of the NSW Act.[7]

The NSW Act also introduced a unique form of 'rapid adjudication' to deal with disputes over the amount of progress payments due, whereby an independent adjudicator makes an interim determination as to the amount of progress payment to be paid to a claimant by a respondent. Only a claimant (i.e., the person who has contracted to carry out construction work or to provide related goods and services) can initiate the adjudication process, however, both parties are entitled to make submissions to the adjudicator (subject to s. 20(2B) of the NSW Act). An adjudicator can only be appointed by an Authorised Nominating Authority (ANA) chosen by the claimant.[8] An extended overview of the operation and performance of the NSW Act is provided by Brand and Uher (2010). A detailed review of the NSW Act, and comparable legislation operating in Australia, is provided by Davenport (2010).

Prior to the introduction of the NSW Act it was not feasible to sue for progress payments. By the time the matter was finally heard by a court, the sub-contract would be complete and any right to progress payments would be replaced by the final accounting between the parties. The sub-contractor would then want a final judgment not merely a judgment for an interim payment. The NSW Act changed that; it enables a sub-contractor to make claims for progress payments and have them adjudicated in a matter of weeks. Suddenly, it became feasible to sue for progress payments. Judgment could be obtained by simply filing an adjudication certificate. Nevertheless, whilst adjudication speeds up the passing of money down the line, it does not remove the ability of a head-contractor, in the interim, to use for the head-contractor's own purposes money which is for the sub-

[1] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 3.
[2] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 8(1).
[3] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 11(2).
[4] *Building and Construction Industry Security of Payment Act 1999* (NSW) ss. 15(2), 16(2), 24(1).
[5] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 11(3).
[6] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 12(1).
[7] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 34.
[8] *Building and Construction Industry Security of Payment Act 1999* (NSW) s. 17(3)(b).

contractor's work. If that ability is removed, the incentive to delay and withhold the money is removed.

Subsequent to the introduction of the NSW Act, section 7(1A) of the *Contractors Debts Act 1997* (NSW) was amended by the insertion of s 7(1)(A), which provides:

> If an adjudication certificate within the meaning of the *Building and Construction Industry Security of Payment Act 1999* has been filed as a judgment for a debt in accordance with section 25 of that Act, the court may, by order made on the application by the person who filed the adjudication certificate, issue a debt certificate in respect of that debt under this section.

Nevertheless, the problem still remained that to freeze moneys in the hands of the Principal until the adjudication certificate is filed, the claimant had to commence legal proceedings in parallel with adjudication proceedings. However, that would be an abuse of process; the two proceedings cannot co-exist. The consequence was that a sub-contractor was unable to freeze moneys in the hands of the Principal if the sub-contractor submitted the payment claim for adjudication. The NSW Government has now rectified the problem in the *Building and Construction Industry Security of Payment Amendment Act 2010* (NSW), which is discussed in detail below.

2 The Building and Construction Industry Security of Payment Amendment Act 2010 (NSW)

2.1 Background

In September 2010, the NSW Department of Services, Technology and Administration released a discussion paper for building and construction industry stakeholder consideration. The discussion paper identified a number of matters of concern regarding operation of the NSW Act. The discussion paper pointed to, *inter alia*, the difficulties being experienced by 'subcontractor-claimants' in securing payment after adjudication, particularly when the respondent became insolvent (DSTA, 2010).

As a consequence of the comments made by industry stakeholders in reply to the discussion paper, the *Building and Construction Industry Security of Payment Amendment Act 2010* NSW ('the 2010 amending Act') was introduced. The 2010 amending Act was assented to on 29 November 2010 and commenced on 28 February 2011. The 2010 amending Act inserts sections 26A to 26F, section 34A and Schedule 2, Part 4 into the NSW Act. The 2010 amending Act applies to existing and future construction contracts and the amendments apply to current and future adjudication applications.

The 2010 amending Act enables a sub-contractor to freeze in the hands of the Principal money that is or will become payable to the head-contractor. It enables a sub-contractor to achieve speedily, inexpensively and without a court order what an 'attachment order' under *Contractors Debts Act 1997* (NSW) previously achieved. Whereas attachment orders under the *Contractors Debts Act* (NSW)

have been uncommon, payment withholding notices under the the NSW Act are expected to be frequently used.

2.2 Payment withholding request

A sub-contractor claiming payment from a head-contractor may serve upon the head-contractor's Principal a 'payment withholding request' at any time after lodging an adjudication application. The prescribed form of payment withholding request and the standard statutory declaration that must accompany the payment withholding request are made readily available by NSW Procurement (2011). The effect of service of the payment withholding request is that while it remains effective the Principal must retain and not pass on to the head-contractor moneys owed by the Principal to the head-contractor for work carried out or materials supplied by the head-contractor. Some qualifications are discussed below.

The problem that the 2010 amending Act addresses is best explained by an example. Assume that a sub-contractor (the claimant) does $10,000 worth of work for a head-contractor (the respondent) and at the end of the month the sub-contractor makes a progress claim. About the same time the respondent will make a progress claim against the respondent's Principal for payment for that work. If, within 10 business days after being served with the claimant's payment claim, the respondent gives the claimant a payment schedule for less than the claimed amount, the claimant can immediately apply to an authorised nominating authority to have the payment claim adjudicated. At the same time as the claimant makes the adjudication application, the amendment enables the claimant to give a payment withholding request to the Principal.

Upon receipt of the payment withholding request, the Principal must retain $10,000 from moneys due or subsequently becoming due from the Principal to the respondent for work carried out by the claimant. If the claimant moves quickly, the claimant should be able to serve the payment withholding request before the Principal has paid the respondent. When payment cycles are monthly, this should be trouble-free. The effect is that the respondent will not be able to use the claimant's money for the respondent's own purposes.

2.3 The Principal's obligation to retain money

Under the Act the person with whom the respondent contracts to provide work or materials is called 'the Principal contractor'. That term is confusing. In this paper the term 'Principal' will be used. The Principal is the person, if any, one step up the contract chain from the respondent. If the head-contractor to the Government, an owner or developer is the respondent in an adjudication application, the Government, the owner or the developer is the Principal. If a sub-contractor to the head-contractor is a respondent in an adjudication application, the head-contractor is the Principal.

The purpose of an attachment order under s 14 of the *Contractors Debts Act 1997* (NSW) and a payment withholding request under s 26A of the NSW Act is to freeze moneys in the hands of the Principal until the claimant's entitlement to the moneys is decided by a court. To obtain payment of those moneys from the Principal the claimant must obtain a judgment and ask the court for a debt certificate under s 7 of the *Contractors Debts Act 1997* (NSW). To obtain payment from the Principal the claimant must serve on the Principal a notice of

claim in an approved form together with a copy of the debt certificate.[1] The procedure is described in detail by Davenport (2010, pp. 223-25).

If served with a payment withholding request, the Principal must act quickly to stop all payments to the respondent for work carried out or materials supplied by the respondent until the Principal can ascertain how much of those payments are for work or materials that the respondent engaged the claimant to carry out. Out of money that is or subsequently becomes payable by the Principal to the respondent, the Principal must withhold sufficient to cover the amount claimed in the payment claim. There are some qualifications. There are three ceilings on the amount to be retained. The Principal is obliged to retain the smallest of the following:

A. the amount claimed in the payment claim the subject of the adjudication application, less any part payment made;[2]
B. the amount owed, or which subsequently becomes payable, by the Principal to the respondent when or after the payment withholding request is served on the Principal;[3] or
C. the amount that is or becomes payable by the Principal to the respondent for or incidental to the work or materials that the respondent engaged the claimant to carry out or supply.[4]

A claimant may claim any amount but the amount which the Principal must retain is only the amount that is payable by the Principal to the respondent for the work or materials supplied by the claimant. For example, under the sub-contract the claimant may claim $1m for certain piling work – this is amount 'A' above. Under the head contract the amount payable by the Principal to the respondent for the piling work may be only $100,000 – this is the amount 'C' above. The Principal is only required to withhold payment of $100,000 even though the Principal owes the respondent $500,000 – this is the amount 'B' above. The amount by which 'B' exceeds 'C' is for work other than the work or materials carried out or supplied by the claimant. It may be for work carried out by other sub-contractors to the respondent.

The obligation to retain money does not extend to all money payable by the Principal to the respondent. It does not apply to money payable to the respondent for work carried out or materials supplied by sub-contractors other than the claimant. The obligation applies not only to payment for the work indicated in the payment claim which is the subject of the adjudication. It also applies to payment for any other work carried out or materials supplied by the claimant under the sub-contract. The application of the NSW Act to refund (by the Principal) retention moneys and security deposits may present problems.

The money which is subject to the payment withholding request is not only the amount which represents the value of that work but "money that is or becomes

[1] *Contractors Debts Act 1997* (NSW), s 6.
[2] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(4).
[3] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(1).
[4] *Building and Construction Industry Security of Payment Act 199* (NSW), s 26B(2).

payable…for work".[1] That could include extra payable for delay, variations and, perhaps, damages. Section 26B(2) provides:

> The amount is only required to be retained out of money that is or becomes payable by the Principal contractor to the respondent for work carried out or materials supplied by the respondent to the Principal contractor as part of or incidental to the work or materials that the respondent engaged the claimant to carry out or supply.

Note the word 'incidental'. Assume that the claimant supplies bricks to the respondent and the payment claim is for $1,000 for the value of the bricks. Assume that the amount payable by the Principal to the respondent for the bricks is $1,100. The extra $100 represents the respondent's entitlement for profit and attendance. Assume that at the time of receipt of the payment withholding request (for $1,000) the Principal has paid the respondent $500 and the Principal owes the respondent $600. It seems that the respondent must retain the $600 even if $100 of that could be said to be the respondent's entitlement for profit and overheads.

Now assume that the respondent's work involves building a house with the bricks. Assume that there are many sub-contractors and the contract price is a lump sum. Progress payments by the Principal to the respondent are payments on account of the lump sum price. It will not be possible to identify any particular amount that is payable by the Principal to the respondent for the bricks. But, ultimately, part of the contract price for the house will represent money that is payable by the Principal to the respondent for the bricks supplied by the claimant. In that situation it seems that the Principal must withhold payment to the respondent of $1,000.

Without the consent of the respondent or a notice from the claimant attaching a debt certificate under s 7 of the *Contractor's Debts Act 1997* (NSW) the Principal must not pay any amount to the claimant. If, prior to issue by the court of a debt certificate under s 7 of the *Contractors Debts Act 1997* (NSW), the respondent is placed in liquidation or made bankrupt, the claimant cannot obtain a debt certificate without special leave of the court. Commonwealth legislation, rather than the *Contractor's Debts Act 1997* (NSW) and the NSW Act, then applies to moneys withheld. If, while withholding money pursuant to a payment withholding request, the Principal receives an attachment order (a garnishee order) from another creditor of the respondent, the Principal would not be able to pay the creditor out of the moneys which the Principal is required to withhold.

If after being served with a payment withholding request, the Principal is uncertain whether an amount due from the Principal to the respondent should be paid to the respondent or be withheld, the Principal should seek the opinion of the respondent and, if there is a difference of opinion, obtain legal advice. Of the two options, paying or withholding, the second involves less risk for the Principal. If the Principal wrongly withholds payment, the Principal will probably be liable to pay interest to the respondent but if the Principal pays the amount to the respondent, the Principal could be liable to the claimant for the amount and possibly interest. Section 26C of the NSW Act provides:

[1] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(2).

> If the Principal contractor discharges the Principal contractor's obligation to pay money owed under a contract to the respondent in contravention of a requirement under this Division to retain the money, the Principal contractor becomes jointly and severally liable with the respondent in respect of the debt owed by the respondent to the claimant (but only to the extent of the amount of money to which the contravention relates).

If an amount becomes payable by the Principal to the respondent and it must be retained pursuant to a payment withholding request, the Principal cannot discharge its obligation to the respondent by setting off an amount that subsequently becomes due from the respondent to the Principal.[1] For example, if at 30 June the respondent is entitled to a progress payment from the Principal of $10,000 and the Principal receives a payment withholding request for an amount of $10,000 or more, the Principal must retain the $10,000. If subsequently, the respondent's work was found to be defective and only worth $1,000, the Principal must still retain the $10,000. There is no obligation on the Principal to deposit in a trust account the money withheld. However, for accounting purposes, the Principal should separately show the money withheld. Even if in the next progress valuation the work is valued at $1,000 or, because the respondent is liable to the Principal for liquidated damages for delay, the next progress certificate shows that the respondent owes the Principal money (and the Principal does not owe the respondent any money), or the contract has been terminated by the Principal on account of the respondent's breach of contract, it seems that when the respondent receives a notice of claim and debt certificate for $10,000 under s 6 of the *Contractor's Debts Act 1997* (NSW), the Principal must pay the $10,000 to the claimant.

It seems that for the Principal there is one only way around the problem. That would be for the Principal to obtain a judgment against the respondent. When the Principal obtains such a judgment, it seems that the $10,000 is no longer an amount which is owed by the Principal to the respondent. The previous debt merges in the judgment. It seems that the amount payable by the Principal pursuant to the notice of claim and debt certificate under s 6 of the *Contractor's Debts Act 1997* (NSW) could not require the Principal to pay the claimant any amount exceeding the amount owed by the Principal to the respondent under the judgment.

If a person is served with a payment withholding request and the person is not (or is no longer) a Principal contractor in relation to the payment claim, the person must give written notice to the claimant within 10 business days after receiving the payment withholding request.[2] A person may have once been but is no longer a Principal contractor (within the meaning of s 26A(4) of the NSW Act) because, before receiving the payment withholding request, the person has paid all moneys due from that person to the respondent and no further moneys will become due.

The Principal is not required by the payment withholding request to retain the money if 20 business days have elapsed since the Principal was served with a copy of the adjudicator's determination of the payment claim to which that

[1] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26C(1).

[2] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26A(5).

payment withholding request relates.[1] In counting the 20 business days, the date upon which a copy of the determination was served on the Principal is not counted. The Principal must allow 20 business days to pass and on the day after the 20th business day has expired, the Principal is no longer required by that payment withholding request to retain any moneys.

Section 26B(5) of the NSW Act provides that within 5 business days after the adjudicator's determination is served on the claimant (by the adjudicator) the claimant must serve a copy of the adjudicator's determination on the Principal. The Principal must not act on that. It is only for information. Even if the determination is that there is no progress payment due to the claimant, the Principal must continue to withhold payment until 20 business days have elapsed after the Principal is served with a copy of the determination.[2] It is always possible that within that period the claimant will commence another adjudication and serve another payment withholding request. The reason why the Principal must retain the moneys for 20 business days is to give the parties time to make applications to the appropriate court. Either party may seek orders from a court with respect to the adjudication determination. To actually have a right to recover moneys from the Principal, the claimant must obtain a debt certificate from the court.

Sometimes a respondent obtains from the NSW Supreme Court a declaration that an adjudicator's determination is void even though the adjudication application is valid. By the time that declaration is obtained, it will be too late for the claimant to withdraw the adjudication application.[3] Sometimes the Court will be far sighted enough to make it a condition of the declaration that the parties agree to an extension of time for the making of an adjudication determination but often this is not the case. Then there could be a valid adjudication application but no possibility of there ever being an adjudication determination. In that event, if the respondent does not obtain an appropriate order from the Court, the Principal's obligation to retain money continues.[4] The limitation period in s 17 of the *Contractors Debts Act 1997* (NSW) does not apply and there is no limitation under the NSW Act on how long the Principal must retain the money. This appears to be a drafting oversight. If the Principal does pay it to the respondent or uses it to discharge an obligation of the respondent to the Principal, the claimant can sue the Principal.[5] Consequently, when a respondent seeks a decision from the NSW Supreme Court declaring an adjudication determination void the respondent should ensure that an appropriate order is made with respect to any payment withholding request that the claimant may have served or might even thereafter serve on the respondent with respect to the adjudication application.

Sometimes the claimant will not know if there is a Principal or who the Principal is. Under s 26E of the NSW Act the claimant may ask the adjudicator to request the respondent to provide information to the claimant as to the identity and contact details of the Principal. The Act does not prescribe a time for the supply by the respondent of the information. The adjudicator should state a time. If the

[1] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(3)(d).
[2] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(3)(d).
[3] See: *Cardinal Project Services v Hanave* [2010] NSWSC 1367.
[4] See: *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(3).
[5] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26C(1).

claimant thinks that there may be more than one Principal, the claimant can serve a payment withholding request on each person that the claimant believes is a Principal.

Section 7(2)(b) of the NSW Act provides that the NSW Act does not apply to a construction contract for the carrying out of residential building work (within the meaning of the *Home Building Act 1989* NSW) on such part of any premises as the party for whom the work is carried out resides in or proposes to reside in. If the contract between the Principal and the respondent is a construction contract to which the NSW Act does not apply by reason of s 7(2)(b), then the claimant cannot validly serve a payment withholding notice on the Principal; that Principal is exempt from the NSW Act.[1]

If the claimant withdraws an adjudication application under s 26(2)(a) of the NSW Act, and makes a new adjudication application under s 26(2)(b), the claimant must give any Principal who has been served with a payment withholding request notice of the withdrawal.[2] A payment withholding request based upon the original adjudication application (now withdrawn) would not apply to the new adjudication application. The claimant would have to serve a new payment withholding request.

Section 26D of the NSW Act provides some protection for the Principal against claims by the respondent. While the statutory obligation to retain money continues, it acts as a defence to a claim by the respondent against the Principal for the money.[3] Any period during which the Principal retains money pursuant to the obligation is not to be taken into account for the purposes of reckoning the period for payment by the Principal of the respondent.

The respondent could not claim interest from the Principal for the period during which the Principal lawfully withheld payment. If the respondent made a claim under the NSW Act against the Principal, in calculating the due date for payment of the amount withheld, time for payment would not run during the period that the Principal withheld payment in compliance with a valid payment withholding request.

The Principal should only make a payment to the claimant with the consent of the respondent or pursuant to a notice under s 6 of the *Contractors Debts Act 1997* (NSW) attaching a copy of debt certificate from a court. If a payment is made pursuant to the court's debt certificate, the *Contractors Debts Act 1997* (NSW) provides protection for the Principal.

When a contract between the Principal and the respondent provides that the Principal can retain moneys (retention moneys) from payments to the respondent, it may be prudent to have an express provision that moneys retained in accordance with a statutory requirement are not to be considered to be part of the retention moneys which the Principal is entitled to retain.

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[1] *Building and Construction Industry Security of Payment Amendment Regulation 2011* (NSW).

[2] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26D(3).

[3] See: *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26D(1).

The Principal's obligation to withhold money can be discharged, in whole or in part, if the respondent pays an amount to the claimant or, with the authority of the respondent, the Principal pays an amount to the claimant.[1] In addition, the Principal is entitled to rely in good faith on a statement in a statutory declaration by the respondent that a specified amount claimed has been paid to the claimant.[2] A prudent Principal would check with the claimant before releasing any amount to the respondent.

Finally, the Principal's obligation to withhold money is discharged if the adjudication application is withdrawn.[3] The term 'withdrawn' is not defined. Withdrawal of a payment claim or the payment withholding request is not the same as withdrawal of an adjudication application. Section 26D(4) provides that the Principal is entitled to rely in good faith on a statement in a statutory declaration by the respondent that an adjudication application has been withdrawn. The claimant can at any time notify the Principal that the claimant withdraws the payment withholding request. A statement by the claimant to the Principal that the claimant withdraws the payment claim would effectively be notice that the claimant withdraws the payment withholding request.

3 Concluding remarks

The 2010 amending Act follows the release of a discussion paper by the NSW Department of Services, Technology and Administration in September 2010 as part of a formal review of the NSW Act. The amendments aim to improve security of payment by addressing difficulties experienced by 'subcontractor-claimants' in securing payment after adjudication an accessing the benefits of the *Contractors Debts Act 1997* (NSW).

The 2010 amending Act enables a claimant to 'freeze' money in the hands of the Principal that is owed to the head-contractor under the head-contract. The effect of the procedure under the 2010 amending Act is similar to that under the *Contractors Debts Act 1997* (NSW), but has been made more accessible to sub-contractors electing to go to adjudication under the NSW Act. Whereas a claimant could not previously compel a Principal to withhold payments to the respondent if the claimant elected to go to adjudication, the 2010 amending Act establishes that a Principal can be required to retain sufficient money to cover the amount claimed against the defaulting respondent without requiring the claimant to go through the courts. This means that claimants now have the ability to secure the claimed amount from the Principal immediately after an adjudication application has been made and ahead of any determination made by the adjudicator of that application. The 2010 amending Act, thus, adds appreciably to the scope of the NSW Act.

For head-contractors, the 2010 amending Act gives sub-contractors direct influence over the cash flow of head-contractors albeit within the relatively short time frame prescribed by the 2010 amending Act. Thus, the NSW Act is likely to further encourage timely negotiation between the parties over payments and early settlement of payment disputes.

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[1] See: *Building and Construction Industry Security of Payment Act 1999* (NSW), ss 26B(4) and 26B(3)(a).

[2] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26D(4).

[3] *Building and Construction Industry Security of Payment Act 1999* (NSW), s 26B(3).

The 2010 amending Act has, for the first time, brought Principals squarely into play when it comes to payment disputes between the parties one step down in the contractual chain. A failure by the Principal to comply with the obligation to withhold money pursuant to a payment withholding request renders the Principal jointly and severally liability (with the Respondent) to pay the adjudicated amount to the extent of any failure by the Principal to withhold the money. For that reason, Principals should have adequate internal mechanisms in place to ensure that any payment withholding request promptly comes to the Principal's notice.

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Case Study: Developing Admission Criteria for SAICE Adjudicators

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Abstract:

Adjudication is a relatively new method of alternative dispute resolution in the South African construction industry. There are low levels of knowledge and use of adjudication. There are not enough Adjudicators in the industry, and there is no established framework for skills and training. It is generally considered that the introduction of Payment and Adjudication legislation can improve the situation.

The author and others have endeavoured to improve the practice and study of adjudication in the construction industry, and have continued to publish and engage in other ways with industry bodies in this pursuit. In order to develop Adjudicator Admission Criteria for the South African Institution of Civil Engineering (SAICE), the author undertook limited research, drafted the admission criteria and sourced comment on this from key industry role players.

Criteria which were supported the most included experience, construction law and formal assessment. Objectivity of criteria was the most recurring theme, which led to the conclusion that the criteria as they are can only be regarded as interim, whilst a longer-term solution is being developed based on formal assessment.

Keywords:

adjudication, admission criteria, alternative dispute resolution, skills

1 Introduction

This paper outlines an investigation into adjudicator skills and training, presents how each admission criteria considered was identified, reviewed and subsequently modified where necessary to finalize the SAICE adjudicator admission criteria. Comments received are analysed to identify trends and themes, and conclusions are drawn where appropriate.

2 Literature Review

2.1 Fundamentals of admission criteria

The Oxford Dictionary (2000) defines admission as entering or being allowed into a building, society or school. Requirements for admission can vary from one extreme to the other, from one's origins, appearance, place in society, educational background, to professional achievements and national honours. For example, whilst admission to a primary school may only require that the place of residence be within a certain radius from the school, admission to a post-graduate programme at a university may require a completely different set of attributes like experience, leadership and intellectual capability.

Admission into professional societies is also varied, depending on whether these are statutory bodies or voluntary associations. Statutory bodies are normally regulated from the minimum educational qualification required, the type and length of experience, and any examination or peer review mechanism employed. An examples is the Engineering Council of South Africa, which is regulated by the Engineering Profession Act No. 46 of 2000. Voluntary associations such as SAICE on the other hand have admission criteria defined by the society itself, with the only proviso typically being that such criteria should not be in conflict with its founding constitution. The subject of the paper relates to the latter.

2.2 SAICE in the South African Construction Industry

The South African construction industry is generally broken up into the building and engineering construction sectors. There are other related sectors and disciplines (quantity surveyors, architects, engineers, project managers, etc.) which together comprise what has come to be known as the Built Environment, including various bodies operating at different levels, from statutory bodies to voluntary associations, of which SAICE is one. Amongst the aims and objectives of SAICE, the following is relevant for this paper:

> …to promote the science and practice of civil engineering.

In keeping with this noble aspiration, SAICE recently introduced a new version of its 'General Conditions of Contract for Construction' (GCC 2010), and this introduces dispute resolution by adjudicators and/or dispute boards, whose nomination can be referred to the SAICE President by the contracting parties.

SAICE enjoys wide recognition from other industry bodies, such as the Construction Industry Development Board (CIDB) and the Engineering Council of South Africa (ECSA), and it plays a critical role in the development of industry norms, guidelines and regulations. This is part of the reason why the idea of an industry-wide centre for dispute resolution has been mooted in many of its proceedings under the dispute resolution portfolio. The paper will however, only consider dispute resolution within the ambit of SAICE, in particular with regard to adjudicators and how these are admitted onto the SAICE President's List. (Discussions regarding the centre are being pursued separately).

Whilst general membership of SAICE has quite straightforward admission criteria, to serve on the SAICE President's List of Adjudicators has its own different admission criteria due to the specialised nature of the skill required.

2.3 Knowledge, skills and training on adjudication

Adjudication is a relatively new method of alternative dispute resolution in the South African construction industry. Maritz (RICS, 2007) concluded that there were low levels of knowledge and use of adjudication. Maiketso and Maritz (RICS, 2009) concluded that there were not enough Adjudicators in the industry, and that there was no established framework for skills and training.

Some research undertaken into skills and training on adjudication in South Africa showed that:

> Adjudicators need an "adjudication qualification", in addition to their professional qualification (Maritz, 2007).

In trying to unpack the finding above, further research (Maiketso, 2008) showed that the following amongst other findings:

- There was a need to establish a framework for skills and training, including provision for accreditation;
- There was general agreement on relevant skills, useful techniques and desirable personal attributes of adjudicators;
- There was broad agreement on the possible content of an "adjudication qualification" if it were to be implemented, from the acquisition of knowledge and experience, to the assessment and accreditation of competence.

The foregoing references amongst others supported the introduction of Payment and Adjudication legislation to improve the situation. Efforts are starting to be put into the conception of this mammoth task, but until such legislation is introduced together with guidelines or regulations on all of the above aspects, each sector of the industry has to address its needs as it best sees fit. The CIDB provides guidance on this matter and therefore was relied upon in developing the SAICE admission criteria, together with the Institute of Civil Engineers (ICE, UK) admission criteria.

A comparison was also made between *skills and training* information sourced from selected institutions associated with adjudication, i.e. CIDB, ICE (UK), Chartered Institute of Arbitrators (CIArb, UK), Dispute Resolution Board Foundation (DRBF, USA), Queensland subordinate legislation for adjudication qualification (Australia), Construction Industry Council (CIC, UK), American Association of Arbitrators (AAA, USA), Federation Internationale des Ingenieurs-Conseils (FIDIC) and others. This is presented in Table 1 below (after Maiketso, 2008). General findings from these showed that experience and professional registration appear to be widely accepted or assumed where not specified, and knowledge of the relevant conditions of contract is also taken for granted. Whilst attendance of a relevant course was considered to be adequate by a few institutions, the general trend appeared to be moving towards formal tuition and peer review to facilitate accreditation.

It is with these considerations in mind that the SAICE adjudicator admission criteria were developed.

Table 1: Information from selected institutions on skills framework and accreditation for adjudicators (after Maiketso, 2008)

Institution	Experience	Registration	CoC	Course	Assignment	Examination	Interview
CIDB	PM past 5 yrs 45 yrs age	10 yrs standing	Recom	written appl			x 1
ICE	10 yrs PM In past 15 yrs	10 yrs standing	required	x 1		x 1	x 1
CIArb			required	x 3 modules	x 2	x 2 modules	x 3 days
Queensland			required	x 18	x 1	x 1	
CIC		RICS, RIBA, ICE, CIArb, CIOB					
DRBF		Attributes only					
AAA	10 yrs snr	As appropriate	Recom	Recom			
FIDIC			required	written appl	x 2	x 2	x 2 days

Abbreviations used in table:

PM – Project Manager; yrs – years; CoC – Conditions of Contract; Recom – Recommended; appl – application; snr – senior

3 Research Methodology

Purposeful sampling was adopted due to the specialised nature of the research subject. Initially theoretical sampling was used to obtain all relevant views, and subsequently discriminant sampling was used to obtain closure. Having drafted the criteria, a selected sample of industry role-players was used to source comment, and the outcome was then subjected to further internal review from within the Project Management and Construction Division (PMCD) of SAICE.

The criteria were first drafted based on two key reference documents:

- CIDB *Best Practice Guideline #C3 Adjudication, 2005; and*
- ICE *Requirements for entry onto ICE's List of Adjudicators, 2006.*

Key considerations were that these should define minimum requirements in the following aspects:

- Experience;
- Professional registration; and
- Forms of contract, construction law and adjudication.

Work in developing the first draft commenced in 2008. PMCD was afforded an opportunity to provide initial comment on this and suggest direction in terms of sourcing further comment. As background, PMCD was also provided with the full version of Table 1 to provide context.

The following institutions were then approached for comment, and feedback was received at the times shown:

- SAICE PMCD (internal), Jan-Feb2009, Sep-Oct 2009;
- Association of Arbitrators (Southern Africa) (AASA), Oct-2009;
- Dispute Review Board Foundation (DRBF) local chapter, Nov-2009;
- South African Federation of Civil Engineering Contractors (SAFCEC), Feb-2010;
- Consulting Engineers South Africa (CESA), April 2010; and
- Construction Industry Development Board of South Africa (CIDB), June 2010.

The final draft is included in the Appendix, following the incorporation of comments, as reflected under the next section (Results). In keeping with standard research ethics, confidentiality was maintained and privacy of the respondents was respected in the presentation of results.

Data handling was mostly based on content analysis. Data was organized and classified into common themes; an attempt was then made to synthesise the emerging trends into a whole, so that conclusions and/or generalisations could be drawn where possible.

To provide safeguards to the case study, as recommended by Leedy and Ormrod (2005), the following disclosures would be in order:

- Attention was paid to any contradictory comment and/or conclusion, in order to validate the overall results and not simply dismiss it as insignificant; and
- Bias, beliefs or values may have played a role, as the author is responsible for the dispute resolution portfolio within SAICE PMCD, and as such had a direct interest in the positive outcome of the exercise, to enable the criteria to be implemented.

It is trusted that these will not have unduly compromised the results and/or conclusions, and that the outcome can still lead to meaningful debate, even if the research itself may be lacking in academic rigour and impartiality.

4 Results

The results presented below are in the form of comments made, compared against corresponding changes in the original criteria circulated for comment. Where a change was not considered necessary, a reason is provided. The last column headed "type" relates to the content analysis that follows in Figure 1, which is based on the concept(s) found in the comment and to some extent in the change made / reason given.

Table 2: Comments and changes/reasons

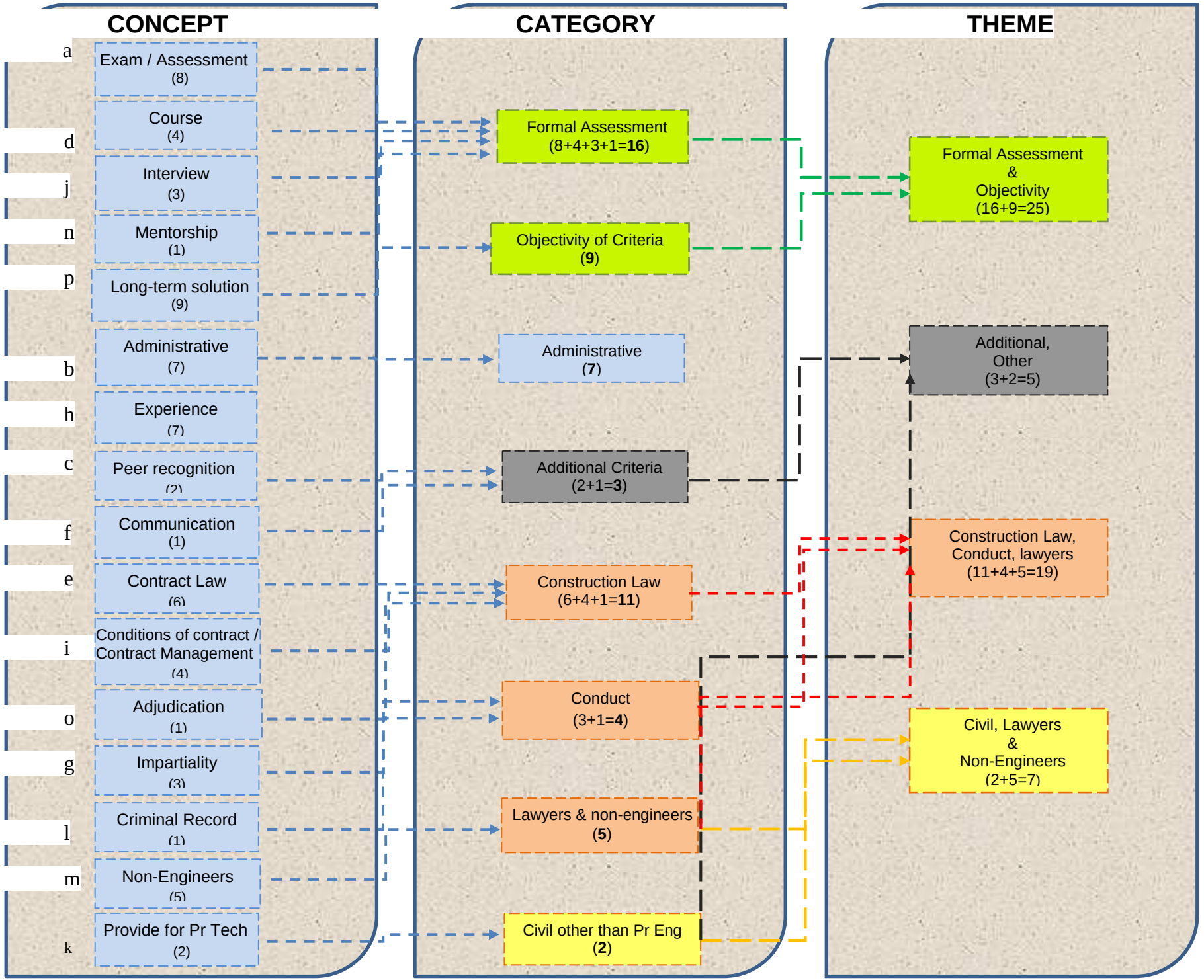
Comments raised	**Corresponding changes made / reasons if not changed**	**Type**
1. Exam not supported: could discourage senior applicants and needs much work in developing it, interim solution required	1. Exam initially removed, subsequently reinstated in the long-term, interim solution provided via sunset/transitional clause	a, p
2. CPD requirements needed for those on list	2. No change: administrative aspects of running the President's list	b
3. Qualifications need to be defined for Panel members	3. No change: administrative aspects of running the President's list	b
4. Include "Fellow of SAICE" or similar, to emphasize peer recognition and respect within the industry	4. No change: SAICE resolved not to use professional honours/peer recognition as an exclusionary criterion	c
5. Are there suitable courses?	5. No change: several courses available, suitability unconfirmed	d
6. Include knowledge of contract law and procedure	6. Adopted knowledge of contract law, but not of procedure (rules of natural justice applicable instead)	e
7. Include knowledge of the English language	7. No change: communication skills considered to be covered by Pr Eng and experience requirements	f
8. Include impartiality	8. Impartiality added to fairness and independence	g
9. Formal qualification via course and exam supported only if courses available in RSA	9. Initially watered down, then removed, but subsequently reinstated as part of long-term solution	a, d, p
10. Include holding of senior position for approx. 10 yrs	10. No change: post Pr Eng experience requirement considered to be adequate	h
11. Include knowledge of conditions of contract, which must be examined	11. Adopted, and referred to SAICE GCC in particular, exam retained for the longer term	i, a, p
12. Make exam/interview discretionary if application/CV does not provide evidence of competence	12. No change: requirements and application of exam / interview to be defined in the longer term, but would be made standard not discretionary	a, j, p
13. Make exam/presentation mandatory, as adjudication itself requires studying a case, interviewing the disputing parties and presenting a ruling	13. Exam/interview reinstated in the longer term, current arrangement transitional whilst exam/interview requirements are being developed	a, j, p
14. Reduce experience requirement from 10 to 5 years	14. No change: 10 years post Pr Eng experience considered necessary	h

Comments raised	Corresponding changes made / reasons if not changed	Type
15. Remove professional registration or include other professional categories besides Pr Eng, e.g. Pr Tech	15. No change: retained *Pr Eng or equivalent* to provide for Pr Tech *et al*	k
16. Must not have criminal record	16. No change: "must not have" criteria not included	l
17. Must have legal qualification, with experience in construction	17. No change: knowledge of construction contract law and conditions of contract considered adequate	e, h, i, m
18. Knowledge of contract law essential	18. Adopted	e
19. Be capable of fair, impartial and sound judgment	19. Impartiality added to fairness and independence, adjudication requires reasoned decision (in response to sound judgment)	g
20. Knowledge of construction regulations, procurement processes, and Constitution of country	20. No change: knowledge of construction contract law, conditions of contract and adjudication considered adequate, supporting laws and regulations to be more fully defined in the longer term	e, h, i, m
21. Include lawyers, do not limit to Pr Eng	21. No change: SAICE resolved to remain within its jurisdiction of civil engineering (industry-wide centre for dispute resolution being pursued separately)	m
22. Include knowledge of construction contract law and rules of natural justice	22. Adopted	e
23. Fairness and independence can be claimed by any applicant, not easy to assess	23. Impartiality introduced, key consideration being to avoid conflict of interest/bias	g
24. Assessment must allow demonstration of potential for those who haven't done adjudications, and example adjudications for those who have	24. No change: to incorporate assessment in formal process to be adopted in the longer term	a, o, p
25. Applicants to show appreciation of tight time constraints of adjudication	25. No change: familiarity with adjudication considered sufficient	o
26. Include lawyers and claims consultants, do not limit to civil engineers	26. No change: SAICE resolved to remain within its jurisdiction of civil engineering (industry-wide centre for dispute resolution being pursued separately)	m
27. Increase experience from 10 to 15 years	27. No change: 10 years post Pr Eng experience considered sufficient	h
28. Fellow of SAICE not pre-requisite, experience and contract management enough	28. No change: SAICE resolved not to use professional honours/peer recognition as an exclusionary criterion	c, e, i
29. Course/exam not supported, will put potential applicants off	29. Exam/course removed for now, to be adopted in the longer term	a, d
30. Most appointments are done by personal reference not via these lists	30. No change: Emphasises need to regularise, status quo not optimal	b
31. Course needs careful consideration, many available, but none sufficient	31. Course removed for now, to be adopted in the longer term	d
32. Review panel to consist of experienced adjudicators	32. No change: administrative aspects of running the President's list	b

Comments raised	Corresponding changes made / reasons if not changed	Type
33. Accept or interview applicant depending on strength of CV	33. No change: acceptance criteria defined for now, interview to be adopted in the longer term as part of the formal process	j, p
34. Pay annual fees to stay on the list	34. No change: administrative aspects of running the President's list (currently not applied for mediators and arbitrators, but may consider in future)	b
35. Provide for mentorship to facilitate training and experience	35. No change: further unpacking of skills and training to be addressed in the longer term	n, p
36. Include other built environment professionals, not limited to Pr Eng	36. No change: SAICE resolved to remain within its jurisdiction of civil engineering (industry-wide centre for dispute resolution being pursued separately)	k, m
37. Remove length of professional membership, as experience is addressed elsewhere	37. No change: post Pr Eng experience requirement considered to be necessary to ensure adequate seniority, and the two length requirements (i & ii) are not mutually exclusive	h
38. Provide for specialisation	38. No change: administrative aspects of running the President's list – on application form, as done for mediators and arbitrators	b
39. Consider geographic location	39. No change: administrative aspects of running the President's list – when selecting, proximity to disputing parties considered	b
40. Minimum requirements must be objective, assessment criteria must be in keeping with CIDB guideline, avoid vague and subjective criteria which could be open to abuse	40. Criteria qualified as a transitional arrangement whilst a formal accreditation / admission process (course/exam/interview) is being developed	p

The results above were then grouped according to key concepts identified to enable a content analysis below in Figure 1 (the numbers in brackets are the frequencies).

Figure 1: content analysis



5 Discussion

From the results above, the following observations can be made at the Concept level:

- The most numerous comments were made in connection with the long term solution, followed by exam, experience and administrative aspects.
- The least number of comments were made in connection with additional criteria of communication, criminal record and mentoring.

The following patterns emerged from a categorisation of the concepts:

- The most conceived Category was formal assessment, followed by construction law and objectivity of admission criteria.
- The least conceived Category of criteria was other professional designations besides Pr Eng, followed by conduct and other additional criteria.

Further synthesis revealed the following Themes out of the broad categories formulated above:

- The most common Theme was objectivity of admission criteria, as supported by formal assessment and the need for a long term solution.
- The second most common Theme relates to law, as supported by construction law, conduct and reference to lawyers (reference to lawyers given dual treatment, both in the positive and in the negative: for confirming additional qualifications and as a basis for exclusion).

Although it is recognised that the sourcing of comments was not on a 'clean slate' basis as standard research would require, as the draft criteria on which the respondents had to comment already influenced them to think in a certain way; their responses are nonetheless useful in terms of whether they support or do not support the fundamental requirements. This recognition therefore necessitated the following further analysis of the data, which was undertaken to ascertain which fundamental requirements had been most supported, and which had been the least supported, in the original draft of the admission criteria as circulated for comment:

- The most commented-upon criterion was formal assessment, as shown by reference to exam, course and interview: only four out of twenty-five comments did not support this criterion, and the rest either supported, conditionally supported, or provided suggestions/advice on how it could be implemented.
- The least questioned criterion was experience, as shown by almost no dispute being raised for the requirement for familiarity with the construction process. Although the length of experience was questioned in two instances (one to increase it, the other to decrease it), the content of the necessary experience

was not disputed. This however, cannot be considered to be a positive confirmation of whether the criterion is supported or not supported, but can be viewed more as a silent affirmation.

- The least supported criterion appears to have been to widen the net to include lawyers and others: there was strong support and motivation for SAICE to remain within its jurisdiction of civil engineering (whilst not abandoning the pursuit of an industry-wide dispute resolution centre as a separate exercise).

It is further instructive to note the high level of interest in how the panel is constituted and operates (administrative aspects), as this would be responsible for putting these criteria into effect. Perhaps because of the long-decried fragmentation of the construction industry on dispute resolution and other contractual matters, the industry needs assurance that SAICE knows what it is doing, and that such fragmentation must not simply be replaced by half-baked solutions or over-regulation without properly thinking through the full process requirements.

6 Conclusion

The results therefore appear to lead to the conclusion that the admission criteria in their current form cannot be considered as final, and that more objectivity needs to be introduced to achieve this. It is considered that such objectivity will be achieved through a formal assessment process involving a course, exam and/or interview process.

This conclusion led to the introduction of a “sunset clause”, and an interim application period during which a longer-term solution must be developed.

7 Recommendation

The following recommendations are therefore made:

- That SAICE adopts the proposed current adjudicator admission criteria as an interim measure to introduce a measure of organisation into the process of adjudication and adjudicator selection in civil engineering construction contracts.
- That SAICE develops robust formal assessment criteria involving a course, a qualifying exam and/or an interview to be implemented in the long term.
- That SAICE publicises these measures and invites interested parties to participate in charting the way forward.

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Appendix – draft SAICE Adjudicator Admission Criteria

INTERIM ADMISSION CRITERIA FOR SAICE ADJUDICATORS

(2011 – 2014)

9 Requirements for persons wishing to be considered for inclusion in the SAICE President's List of Adjudicators, to be applied in the period 2011 to 2014 until final criteria are developed

9.1 Introduction

This document is based on the following documents, for which the relevant institutions have granted their kind permission:

CIDB Best Practice Guideline #C3 Adjudication, 2005

ICE Requirements for entry onto ICE's List of Adjudicators, 2006.

SAICE can nominate adjudicators in terms of the SAICE General Conditions of Contract and maintains a President's List of adjudicators for this purpose (the List), as well as to facilitate adjudicator selection by Employers and/or Contractors. Admission to the List does not guarantee that any nomination will be made or that appointments will follow.

SAICE sets requirements for admission to the List and for maintenance of a name on the List.

Candidates wishing to be selected for the List must complete the standard SAICE application form for Mediators, Arbitrators and Adjudicators, and satisfy the SAICE's Dispute Resolution Panel that they meet minimum requirements stipulated below. Failure to demonstrate the necessary competence may result in one of two options:

Where clarification is required, the applicant may be invited for an interview

Where certain requirements have not been met, a response will be issued specifying this.

The SAICE Dispute Resolution Panel's (the Panel's) decisions on all such matters are final.

9.2 Minimum Qualification Requirements for Entry onto the SAICE President's List of Adjudicators

Applicants should:

have worked as Project Manager, Contract Manager, Engineer, Principal Agent or equivalent on engineering construction projects for a period of at least 10 years, preferably within the past 5 years, with appropriate disputes experience;

(i) be registered as a Professional Engineer or equivalent of at least 10 years standing.

have detailed working knowledge of at least one, and preferably more, of the standard forms of contract recommended by the CIDB, in particular the General Conditions of Contract published by SAICE (including the adjudication provisions);

have working knowledge of international and local practice, legislation and institutional guidelines on adjudication, including CIDB guidelines;

have working knowledge of construction contract law and rules of natural justice

have appreciation of:

the factors that affect construction costs

investigations, design, construction and fabrication methods

programming and delay assessment

resource and risk assessment;

be impartial and capable of fair and independent judgment;

if invited for an interview, be able to satisfy the panel that they are a suitable person who has achieved the necessary level of knowledge of construction and dispute resolution and possesses the necessary personal management and communication skills to conduct an adjudication.

9.3 Sunset clause / interim application period

This document shall apply for a maximum period of three (3) years beginning from 2011, in which time SAICE shall develop more objective assessment criteria to be applied for all new applicants. These shall include but not be limited to the establishment of requirements for:

Written application

Passing Adjudication course(s) and / or Qualifying Examination

Panel interview

Statutory Adjudication in New South Wales: Operational Problems and Potential Improvements

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Abstract:

The Australian state of New South Wales (NSW) was the second jurisdiction in the common law world and the first in Australia to introduce statutory adjudication. Although being modelled after the UK statutory adjudication regime, there are significant differences in the NSW regime that make it distinctive. The NSW regime is essentially a neutral certification process conducted by an adjudicator whose role is that of a certifier. However, due to its rapid nature and judicial interventions, there have been some serious problems with regard to the operation of the regime. This paper attempts to identify the operational problems of the NSW regime from neutral (adjudicator) and user (legal representatives in adjudication) viewpoints, allowing for the establishment of potential improvements to the current regime. The first stage involved a review of the relevant literature, parliamentary speeches and consultation documents, cases on statutory adjudication, and expert commentaries. It was followed by qualitative interviews with 11 leading adjudicators and construction lawyers who represent parties in adjudication proceedings. The main problems identified are court involvement, invariability in the quality of adjudicators, rubber stamp approach and the accessibility of the NSW Act. It is established that the introduction of a dual system of adjudication and an adjudication registry could solve most of the problems identified above.

Keywords:

adjudication, cash-flow, construction contracts, disputes, payment.

1 Introduction

New South Wales was the first jurisdiction in Australia to introduce statutory adjudication when the Building and Construction Industry Security of Payment Act[1] (the NSW Act) was on the statute books in 1999. Historically, statutory adjudication in the common-law world was first introduced three years earlier in the United Kingdom, when the Housing Grants Construction and Regeneration Act (the UK Act) was passed. Despite following the UK government's footsteps in introducing statutory adjudication,

[1] The NSW Act has been amended twice since its inception. The first once was in 2002 and the second was once in 2010.

the NSW State Government established a completely different scheme of adjudication in terms of procedure and application in its construction industry. The stark difference between the UK and the NSW adjudication schemes is that the latter imposes a reference to 'rapid mandatory adjudication' contingent on the crystallisation of progress payment disputes as prescribed by the NSW Act, whilst the former was designed for adjudication to be independent of payment. In other words, the UK adjudication model caters to all types of disputes as long as they arise under the contract, whereas the NSW model confines its application exclusively to progress payment disputes as established by the NSW Act. The UK adjudication model has been adopted (with modifications) in New Zealand,[1] a few Australian states (Western Australia[2] and the Northern Territory[3]), and the Isle of Man,[4] whereas the NSW adjudication model appears, to varying degrees, has been emulated by a number of Australian states (Victoria,[5] Queensland,[6] Tasmania,[7] the Australian Capital Territory,[8] and South Australia[9]) and Singapore.[10] The adjudication regimes in Western Australian and Northern Territory which are closely modelled after the UK regime are collectively referred to in industry parlance as *the west coast model* whereas those states and territories in Australian whose their adjudication regimes are largely based on the NSW regime are together known as *the east coast model*.

The difference in terms of adjudication operations in New South Wales and the UK is understandable, since the objectives of both Acts that underpin adjudication in these jurisdictions are fundamentally different. As stated by the then Construction Minister Nick Raynsford the objectives of the UK Act were:

> First of all, it is necessary to address serious payment problems affecting many in the industry - particularly smaller firms. I receive a steady stream of mail from firms facing unnecessary hardship and even insolvency because they have not been paid for work carried out in good faith. This legislation will help to protect such firms from this sort of bad practice. Second, the legislation will address the problem of the costs and delays currently involved in settling even the most straightforward construction disputes. The legislation offers a quick means of resolving disputes so work can continue on site without delay and disruption.[11]

1 Construction Contracts Act 2002, New Zealand.
2 Construction Contracts Act 2004, Western Australia, Australia.
3 Construction Contracts (Security of Payments Act) 2004, Northern Territory, Australia.
4 Construction Contracts Act 2004, the Isle of Man.
5 Building and Construction Industry Security of Payment Act 2002 amended in 2006, Victoria, Australia.
6 Building and Construction Industry Payments Act 2004, Queensland, Australia.
7 Building and Construction Industry Security of Payment Act 2009, Tasmania, Australia.
8 Building and Construction Industry (Security of Payment) Act 2009, Australian Capital Territory.
9 Building and Construction Industry Security of Payment Act 2009, South Australia.
10 Building and Construction Industry Security of Payment Act 2004, Singapore.
11 'Laying Down the Law'; Building; 17 April 1998.

Conversely, Morris Iemma the Minister for Public Works and Services of New South Wales had this to say:

> The main thrust of this bill is to reform payment behaviour in the construction industry. The bill creates fair and balanced payment standards for construction contracts. The standards include use of progress payments, quick adjudication of disputes over progress payment amounts and provision of security for disputed payments while a dispute is being resolved. The bill will speed up payments by removing incentives to delay.[1]

The objective of the NSW Act is thus clear, i.e., to improve payment practices in the construction industry. Adjudication under the NSW Act is merely a tool to achieve its policy objective. Conversely, the objective of the UK Act is two-fold. It first attempts to improve cash flow in the construction industry. Its other objective is to improve the efficiency of dispute resolution in the construction industry.

Since the objective of the NSW Act is different from its UK counterpart, its adjudication regime has been designed to be prescriptive, with strict and tight time frames for each step in the adjudication process, from the nomination of the adjudicator until the delivery of the decision. The scope of this regime's application is also considerably narrower than that of the UK regime. Only disputes on progress payments as crystallised under the NSW Act can be referred to adjudication. The definition of progress payments as prescribed by the NSW Act is, however, wide enough to include final payments.[2] Based on the take-up rates published by the NSW Department of Commerce, it may be inferred that statutory adjudication has been effective in New South Wales (Coggins et al, 2010). This supports the notion that, if adjudication is not effective, industry participants will simply not use it.

The success of statutory adjudication in New South Wales, however, is not without its challenges. The adjudication system underpinned by the amended NSW Act seems to have drifted away from its original mission (Coggins, 2009). Adjudication was intended as a system to provide an impartial, neutral certification process, independent from the contract administration process, conducted by an adjudicator acting as a certifier (Davenport, 2007 & Uher and Brand, 2007). However, due to considerable judicial intervention, adjudication is now subject to the rules of natural justice, (which are applicable in litigation and arbitration),[3] and adjudication determinations are amenable to judicial review.[4] The courts have also allowed damages claims to be included in progress payment claims, which clearly was not the legislation's intent (Davenport, 2007). This somewhat broad interpretation by the courts creates severe repercussions for the NSW adjudication regime, as it was not designed to assess such claims.

A proposal has since been made by a leading adjudicator in New South Wales to have a dual process of adjudication (Davenport, 2007 & Brand and Davenport, 2010). In essence, a dual process of adjudication combines both the strengths of the NSW and UK adjudication regimes. This process works on the idea that the UK adjudication regime is effective in dealing with damages claims, and that the NSW adjudication regime is

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1 In the second reading of the Bill on 8 September 1999.
2 See the definitions of 'Progress Payment' under Section 4 of the NSW Act.
3 See *Musico* v. *Davenport* [2003] NSWSC 977.
4 See *Chase Oyster Bar v Hamo Industries Pty Limited* [2010] NSWCA 190.

effective in dealing with certification claims. There will be two different schemes in adjudication. The first scheme will be similar to the one currently provided under the amended NSW Act, except that its scope is restricted to certification claims (excluding damages claims) made by the claimant. The second scheme will deal exclusively with damages claims made by either the claimant or the respondent. Each scheme will have different time frames for responding to a claim and making an adjudication determination. This proposal should be distinguished from another proposal of harmonising Security of Payment (SOP) legislation in Australia, which is in essence the amalgamation of the east coast and west coast models (Coggins, et. al, 2010). This means that there will be a single scheme incorporating both the strengths of the two models.

The amended (2002) NSW Act was amended again on 29th November 2010 and came into force on 28th February 2011. The amendment deals only with the additional right given to the claimant subcontractor to ask the principal to freeze money due to the respondent contractor. The perceived problems with the NSW statutory adjudication regime were not addressed in the Building and Construction Industry Security of Payment Amendment Act 2010 (the new NSW Act). Accordingly, Accordingly, the aim of this paper is to identify the operational problems of the NSW regime from neutral (adjudicators) and user (legal representatives in adjudication) viewpoints. It also establishes potential improvements to the current regime. When the data for this research paper was collected in July 2010, the new NSW Act had not been passed, therefore, the interview questions were structured to ask the respondents about the operational problems of the Act and potential improvements to the NSW adjudication regime. Since the new NSW Act is now in force, the potential improvements to the NSW adjudication regime proposed in this paper may be regarded as missed opportunities instead.

2 Methods

A socio-legal approach was adopted for this study. The first stage involved the review of the relevant literature, parliamentary speeches and consultation documents, cases on statutory adjudication and expert commentaries. It was followed by qualitative interviews with five leading adjudicators and six construction lawyers who represent employers (n=3) and contractors (n=3) in adjudication. This study chose a purposive sampling method to identify interviewees in New South Wales. Using this sampling method, individuals are selected because they have specific experiences central to the phenomenon or because they conform to the criteria set by the researcher. The interviewees in this study had to meet one of a set of strict criteria. They must be:

A senior adjudicator from one of various backgrounds (construction professionals, i.e., architects, engineers and surveyors and construction lawyers) who has been appointed as an adjudicator for at least five cases and must have made determinations on those cases.;

A senior construction lawyer who has represented claimants or respondents in adjudications or court cases involving adjudication matters for at least five cases; or

A senior legal advisor to a contractor, consultant, subcontractor, supplier organisation or group, who has substantial knowledge in adjudication matters.

The reason why the number five (cases) was considered sufficient was that the interviewees would have substantial knowledge on the practice and procedure of adjudication particularly on the difficulties associated with it and potential improvements to the regime. Adjudicators are considered the neutrals in the adjudication process. The *neutral* signifies the third party appointed by the disputing parties to resolve a dispute (Sai-on Cheung et. al, 2002). To obtain holistic views on the issues investigated, this study also included the users of adjudication. Due to the complexity of this study, the *users* should have specialist knowledge on the scope, law, practice and procedure of adjudication. In this regard, the user category should exclude contractors, consultants, subcontractors and suppliers who have been involved in adjudications. Rather, users should include construction lawyers who have represented them in adjudications.

Whenever possible, face-to-face interviews were conducted with the interviewees. This was possible as the author was in Sydney from the 18th to the 24th of July 2010. However, out of 11 interviewees, three were interviewed by phone when the author was back in the UK. Each interview was taped with the consent of the interviewee and then transcribed. The transcripts of the interviews were sent to the interviewees for confirmation. The interview data were analysed using thematic analysis.

3 Operational Problems in the NSW Regime

3.1 Inconsistent Judicial Interpretations

The operation of statutory adjudication in New South Wales has been subject to a great deal of judicial interpretations since its inception in 1999. Unfortunately, there has been apparent inconsistency in judicial interpretations concerning a number of important issues. A leading construction lawyer in New South Wales revealed that:

> [S]o far as challenging adjudication determinations well in New South Wales what we have noticed is a bit of an exploration of how that should be done for the first few years of the Act, then the law became fairly settled and just recently in New South Wales the Court of Appeal has actually said well, it's got to all change again so we have gone back full circle. So it's constantly evolving it's not static, difficult to know where a person actually stands in so far as their rights, both under the contract and where the contract fits in, together with the Act.[1]

These conflicting judicial interpretations have resulted in a flood of jurisdictional challenges in New South Wales. Parties who have lost their adjudications (mostly employers) may exploit these opportunities to challenge an adjudicator's determination, with the hope to delay or avoid payment to the winning parties. It can be seen from the case law covered in a later part of this paper that the courts' attitude toward enforcement of adjudication decisions in New South Wales differs considerably from its UK counterparts. Whilst the courts in the UK are more vigorous in enforcing adjudication decisions, the courts in New South Wales are more robust in setting aside adjudication determinations.

[1] Construction Lawyers/NSW/Contractors/9.

The crux of judicial inconsistency in New South Wales appears to be caused by the uncertainty of the legal nature of adjudication as interpreted by the courts (either it is intended to be a quasi-judicial dispute resolution method or a neutral certification process). Several judges in New South Wales seem to have perceived adjudication as a quasi-judicial dispute resolution method, rather than a neutral certification process. Notably, McDougall J, who is one of the Supreme Court Judges in New South Wales and has been responsible in many adjudication-related court cases, regards adjudication as a decision making tribunal (McDougall, 2009).

This is contrary to the statement made by Mr. Morris Iemma, the then Minister for Public Works and Services of New South Wales, in the second reading speech of the Building and Construction Industry Security of Payment Amendment Bill 2002 when he said :

> Parliament intended that a progress payment, on account, should be made promptly and that any disputes over the amount finally due should be decided separately. The final determination could be by a court or by an agreed alternative dispute resolution procedure. But meanwhile the claimant's entitlement, if in dispute, would be decided on an interim basis by an adjudicator, and that interim entitlement would be paid.

As can be deduced from the above statement, statutory adjudication imposed by the NSW Act is merely a neutral certification scheme (Davenport, 2007 & Uher and Brand, 2007). Three interviewees (all of whom are adjudicators) affirmed that the Government intended adjudication to operate a neutral certification process. An adjudicator with considerable adjudication experience emphasised that adjudication is 'supposed to be a certification process in New South Wales at least, but that is not how it's panned out. It's a quasi judicial.'[1]

Five interviewees (four construction lawyers and one adjudicator) although did not specifically mention that adjudication is essentially a neutral certification process support the view that only progress payment disputes should be subject to adjudication and therefore imply that adjudication is a neutral certification process. A senior adjudicator explained:

> [T]he preferable model is...a model that ensures that small contractors and subcontractors, have a mechanism for being paid, and the model would be that it looked only at progress payment claims and that is no claims for damages, no claims for time related costs or damages, and it simply meant that if somebody was not getting paid, they could get an assessment.[2]

The effect of the misconception of the intended nature of adjudication by the courts is three-fold. First, adjudicators' determinations (similar to court judgements or arbitrators' awards) are amenable to judicial review.[3] Second, statutory adjudication is

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1 Adjudicator/NSW/Construction Management/3.

2 Adjudicator/NSW/Legal/2.

3 The courts initially held that, in a string of cases (*Abacus Funds Management* v. *Davenport* [2003] NSWSC 1027; *Brodyn Pty. Limited* v. *Davenport* [2003] NSWSC 1019; *Multiplex Constructions Pty. Limited* v. *Luikens* [2003] NSWSC 1140; *Transgrid* v. *Walter Construction Group* [2004] NSWSC 21, *John Holland v Cardno MBK* [2004] NSWSC 258 and *Emergency Services Superannuation Board v Davenport* [2004] NSWSC 697), that adjudication determinations were subject to judicial review. That decision was overturned a year later by the Court of Appeal in *Brodyn v Davenport*[3],

subject to the rules of natural justice (which are applicable in litigation and arbitration proceedings).[1] Third, the scope of adjudication has been widened to include damages claims.[2]

The examination of caselaw discovers that the inconsistency in judicial analysis by the courts, had created a practice amongst dissatisfied claimants to refer a payment claim for the same work that is identical or nearly identical to the one that was earlier referred to adjudication for the second or even the third time, until a favourable determination is achieved. This practice is known in New South Wales industry parlance as *adjudicator shopping*. Three interviewees (two construction lawyers and one adjudicator affirmed the existence of such a practice in the past. One of them stated: 'Adjudicator shopping...has been a big issue...there are provisions in the Act that deal with that...but the court has made it very clear now that, once the adjudicator has dealt with the issue, then it would be an abuse of process to allow that issue to be re-agitated.'[3]

The first case in New South Wales that gave rise to the practice of adjudicator shopping was *Rothnere* v *Quasar*.[4] In that case, McDougall J held that the submission of a second claim identical to the first claim to another adjudicator did not offend the provisions of the NSW Act and was therefore acceptable. Later, in *John Goss v Leighton Contractors*,[5] the same learned judge was asked to determine whether the subsequent adjudicator was bound by Section 22(4) of the NSW Act to follow the decision of the first adjudicator. In that case, the first adjudicator decided that the failure on the part of the claimant to comply with Clause 45 in the contract—concerned with the issue of notice of the claim in the prescribed time, manner, and form to the respondent for claims over and above the contract amount—barred its entitlement under the contract. In that case, the first adjudicator decided that the claimant was not entitled to payment for the delay and disruption claims. The second adjudicator was of the view that he was bound by Section 22(4) of the NSW Act and, therefore, followed the decision of the first adjudicator in deciding that the claimant was not entitled to additional money. He refused to follow the ruling in *Rothnere* because of its contradiction with the principle of issue estoppel. McDougall J later set aside the second adjudicator's determination and reiterated that a claimant can make a further adjudication application for the same claims that have been decided and rejected in earlier adjudication decisions.

The effects of these two decisions led the flourishing practice of adjudicator shopping in New South Wales (Davenport, 2010). Claimants had more than one chance to submit a claim and would continue to do so until favourable determinations were achieved. This practice created a scope for potential injustice to respondents, who may be faced with one adjudication case after another, on the same work that had been previously decided in their favour. The NSW Court of Appeal found this practice unacceptable in *Dualcorp v Remo Constructions*,[6] when it acknowledged that the principle of issue estoppel is

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where the judges held that adjudication determinations were not amenable to judicial review. *Brodyn* was law for almost six years until the recent decision in the *Chase Oyster Bar v Hamo Industries Pty Limited* [2010] NSWCA 190 reverted back to the old position that adjudication determinations are subject to judicial review.

1 *Musico* v. *Davenport* [2003] NSWSC 977.

2 *Walter Construction Group Ltd* v. *CPL (Surry Hills) Pty Ltd* [2002] NSWSC 266.

3 (Adjudicator/NSW/Construction Management/3).

4 [2006] NSWSC 798.

5 [2006] NSWSC 798.

6 [2009] NSWSC 69.

applicable in adjudication determinations made under the NSW Act. Once an entitlement to a payment or a decision as to the value of construction work has been determined by one adjudicator, the decision is binding on any subsequent adjudicators.

3.2 Variability in the Quality of Adjudicators

There has been concern raised by the interviewees on the quality of the adjudicators in New South Wales. These interviewees are generally construction lawyers who predominantly represent employers or contractors. Generally, the construction lawyer interviewees are not satisfied with the quality of the adjudicators in New South Wales. An interviewee, who has done more than 120 adjudication cases as a legal representative to employers predominantly, discovered that there is 'variability in experience and expertise of adjudicators.'[1] Similarly another interviewee who has done more than 100 adjudications as a construction lawyer representing contractors predominantly stated that 'we have got a lot of adjudicators in New South Wales...of different grades and qualities.'[2] These interviewees provide valuable insights on the quality of the adjudicators in New South Wales. They are in an ideal position to assess the quality of the adjudicators across the board since they have represented parties in a substantial number of adjudications as legal representatives.

The analysis of the interview data discovers two factors which may contribute to the variability in quality of the adjudicators in New South Wales. First, the variability in quality of the Authorised Nominating Authorities (ANAs).[3] Second, the extension of the NSW adjudication regime to include damages claims.

3.2.1 Variability in Quality of the Authorised Nominating Authorities

At present, there are nine ANAs responsible for the nomination of adjudicators under the NSW Act. These ANAs are comprised of professional bodies,[4] contractor organisations[5] and private companies.[6] In the absence of prescribed qualifications and experience applied to adjudicators in the NSW Act, the minimum qualifications and experience standards of adjudicators are set by these ANAs, which are responsible for recruiting adjudicators to serve on their panels. Three interviewees (one construction lawyer and two adjudicators) perceived that the quality of the ANAs in New South Wales is varied. One of them pointed out that 'not all of the ANAs are the same, [and] not all of the ANAs have that same quality control over adjudicators.'[7]

Some interviewees observed that the selection process undertaken by ANAs in recruiting prospective adjudicators is varied.[8] Some ANAs specify high requirements

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1 Construction Lawyer/Employers/7.

2 Construction Lawyer/Contractors/9.

3 As pointed out by one interviewee: 'The quality of the adjudicators comes down to the quality of the ANA', Adjudicator/Construction Management/3.

4 Institute of Arbitrators and Mediators Australia, LEADR – Association of Dispute Resolvers and Royal Institution of Chartered Surveyors Dispute Resolution Service (RICS DSR).

5 Air Conditioning and Mechanical Contractors Association of NSW Limited, Master Builders Association of NSW Pty Limited and Master Plumbers Association of NSW.

6 Able Adjudication Pty Limited, Adjudicate Today Pty Ltd and Australian Solutions Pty Limited.

7 Construction Lawyer/NSW/Employers/6.

8 For example one interviewee highlighted that 'The ANAs are varied I guess in their approach to adjudication in a number of ways. One of those may be the emphasis their place on training for example. What kind of selection process they go through to, to put the people on to their panel.' Adjudicator/NSW/Construction Management/3.

for prospective adjudicators to serve on their panels, whilst others stipulate less extensive requirements. The amount of training provided to prospective adjudicators by ANAs is also varied. Some ANAs provide months[1] of training while others provide mere days of training.[2] The quality of monitoring of adjudicators on the panels also differs.[3] Certain ANAs provide mentoring[4] and reviewing[5] systems, whilst others do not. Some ANAs are also perceived to have a reputation of being claimant-friendly.[6]

The problem of variability in quality of adjudicators among ANAs could be caused by several factors. The absence of specific provisions in the NSW Act regarding qualifications and experience of adjudicators may be a contributing factor. Each ANA imposes a varying set of selection criteria for the recruitment of adjudicators, and some ANAs impose stricter requirements than others. The absence of an adjudication registry, similar to that established in Queensland, that nominates training organisations responsible for delivering courses in accordance to an approved syllabus may also be a factor contributing to varying quality of adjudicators across the ANAs. The registration of an adjudicator under the NSW Act should be standardised so that the exact requirements in terms of qualification and experience can be set at a higher standard across all the ANAs.

3.2.2 The Extension of Adjudication to include Damages Claims

It may be argued that the extension of the scope of application of adjudication to include damages claims may have caused the varying quality of adjudicators in New South Wales. Damages claims, which usually involve complex analysis of the law, are arguably unsuitable for the NSW adjudication regime, which is designed as a certification process with a short time frame for the adjudicator to make a determination (Davenport, 2007). As some adjudicators have little or no legal knowledge, this could contribute to the lack of quality of the adjudicators specifically when dealing with damages claims. As pointed out by one interviewee 'many of the current adjudicators are not legally qualified and they are producing very bizarre and terrible results.'[7] It is expected that adjudicators with little or no legal knowledge may find it difficult to assess damages claims, particularly on the parties' entitlements of damages under the law. The entitlement of damages claims involves a complex analysis of culpability and is largely based on the examination of case law. Furthermore, the strict time frame of ten business

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1 As highlighted by one interviewee who is an adjudicator 'Our training is not two days, it's three months.' Adjudicator/NSW/Legal/5.

2 As highlighted by one construction lawyer interviewee: '[prospective adjudicators] merely have to go through a short course, that course is no longer available, so people who are already qualified are already in and nobody else is being admitted to be an adjudicator.' Construction Lawyer/NSW/Contractors/8.

3 As highlighted by one interviewee: '[T]here is insufficient scrutiny of the adjudicators.' Adjudicator/NSW/Legal/2.

4 One interviewee explained '[A]ll adjudicators are in groups, so that if they're resting an issue, they don't have to, they are not alone, they can go into the group, and say, I am resting with this issue, has any one encountered with this issue before? This is the way the courts work. That's how the judges work.' Adjudicator/NSW/Legal/5.

5 As highlighted by an interviewee who is also a senior adjudicator on an ANA's panel: In the XXX [the name of a nominating body], there is a process whereby every adjudication determination is reviewed...to ensure that the standard is met. Adjudicator/Legal/2.

6 As pointed out by a construction lawyer who has done more than 100 adjudications; 'Some ANAs are very claimant friendly, and so, people tend to go to the most friendly ANA.'. Construction Lawyer/NSW/Contractors/9.

7 Construction Lawyer/NSW/Contractors/8.

days to make a determination may add considerable pressure to the adjudicator. These two factors may lead to adjudicators producing erroneous determinations.

3.3 Rubber Stamp Approach

One of the main criticisms of the NSW adjudication regime advanced in the literature is the fact that it allows the claimant to apply for summary judgment on the statutory debt created as a result of the respondent's failure to issue a payment schedule.[1] One respondent expressed this concern when he said: '[I]t's very harsh particularly during the learning cycle of how the Act works for respondents to be unfairly penalised because of ignorance. For example of they don't put on a payment schedule, they might be hit with a payment claim or a judgement for $2million simply because they didn't know. That is not fair.'[2] The case of *Walter Construction Group* v *CPL (Surry Hills)*[3] provides a good illustration on the inherent difficulties caused by this so-called rubber-stamp mechanism. In that case, a multi-million dollar payment claim, which included damages claims to the respondent, was issued over Christmas. The respondent later failed to issue a payment schedule. The failure allowed the claimant to recover the claimed amount as a statutory debt in a court of competent jurisdiction by way of summary judgment. The claimant then went into liquidation and the respondent could not recover the overpaid amount. In that case, the claimant made a claim which exceeded the amount to which the claimant was entitled, and there was no option for the claimant to apply for adjudication.

3.4 Accessibility of the NSW Act

A majority of adjudicators and one construction lawyer[4] indicated that the NSW Act is not being widely used by industry participants. They found that the NSW Act is used by big construction companies, but not small or medium-sized companies. One of the interviewees stated: 'I guess the only difficulty with it is,...it is still not used by such small subcontractors. It is really only the big ones who can afford legal representation probably.'[5] The finding of the study confirms the study of Brand and Uher (2010), it must be stressed that, the sample size of this qualitative study is small, therefore this finding cannot be generalised to reflect the whole population. The adjudicators and construction lawyers who have been involved in many adjudications between them are in a good position to assess who has been using the NSW Act, as they are appointed by parties to become adjudicators or legal representatives. From their personal experience in adjudication, they found that the NSW Act is not used by all levels of the contractual payment chain, but rather at the top level, i.e., between the employer and the contractor.

This is divergent from the intention of Parliament, as the NSW Act was intended to assist small builders to recover payment for their errant paymasters. The fact that the NSW Act covers oral contracts as well as written contracts exemplifies Parliament's intention to provide cash flow protection to subcontractors, as they normally carry out work based on oral contracts. Therefore, if subcontractors are not using the NSW Act as Parliament intended, it brings the effectiveness of the NSW Act into question.

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1 Sections 15(2)(a) and 16(2)(a) of the NSW Act.
2 Construction Lawyer/NSW/Contractors/9.
3 [2003] NSWSC 266.
4 The construction lawyer used to be a legal advisor to a contractor organisation and now a member of a contractor organisation in New South Wales.
5 Construction Lawyer/NSW/Contractors/10.

4 Potential Improvements

4.1 Administrative Improvements

4.1.1 The Variability in the Quality of Adjudicators in New South Wales

It is established from the analysis of the interviews that the quality of the adjudicators is effectively determined by the ANAs. From the interviews, it was discovered that some ANAs provide a review system in which adjudicators' determinations are reviewed by a senior adjudicator or a panel of senior adjudicators before being published.[1] Some ANAs have a mentoring system in which a junior adjudicator may discuss the case he or she is currently working on with a senior adjudicator.[2] Some ANAs have extensive databases that provide information on case law and past adjudicators' determinations.[3] Certain ANAs are very efficient in 'picking the right sort of adjudicator for the right sort of dispute'.[4] In some ANAs, the adjudicators are placed in groups to discuss their adjudication cases.[5]

4.1.2 Accessibility of the NSW Act

The issue of the accessibility of the NSW Act is fundamental, as one of the parameters to measure the effectiveness of Security of Payment legislation is by determining its level of use by industry players (Uher and Brand, 2008). The findings of the interviews reveal that the NSW Act is not widely used by subcontractors – the primary intended beneficiaries of the NSW Act. This is unfortunate, as the NSW Act has been in operation for more than a decade now, yet a large segment of the industry is not using it.

Despite having some of the highest numbers of adjudication applications in Australia (together with Queensland), there is reason to believe that the NSW Act is not widely used by the industry. Since 2005, the number of adjudication applications in New South Wales has levelled out at around 900 applications annually (Coggins, 2009). Queensland, which was the third jurisdiction in Australia to enact SOP legislation, had the highest number of adjudication applications (around 1000) in the period between 2008 and 2009. In the period between 2007 and 2008 the number of adjudication applications in Queensland was around 500. There was almost a 100 percent increase in terms of the number of appointments from the period of 2007-2008 to 2008-2009 in Queensland.

The fact that Queensland has overtaken New South Wales in terms of having the highest number of adjudication applications in Australia offers some interesting observations. Despite Queensland having a population of only 4.53 million compared to 7.25 million

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1 As highlighted by an interviewee who is also a senior adjudicator on an ANA's panel: In the XXX [the name of an ANA], there is a process whereby every adjudication determination is reviewed...to ensure that the standard is met. Adjudicator/NSW/Legal/2.

2 As highlighted an interviewee: I'm involved in mentoring of adjudicators. Adjudicator/NSW/Legal/5.

3 As highlighted an interviewee: [The adjudicators] have access to enormous internal resources. Adjudicator/NSW/Legal/5.

4 Construction Lawyer/NSW/Employers/6.

5 As highlighted by an interviewee: [A]ll adjudicators are in groups, so that if they're resting an issue, they don't have to, they are not alone, they can go into the group, and say, I am resting with this issue, has any one encountered with this issue before? This is the way the courts work. That's how the judges work. Someone might say, yeah, I've dealt with that, when they talk about it, the adjudicator doesn't have to follow it, but the process, the fact that they are talking to people in their group who collectively is a massive amount of experience available. Adjudicator/NSW/Legal/5.

in New South Wales,[1] and less volume of construction activity when compared with New South Wales, based on the recent number of adjudication applications it may be inferred that Queensland has been successful in terms of addressing the issue of accessibility of its SOP legislation. The Queensland version of the Security of Payment legislation closely resembles the NSW's SOP legislation; therefore, the argument that the NSW Act is more complex than its Queensland counterpart in terms of operation, which may have the effect of deterring industry usage, is not attestable. The reason statutory adjudication is widely used in Queensland could be attributed to the measures taken by the government to promote the SOP legislation.

The Queensland government formed the Building and Construction industry agency, a branch of the Building Services Authority, 'to provide the infrastructure to assist the Adjudication Registry, in its duties to give effect to the Building and Construction Industry Payments Act 2004.'[2] One of the roles of the Adjudication Registry is to 'ensure that an effective educational and awareness strategy is in place with regard to the statutory obligations and entitlements established under the Act.'[3] No equivalent agency exists in New South Wales. The agency responsible for matters relating to Security of Payment in New South Wales, is NSW Procurement, a division of the NSW Department of Services, Technology and Administration. The roles of the NSW Procurement are varied and are not solely focused on Security of Payment matters.

It is proposed that an agency whose exclusive role is to look into Security of Payment matters should be established in New South Wales to actively promote accessibility to the NSW Act. Apart from the government, promotion of the NSW Act also falls upon the authorised nominating authorities, professional bodies and trade associations.

4.2 Potential Legislative Improvements to the NSW regime

4.2.1 Dual Process of Adjudication

Four interviewees (three adjudicators and one construction lawyer) support the proposal of introducing a dual process of adjudication. As stated in one interview:

> [T]he ideal would be to have, a dual system, allowing the popularity obvious success of the New South Wales model in dealing with payment claims, to allow that to run, parallel to another adjudication system which ultimately connects in the end, that deals with other types of money claims that allows both parties to enter into the arena, and it looks more like an arbitration in a sense.[4]

There are two opposing views expressed by the rest of the interviewees. Four interviewees (comprising of both three construction lawyers and one adjudicator) agreed that adjudication should only be used for progress payment claims. Three interviewees (two construction lawyers and one adjudicator) supported introducing adjudication to a wide spectrum of disputes, but one of them felt that the issue of quality of adjudicators

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1 Population data sourced from Australian Bureau Statistics (ABS), Australian Demographic Statistics, September Quarter 2010 available on ABS website <http//:www.abs.gov.au>.

2 http://www.bcipa.qld.gov.au/Pages/AboutUs.aspx.

3 http://www.bcipa.qld.gov.au/Pages/AboutUs.aspx.

4 Adjudicator/NSW/Construction Management/3.

must be first addressed. The introduction of a dual process of adjudication could fulfil the aspirations of these two diverging groups.

The dual process of adjudication is essentially a hybrid between the UK and New South Wales adjudication schemes. In essence, the dual process of adjudication combines the positive attributes of both the NSW and UK adjudication regimes (Davenport, 2007). This process is based on the idea that the UK adjudication regime is effective in dealing with damages claims but deficient in dealing with certification claims, while the NSW adjudication regime is effective in dealing with certification claims but deficient in dealing with damages claims. Interestingly, the limitations and the strengths of these two adjudication schemes do not overlap; hence, an integration of these schemes could offset the weaknesses inherent within one scheme by adopting the strengths of the other.

There are two different scheme for a dual process of adjudication. The first is similar to the system currently provided under the amended NSW Act, except that its scope would be restricted to certification claims made by the claimant. The second scheme, which mirrors the UK adjudication regime, would deal exclusively with damages claims made by either the claimant or the respondent.

Each proposed system would have different time frames for responding to a claim and making an adjudication determination. For ease of reference, the term *certification scheme* will be used to refer to the adjudication regime that mirrors a certification process whereas the term *dispute resolution scheme* will be used to refer to the adjudication regime that is akin a quasi-judicial dispute resolution method.

Three interviewees, although they did not specifically mention the dual adjudication process, suggested that there should be different time frames for different disputes. One of them suggested; that there be perhaps slightly different time frames or different processes for different types of disputes.'[1] This suggestion appears to be consistent with the idea of the dual process of adjudication.

The proposal for a dual process of adjudication should be distinguished from another proposal of harmonising Security of Payment legislation in Australia, which is essentially the amalgamation of the east coast and west coast models (Coggins, et. al, 2010). This means that there would be a single scheme incorporating the strengths of both models. The SOP regimes in Western Australian and the Northern Territory, which are closely modelled after the UK regime, are collectively referred to in industry parlance as *the west coast model*, whereas those states and territories in Australia whose SOP regimes are largely based on the NSW regime are together known as *the east coast model*. Some of the interviewees applauded this idea, however, they felt that it may be difficult to realize. As one said: 'Well I think that is admirable intent but the problem is that you have got two radically different models at the moment.'[2]

The dual process of adjudication could solve most of the problems identified earlier in this paper. The problems that have emerged as a result of inconsistent judicial analysis may be eliminated by the dual process of adjudication. The certification scheme should not be subject to judicial review and the rules of natural justice, as it is designed to be prescriptive as a result of limited time frames and the claimant's sole right to initiate

[1] Construction Lawyer/NSW/Employers/7.
[2] Adjudicator/NSW/Legal/4.

adjudication. There should be an express provision in the NSW Act that gives effect to these exclusions. These may mean that grounds for jurisdictional challenges, which are usually y advanced by respondents to resist payment to claimants, would therefore be minimised; this works toward the policy objective of the NSW Act by improving cash flow in the construction industry.

The scope of the certification scheme should also exclude damages claims. In order to distinguish between certification and damages claims one interviewee proposed that: 'Distinction between what is a damages claim, we're looking at similar types of words towards the Victorian legislation, which already pull out a lot of the damages claims.'[1] However, the Victoria legislation excludes unapproved variations from being subject to adjudication. Arguably, unapproved variations are not damages claims and therefore should be part of the certification scheme. Conversely, delay and disruption claims arising from variations either approved or otherwise should be excluded from the certification scheme, as they are essentially damages claims. The inclusion of unapproved variations within the scope of the certification scheme may enliven the practice of ambush claims. Nonetheless, the severity of these ambush claims may be minimised if a time bar provision is introduced in the Security of Payment legislation.

An example of this time bar provision can be found in the Victorian Act. The Victorian Act provides that a period of 3 months after the reference date referred to in Section 9(2) is the minimum period for a claimant to make a claim (either a monthly, one-off or final payment claim). It also Act provides freedom to the parties to agree to a longer period for the claimant to make a claim, but to do so is to the detriment to the respondent, who may be faced with ambush claims if the claimant has a longer time to make a payment claim.

The exclusion of damages claims from the ambit of the certification scheme may eliminate the problems of ambush, limited time frame for the respondent to respond to a payment schedule and adjudication application, and limited time frame for the adjudicator to make a determination. Since ambush tactics are more common in damages claims, the distinction made by the dual process of adjudication may eliminate or at least diminish the risk ambush in the certification scheme. If the risk of ambush claims were minimised, the respondent and the adjudicator might no longer be faced with time pressure to perform their duties as prescribed in the SOP legislation.

The dispute resolution scheme that the dual process introduces should be subject to judicial review and the rules of natural justice. There should be an express provision in the NSW Act to this effect. Since the dispute resolution scheme performs a quasi-judicial function, it is acceptable that adjudication determinations made under this scheme should be subject to judicial review and some of the rules of natural justice. The problem created by the courts in extending the application of the NSW adjudication regime to include damages claims may also be solved, as the dispute resolution scheme provides longer time frames for the respondent and the adjudicator to perform their duties under the SOP legislation, and allows both parties in the contract to initiate adjudication. The problem with ambush claims may also be minimised if the dispute resolution scheme adopts the time bar provision as proposed in the certification scheme.

[1] Adjudicator/NSW/Legal/5.

4.2.2 Administration of Authorised Nominating Authorities and Adjudicators by the Adjudication Registry in the NSW Act.

As explained earlier, in New South Wales the quality of the Authorised Nominating Authorities is varied. This leads to a varying quality of adjudicators. The problem lies in a lack of monitoring on the part of the ANAs. For example, the absence of specific provisions in the NSW Act about qualifications and experience of adjudicators, means that ANAs are at liberty to specify any selection criteria; this may lead to the variability of quality among adjudicators.

In Queensland there is a body that closely monitors the conduct of the ANAs and the adjudicators. The Adjudication Registry, a body created by the Queensland Act consisting of a Registrar and other staff, has functions of registering adjudicators and ANAs, publishing adjudicators' determination and collecting statistical data.[1] The administration of the ANAs and Adjudicators by the Adjudication Registry is spelled out in detail in the Queensland Act. The requirements imposed on the ANAs in recruiting adjudicators are consistent as prescribed in the Queensland Act. As a result, the ANAs all apply the same set of selection criteria in recruiting their adjudicators. This leads to consistency in terms of quality of adjudicators. It is proposed that in order to have consistency in the quality of adjudicators, the approach taken by the Queensland Government in spelling out the administrative matters of the ANAs and the qualifications of adjudicators in the body of SOP legislation should be introduced.

5 Conclusion

It is evident that the NSW Adjudication regime has been effective thus far in improving payment practices. However, there remain problems areas which need to be addressed. The guidance from courts so far has been inconsistent. Inconsistent courts' interpretations lead to jurisdictional challenges. This is to contrary to the objective of Parliament that adjudication should be subject to minimum court involvement. It is apparent from this study that the quality of the adjudicators in New South Wales is varied amongst the ANAs. The rubber stamp approach is also perceived as one of the main deficiencies of the NSW regime. The fact that adjudication is not widely utilised by subcontractors is also a major issue of concern. The introduction of a dual process of adjudication could solve most of the problems identified above. As to the quality of adjudicators, the ANAs should be more rigorous in recruiting their adjudicators by imposing stricter selection criteria. It is important that the quality of the adjudicators in these ANAs should be sustained and improved upon by having the mechanisms discussed earlier in this paper. The introduction of an adjudication registry that is entrusted with the task to actively promote adjudication should address the issue of accessibility of the NSW Act. This governing agency should also monitor the conduct of the ANAs.

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Factors which impact upon the selection of Dispute Resolution methods for commercial construction in the Melbourne industry: Comparison of the Dispute Review Board with other Alternative Dispute Resolution methods

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Abstract:

This paper provides an insight into the factors which impact upon the selection of dispute resolution methods for commercial construction in the Melbourne industry. The ten factors used are cost, speed, outcome, enforceability, privacy and confidentiality, open and fairness, control, flexibility creative remedies and relationships. The dispute review board will be compared with alternative dispute resolution methods to demonstrate the differences and the impact it has on construction performance, primarily time, cost and quality. Through questionnaire survey, the relative importance of these factors in the selection of dispute resolution methods is examined and through interviews, the efficiency of the current alternative dispute resolution methods operating in Melbourne is compared with the efficiency of the dispute review board. Concerns regarding the use of DRB arising from high costs, lack of faith in the board's ability to achieve qualities of neutrality and impartiality in the selection of broad members as well as the general attitude of resistance to change in the highly adversarial culture of the construction industry will be discussed. Negotiation is still the preferred method of dispute resolution in Melbourne.

Keywords:

dispute review board, alternative dispute resolution, Melbourne construction industry

1 Introduction

Construction is a highly complex activity filled with uncertainties: economical, financial, and physical risks, as well as scope variations and documentation complexities (She, 2010). Research of the past indicates that during the construction process these risks can lead to disputes arising between two or more of the parties

involved in the works (Goldfayl, 2004). In Australia, 50% of all projects over 500 million are delayed (Dawson, 2007).

The key requirements of any methods of dispute resolution are they must be based on justice and is fair and impartial (Goldfayl, 2004). Construction law in Australia is based the common law. For litigation, it is based on the adversary system consisting of a series of statements of facts and arguments of law put forward by the party to be disputed and challenged by the other party (McGranaghan, 1992). For other dispute resolution methods such as the Alternative Dispute Resolution (ADR) it is non-binding however when a written agreement has been concluded between the two parties then it becomes a contract which both parties are obliged to comply.

The Dispute Review Board (DRB or DB) is a Dispute Avoidance Procedure method to settle various construction dispute claims (Gerber, 2001). Other techniques include voluntary negotiations between the parties; third party assisted negotiations such as mediation, conciliation and adjudication; and adversarial approaches such as arbitration or litigation (Sprague, 2006). The Melbourne construction industry is based more on relationships than most others and as a result dispute resolution using ADR methods, such as mediation allow flexibility in addressing technical issues and preservation of relationships as well as minimising adverse publicity (Sprague, 2006) (Megens, 2005). However, sufficient attention should be directed to the dispute resolution clauses at the time of contract preparation and negotiation to avoid costly, time consuming as well as distracting and ineffective dispute resolution processes later on. (Gould, 2006).

This research aims to explore the importance of the factors which affect the selection of dispute resolution methods in Melbourne when compared to the dispute review board as well as the efficiency of the current dispute resolution methods in Melbourne

2 Conflict and Dispute

Conceptually a *conflict* is a difference between two or more beliefs, ideas, or interests (Collin et al. 1996). Based on the above definition conflict in construction may include dissatisfaction, disagreements over contract administrator's decisions, anger, hostility, and negative attitudinal propensities by parties (Aibinu *et al* 2008).

2.1 Disputes- When conflicts are unresolved

Dispute arises in a situation when a claim or assertion made by one party is rejected by another party and this rejection is not accepted (Kumaraswamy, 1998). A claim is an assertion of a right to money, and property, or a remedy and can be made under the contract itself, for breach of the contract, or for breach of a duty in common law (Powell-Smith and Stephenson, 1989). Construction claims can be in the form of money and time claims by the main contractor against the project owner for extension of contract time and additional payment arising from a specified event in the contract (Aibinu *et al* 2008). The claim can be any application to the project management team pursuant to any relevant clause of the contract including any variation to payments, extension of time and or damages for any alleged breach of duty by the employer or employer's management team (Kumaraswamy, 1998).

3 Dispute Resolution Methods

The common dispute resolution methods operating in Melbourne are litigation, arbitration, mediation, conciliation, adjudication, mini-trials, facilitated negotiation, partnering and expert determination.

3.1 Litigation

Litigation is a legal proceeding in a court or a judicial context to determine and enforce legal rights (Hill, 2008). This is the least preferred method in the construction industry as the courts act on the adversary system (Bailey, 1998) and damage business relationships (Sprague, 2006). Besides the slow, expensive, time consuming, risky and stressful procedure which litigation brings, there is no real certainty of results other than a certainty of at least one loser (Merritt, 2006).

3.2 Arbitration

Arbitration is a mini-trial for a law suit ready to go to trial, held in an attempt to avoid a trial and is conducted by an independent person, usually with some relevant skill or knowledge, to determine the dispute (Bailey, 1998). During the arbitration process, parties make submission to an arbitrator and are bound by the arbitrator's decision (ACDC, 2005).

3.3 Mediation

Mediation is a prominent ADR method used in the Melbourne construction industry and is now a firmly established preferred dispute resolution tool for construction claims (Megens, 2005). Mediation is an attempt to settle a legal dispute through an active participation of a third party, a mediator, who works to find points of agreements and make those in conflict agree on a fair result (Hill, 2008). Resolution is attempted but settlement is not always achieved (Hill, 2008).

3.4 Conciliation

Conciliation is similar to mediation however the main goal is to conciliate by seeking concessions.

3.5 Adjudication/Security of Payment

Adjudication is the process where an independent person, the adjudicator, makes a determination as to the amount, if any, which the respondent owes to the claimant, on a specific date it was (or will be due) to be paid and on what interest applicable (IAMA, 2006). The objective is to impose a settlement on parties.

3.6 Mini-Trials

Mini-trials are a structured information exchange attended by representatives authorised to settle the dispute and are used where a dispute exists between the key decision makers of both parties (Sprague, 2006).

3.7 Facilitated Negotiation

Facilitated negotiation involves an independent and objective person which enters the negotiation session to assist the parties in reaching agreement (Berman, 1995). The

purpose is to facilitate a mutual understanding of both parties rather than settlement (Sprague, 2006).

3.8 Expert Determination/Appraisal

Expert determination is a person who a specialist in a technical subject who may present his or her expert opinion without having been a witness to any occurrence relating to the lawsuit or criminal case (Hill, 2008). The critical areas of importance for the 'expert' are to remain independent of, and act fairly and impartially between parties and to adopt a suitable procedure whilst avoiding unnecessary delay and expense in the given circumstances (Sprague, 2006).

3.9 Partnering in Alliance Contracting- towards proactive dispute avoidance

Partnering is a project procurement method where the parties to the contract share a common goal aim to complete the project successfully (Sprague, 2006). This is achieved by sharing both the benefits and risks of the project. Partnering is a proactive dispute avoidance technique. It is based on relationships and trust that all parties share a common goal (Eilenberg, 1996). Under this procurement method, a contract is set up with an agreed target price and incentives for parties.

4 Factors which impact upon the selection of dispute resolution methods

Many researchers and practitioners have investigated the attributes of ADR methods. York (1996) was concerned with the practical issues and identified time, cost and preservation of relationships, enforceability, degree of control by parties, flexibility in procedure and confidentiality as factors which had an impact upon the selection of dispute resolution methods (Cheung *et al* 2002). David (1988) focused on social and human issues such as impartiality, consensus, and continuing business relationships (Cheung *et al* 2002).

Cheung *et al* (2002) has identified ten criteria as the most common factors which affect the performance and selection of dispute resolution methods. These are:

4.1 Cost

The costs associated with dispute resolution involve reaching settlement agreements including expenses relating to revenue, the neutral third party fee, documentation, and settlement costs.

Cost is the one of the most critical criteria for organisation when assessing which dispute resolution method to use for dispute resolution as it affects the profit share of the project outcome. In assessing the suitability of a case for ADR, a cost-benefit analysis of the costs and value of the case must be undertaken. This involves trading off the various criteria and also helps the parties to better understand the issues involved and the expense likely to be incurred if the dispute continues.(Cheung *et al* 2002).

4.2 Openness, Neutrality and Fairness

Neutrality and fairness depend heavily on the competence, training, and integrity of the neutral third parties. During the resolution process, a neutral third party owes a duty of

care to his or her clients to remain impartial. He or she facilitates the parties' reaching a settlement but must make a conscientious effort to avoid personal biases. The neutral third must not have any professional or financial relationship with any party otherwise the information must be disclosed to the other party. Finally the neutral third party must be agreed by both sides. Since the choice of the neutral third party is of paramount importance there must be a code of conduct to monitor the standard of professional mediators, conciliators and arbitrators. This will enhance the trust and comfort level between parties to voluntarily reach a settlement.

4.3 Speed

Time is money in the world of business and project management. Lengthy delay of dispute resolution will delay the progress of works resulting in extra costs and incur potential penalty points.

4.4 Outcome

The outcome of a construction dispute is usually related to the costs liability. The party which initiates the dispute feels that the other party owe costs for reasons such as variation of payments, quality of workmanship, and final payments or owes compensation costs due to factors such as delay of works, payment for extension of time and liquidated damages.

4.5 Privacy and Confidentiality

Confidentiality is an implied and inherent feature of ADR processes that parties to a dispute are not allowed to disclose any information or materials to the public unless by mutual consent of the parties.

4.6 Enforceability

ADR methods of dispute resolution are non-binding therefore it cannot be enforced upon by the courts unless a written agreement is concluded. However, the selection of a competent neutral facilitator with excellent negotiation skills can encourage the parties to settle.

4.7 Preservation of Relationships

A continuing relationship is one of the key elements for any organization to strive for. A good relationship is always based on trust, common interests, and respect and requires the effort and commitment of the parties to make it last. ADR methods allow parties to negotiate the process of dispute resolution and the neutral facilitator assists both parties to always focus on the issue of the dispute and to try to achieve a win-win situation which is crucial to the Melbourne construction industry as it is heavily reliant on relationships (Sprague, 2006).

4.8 Flexibility

The non-binding nature of ADR methods is likely to encourage cooperation for all parties to reach an agreement through negotiation as it is more flexible than traditional methods.

4.9 Creative Remedies

Creative agreement is directly related to the skills, experience, and inherent character of a neutral third party. Depending on the nature and requirements of the parties, he or she should try to come up with a solution that can satisfy both parties' needs. Settlements can include human factors such as business relationships and personal issues can be considered. Lateral thinking by the facilitator is vital as it takes the various factors into consideration before reaching a settlement. Reality testing by writing down the pros and cons of each possible outcome will allow parties to feel fully informed with the decision making power in their hands.

4.10 Degree of Control

When parties feel in control of the outcome and processes involved to reach an agreement, it will also mitigate the adversarial climate between disputing parties.

5 Dispute Review Board-Overview of the structure, components and use

The Dispute Review Board (DRB) consists of three *qualified* members committee, nominated by *both parties*, formed at the *start of the project* and meet periodically *on site* to discuss issues (DRBF, 2007). Then they form non- binding recommendations. If the parties are *unsatisfied*, they can turn to other methods of binding or non-binding methods of such as mediation and conciliation or any other ADR methods (DRFB, 2007).

5.1 Selecting, nominating and appointing Board Members

The three members nominated by both parties (Gould, 2006) :

They must not have any financial ties to any party either directly or indirectly involved in the contract, not be currently employed by any party directly or indirectly in respect of the contract, and

Not have a close professional or personal relationship with a key member of any party directly or indirectly involved in the contract that could give rise to the perception of bias

Each party selects one member which is approved by the other party and then a third member is chosen by the two selected members. The three DRB members then selects one as the chair with the approval of both the contractor and the owner.

Members must be qualified in both the technical and legal facets of construction practices and methods.

5.2 Formation of DRB clause into the contract at the commencement of the project (Gaitskell, 2005):

When DRB is established before the commencement of the project, the members will have the relevant design documentations, specifications and project scope as well as understanding the contract conditions.

5.3 Periodic visits on site to resolve issues (Gaitskell, 2005):

Meeting 3 to 4 times a year or more frequently as agreed by both parties

Issues are seen, heard and resolved as they arise on site.

5.4 Issuing non-binding recommendations (Gaitskell, 2005):

DRB can act as a flexible and informal advisory panel. Before issuing a recommendation, the DRB may be asked for general advice on any particular matter. The DRB would then look at documents and or visit the site as appropriate and most usually, provide an informal oral recommendation, which the parties may choose to adopt.

If the parties were not satisfied, the DRB would follow the formal procedure of exchange of documents and a hearing and afterwards issue a formal written recommendation.

The decisions made by the board are non-binding but are generally accepted by the parties due to the merit of the expert opinion been admissible of the matter proceeds to arbitration or litigation.

5.5 Costs associated to implement the Dispute Review Board (DRBF, 2007):

The fees will be shared by both parties.

The fees will range between 0.05%- 0.25% of the project value and will act as an insurance premium against potential heft dispute costs if the claim progresses to litigation and arbitration.

6 Analysis of how the DRB should perform with the ten factors which impact upon the performance and selection of Dispute Resolution Methods

Ten factors were used to test the performance and selection of dispute resolution methods namely, cost, speed, outcome, enforceability, privacy and confidentiality, open and fairness, control, flexibility, creative remedies and relationships as identified by Cheung *et al*, (2002).

6.1 Cost

The direct fees for the DRB ranging from 0.05% to 0.25% of the total construction cost. The fees are shared by both parties which mitigate the conflict of interest and perception of bias that *all three* DRB members will take one particular side. In mediation, conciliation and other current ADR methods operating in Melbourne, there is only *one* member facilitating the negotiation for settlement between two parties.

6.2 Openness, Neutrality and Fairness

Neutrality, openness and fairness are the core values of the DRB. The board members must not have financial ties with any party. If there is a conflict of interest, it must be disclosed to all parties. The selection process for the DRB members is a consensus approach.

6.3 Speed

The DRB is established before the commencement of the project. It will involve the experts every early on the project and potential claims dispute may be identified *before* the issues surfaces as the conflict is resolved as they arise *on site* where as the current ADR methods in Melbourne resolve disputes *after* the event has occurred. This solves the problem of delaying the time to sort out missing documentation and historical information to make an accurate determination. Additionally, the periodic site visit will improve the adversarial nature between conflicting parties when liability can be determined before the conflict turns into a dispute.

6.4 Outcome

The DRB has the flexibility of acting as an advisor as well as issue non-binding recommendations. The use of lawyers on the board is discouraged to avoid an adversarial climate however the question of liability is ruled upon by *three* members. This should encourage the parties to accept the board decisions especially if the contract language includes a provision for the admissibility of a DRB recommendation into any subsequent arbitration or legal proceeding.

6.5 Privacy and Confidentiality

The code of ethics for DRB stipulates that the DRB must keep all information arising from the DRB review and hearing confidential and since the dispute is resolved on site, no external party will know that an issue exists. This should preserve business relationships and prevent any unnecessary complexity which may arise from external parties after hearing about the dispute.

6.6 Enforceability

The DRB is non-binding however, the goal of the DRB is facilitate the conflicting parties to resolve their differences so that construction works can continue on site.

6.7 Preservation of Relationships

Both parties agree on the selection of the DRB members at the appointment of the board. This means that all parties are willing to cooperate with each other in good faith and trust the board's decision making abilities when a conflict arises. If the parties are unsatisfied with the decisions of the DRB, they are free to sort dispute resolution methods.

6.8 Flexibility

The DRB can act as a flexible panel acting as an advisor which will facilitate the negotiation process more than the current ADR methods which can only act as a neutral facilitator as with mediation or act to make a judgement of a technical issue as with expert determination. Litigation and arbitration are the least flexible methods as it is only interested in the issue which relate to a point of law and does not take into account of any other factors.

6.9 Creative Remedies

The DRB is a panel of three experts with different but relevant qualifications, skills and more than ten years of experience within the construction industry. The blend of

qualifications and experience of the three-person DRB can provide a powerful combination of decision-making abilities than one person trying to make a judge within their limits of understanding and experience which is the case with expert determination.

6.10 Degree of Control

As mentioned before, the DRB members are agreed upon by both parties and the board resolves issues on site. The board can also act as an advisory panel which is not possible with the current operation of ADR methods. These factors give both parties a feeling of being control of the outcome and processes involved to reach an agreement.

7 Methodology

The entire process comprised of a pre-interview questionnarie, structured interview and a post interview questionnaire to examine the respondents' perception of the DRB's conflict management mechanisms in comparison with other dispute resolution methods.

Pre-interview questionnaire: The respondents were asked to comment on their experience with the current dispute resolution mehtods operating in Melbourne as well as the efficiency of the methods.

Interview Questions: and then they were asked to read some information regarding the use of DRB and they were asked questions regarding their perception of the DRB as well as any concerns regarding the implementation of the mechnism in the Melbourne construction industry.

Questionnaire: There were eleven survey questions asking the respondents to rank from the likert scale of 1 to 5 (1 for extremely unimportant and 5 for extremely important), whether they think the ten criteria factors are important in the comparison for the selection of dispute resolution methods.

7.1 Population and Sample

The population sample was restricted to the Melbourne industry. The research sample consisted of twenty one respondents which undertook both the structured interview and questionnaires. The research sample included: five architects, three engineers, three quantity surveyors, two development managers, three project managers, one project director, one CEO, one site foreman and two construction managers. Fifteen of these participants had over ten years of experience in their respective field of work. Eighty percent of the respondents answered that the project size their company generally undertake is in excess of $10 million. The average number of disputes that each building professional had been involved in over the last five years was five which confirms that these respondents have had a reasonable level of experience.

7.2 Data Analysis Tool

7.2.1 Structured Interview Analysis

The structured interview has been analysed using the 'grounded theory' approach, an example can be referred in Strauss and Corbin (1998).

7.2.2 Questionnaire Survey data analysis

To measure the performance of the conflict management mechanisms of the DRB in comparison with other dispute resolution methods a mathematical equation, Relative Importance Index (RPI) was used for the analysis of the quantitative data.

7.2.3 Relative Performance Index

To determine the performance of any dispute resolution method when compared with DRB on each criterion, the respondents' ratings are transformed in Relative Performance Index (RPI) for each criterion. RPI is computed using the following mathematical expression:

$RPI = \Sigma Wi/(A \times n)$

Where ΣWi is the total score assigned importance of a decision criterion by all the respondents;

A is the highest weight (5; and

n is the number of respondents

The computed RPI are then ranked for each dispute resolution method on each criterion. The areas of comparative advantages of the DRB over dispute resolution method on each criterion were identified.

8 8 Results

8.1 Analysis of Data from Pre-Interview Questionnaires

The results of this section present the demographics of the respondents and the current climate of dispute resolution in the Melbourne construction industry.

8.1.1 Profile of Respondents

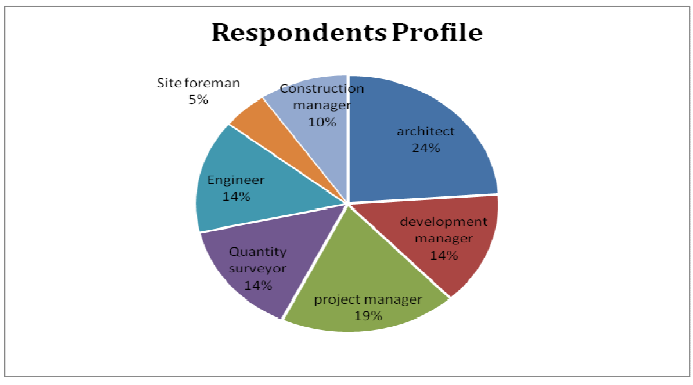

Figure 8.1.2 Diverse mix of professionals interviewed for this research.

As shown in figure 8.1.2 48% of the respondents held positions in a managerial capacity and 52% of the respondents held positions as a consultant in design, engineering and cost management. This demonstrates that all the respondents who participated in the research had the capacity of to make decisions regarding dispute resolution in their organisation.

8.1.2 Respondents Age

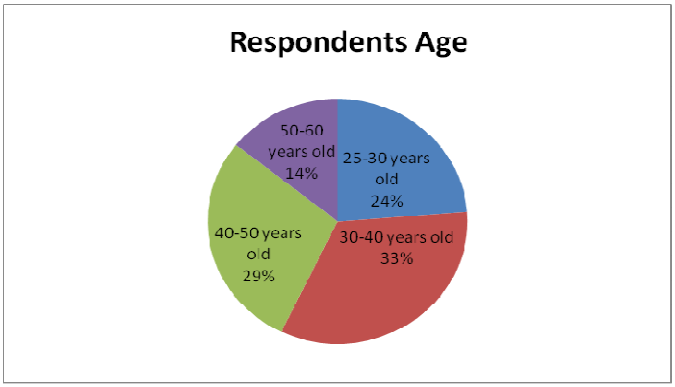

Figure 8.1.3 Age groups of the respondents who participated in the research.

As shown in figure 8.1.3, 76% of the respondents were over thirty years old. 33% of the respondents were between the age group of 30-40 years old and 29% of the respondents were between 40-50years old. 14% of the respondents were between the ages 50-60 years and held positions in senior management and 24% of the respondents were between the ages of 25-30years. Different age groups of professional have a different perception towards conflict management due to the length of their life and work experience.

8.1.3 Years of Experience in the Construction industry

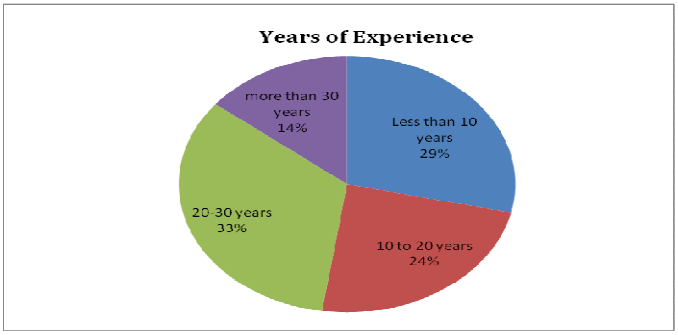

Figure 8.1.4 Number of years of experience which the respondents had within the construction industry.

As shown in figure 8.1.4, 33% of the respondents had more than 20 -30years of experience within the construction industry, 24% of the respondents had 10-20 years of experience, 14% of the respondents had more than 30 years of experience and 29% of the respondents had less than 10 years of experience. These respondents worked in a range of middle to senior management positions. Senior managers focus on strategic views whilst middle managers focus on efficient project operation and younger managers bring creativity into the workplace.

8.1.4 Size of Projects

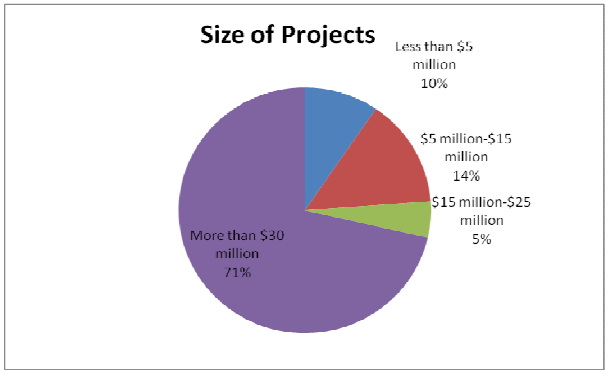

Figure 8.1.5 Size of projects which the respondents' organisation usually undertook.

71% of the respondents worked in large corporations which usually undertook big project in access of more than $30 million. Usually, the larger projects have more complexity and risks associated than smaller projects and so are more likely to encounter disputes.

8.1.5 Contractual disputes encountered during the past five years

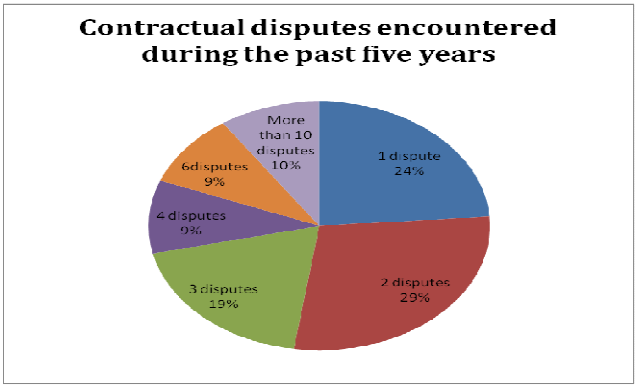

Figure 8.1.6 Number of contractual disputes encountered by the respondents during the past five years.

As shown in the pie chart above the 72% of the respondents encountered between one to three disputes during the past five years.

8.1.6 Types of Dispute

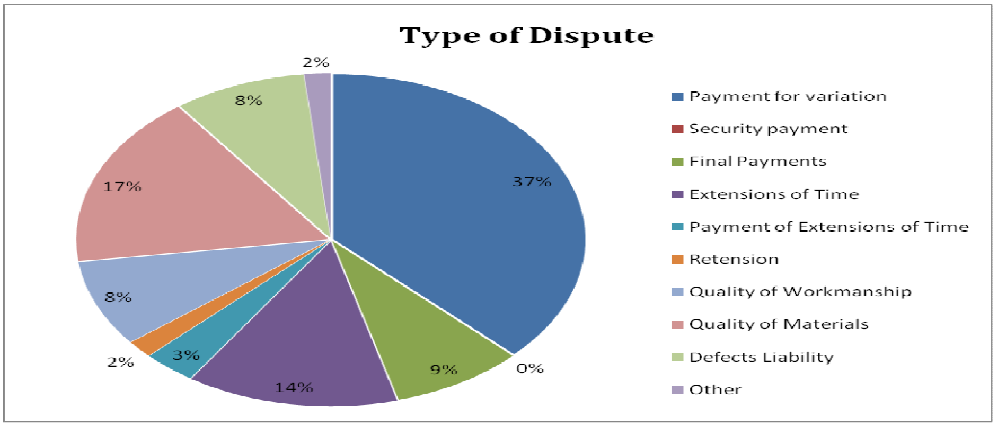

Figure 8.1.7 most common type of disputes which were encountered by the respondents who participated in the research.

As shown in figure 8.1.7 the most common types of dispute encountered by the respondents were all related to money, in particular 37% of the disputes were related payment for variation, 17% of the disputes were related to quality of materials and 14% of the disputes were extensions of time.

8.1.7 Most commonly used Dispute Resolution Methods

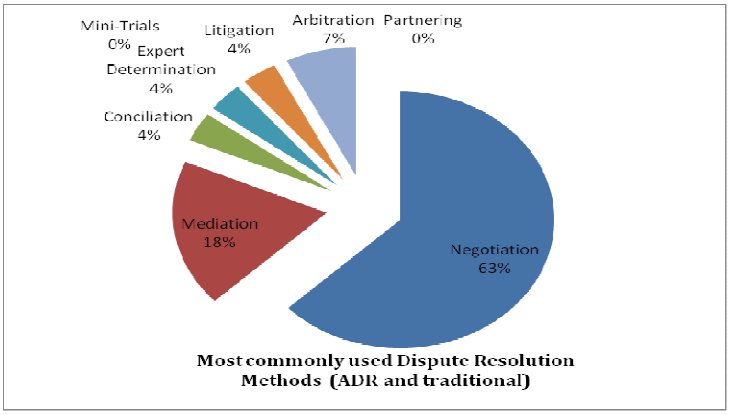

Figure 8.1.9 Most commonly used dispute resolution methods by the respondents who participated in the research.

As shown in figure 8.1.9 negotiation was the most commonly used method for dispute resolution followed by mediation. Respondents preferred to negotiate at all times to resolve disputes.

8.1.8 Overall satisfaction with the current dispute resolution methods

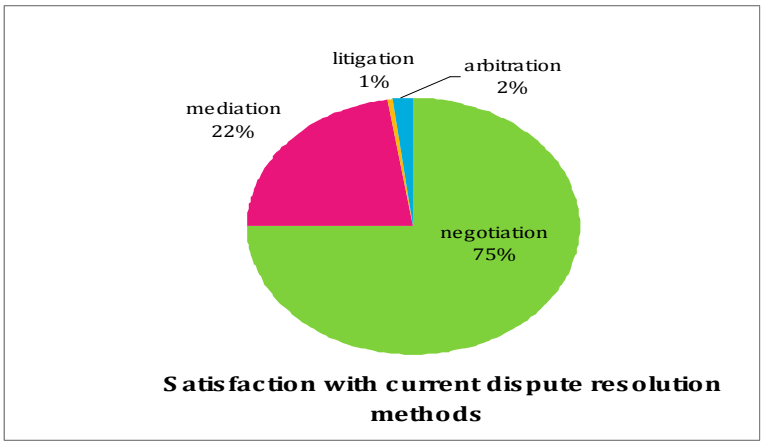

Figure 8.1.10 Overall satisfication of how the current dispute resolution methods are operating in relation to their response in 8.1.9.

Respondents were most satisfied when negotiation was used for dispute resolution. Through the interviews, respondents were most satisfied with the outcome of negotiation and emphasised the importance of excellent communication skills and the preservation of relationships in the Melbourne construction industry.

8.2 Analysis of Interview Responses -Perception of the current operation of dispute resolution methods in Melbourne

Participants were asked to comment on the efficiency of the dispute resolution processes in Melbourne. Every respondent agreed that litigation was the least efficient and

preferred method as it was time consuming, costly with no guarantee of satisfactory results and was just a 'revenue for the lawyers'. Of the twenty one respondents, thirteen professionals were moderately satisfied with the current operation of mediation in terms of the time involved in the process and outcome. Three respondents did not have any strong opinion towards any ADR methods as they felt dispute resolution 'was just part of their job in project management' as the Melbourne construction industry has an adversarial work culture. Five of the respondents felt confident about their negotiation ability to resolve conflicts and the ability to maintain relationships with their contractors and subcontractors as they only collaborated with people they knew.

Participants were then asked if they felt that an unresolved issue often had a detrimental impact the on the cooperation, coordination and communication between parties before the conflict is transformed into a dispute. Sixty five percent of the respondents commented that with any conflict that arises cooperation between parties always broke down first. Thirty percent of the respondents felt that communication became the most difficult task as unsatisfied parties were often unresponsive to written confirmations and other correspondence requests. One project manager stated that when subcontractors and contractors became uncooperative the problem of coordination delayed the project. All respondents emphasised on the importance of preserving relationships in the Melbourne construction industry.

8.3 Perception and concerns of the Dispute Review Board method

Positive Perception of DRB	Concerns regarding DRB
Experts will be involved in the project very early with the formation of DRB clause into the contract at the commencement of the project.	Practicality of achieving qualities of neutrality, impartiality and independence in the selection, nomination and appointment of the DRB members
Selection process is open.	Melbourne Construction industry is relatively small and more reliant on relationships than US market.
Fairness can be achieved in the extent that both parties agree on the other party's chose of member.	Adequate knowledge of DRB members in all stages of the project.
Use lawyer is discouraged.	Fairness may not be achieved it influenced by political interests.
Independence could be achieved as board members have no financial ties with any party.	DRB's function is perceived to be very similar to a panel of three expert witness so impartiality may not be achieved.
DRB will enhance cooperation among the project manager, the owner and the contractor as all parties have the intention to abide by the board's ability to make decisions and investigate any unreasonable behaviour when the board is formed at the start of the project.	Use of Design and Construct contracts may not be suitable for DRB design is not fully documented before the construction starts therefore the experts' knowledge of the design documentation is limited.
Incorporate a spirit of cooperation among parties.	that the periodic site visits needed to be weekly and at the end of every milestone to effectively mitigate conflicts transforming into disputes.
	Adversarial attitude between will not improve if DRB members can determine the liability before the conflicts turns into a dispute as the notion of liability is subjective.
	Fee of 0.05%-0.25% of the total project costs was too high to be factored into the overall construction cost
	preservation of relationships is not a strong enough incentive for most respondents to implement the DRB at the current cost structure
	small matters can inflate unnecessary with the existence of the DRB whereas before, the matter could have been resolved through private negotiation.
	Whether decisions be accepted depends on the person and their crediability.

8.4 Importance of the selection criteria for dispute resolution methods

Respondents were asked to rank on a 1-5 likert scale the perceived importance of the ten criteria in the selection of dispute resolution methods. Results from the Relative Importance Indices analysis are displayed in table 5.1.

Table 8.4: Importance of Factors which may influence the selection of dispute resolution methods

Criteria	Total Score	RII*	Rank
Cost	105	1	1
Open and fairness	98	0.933	2
Speed	98	0.933	2
Privacy and Confidentiality	65	0.619	8
Outcome	98	0.933	2
Enforceability	83	0.79	6
Relationship	88	0.838	5
Flexibility	63	0.6	9
Creative remedies	51	0.486	10
Control	70	0.667	7

*RII= Relative Importance Index

Results indicate that the cost, with the highest ranking of 1, was the most important criteria when considering the selection of dispute resolution methods. The second most important factor in the selection of the dispute resolution methods are open and fairness, speed and outcome. Preservation of relationship and enforceability was the third most important factor when considering methods of dispute resolution. Degree of control ranked 7 and privacy and confidentiality ranked 8. The ranking of this research demonstrates that respondents are primarily concerned with the tangible benefits of dispute resolution. However, preservation of relationships is crucial for the Melbourne construction industry. Flexibility scored a lower ranking of 9 and creative remedies scored the lowest ranking of 10. This indicates that respondents are less concerned with *how* disputes are resolved but focus on the results of the outcome.

9 Conclusion

Negotiation is still the preferred method of dispute resolution in Melbourne. Cost achieved the highest ranking RII value of 1 indicating that it was the most important performance criteria when in the selection of dispute resolution methods. Other critically important factors are speed, outcome, open and fairness as well as relationships. Flexibility and creative remedies received the lowest ranking score of 9 and 10 in RII indicating that in the context of project management professionals are more interested in the immediate tangible outcome when selecting dispute resolution methods than long term intangible benefits such as improvement in the process of dispute resolution for future benefits.

The spirit of cooperation is evident in the dispute review board but is inadequate to improve adversarial attitude between parties. Extensive training at the graduate level is needed in order to change the general attitude of the high level of resistance to change in Melbourne. The notion that “things can’t improve” and “disputes is just part of the job in this industry” hinders the potential for the Melbourne construction industry to develop in full capacity and compete at international level.

Further research can be done in the field of organisational change and learning to improve the training in organisational leadership and conflict management in project management.

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Performance of the Dispute Review Board in Melbourne Construction projects: Is it suitable?

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Abstract:

Currently litigation and arbitration are too time consuming, costly and damaging in business relationships whilst Alternative Dispute Resolution (ADR) methods such as mediation and conciliation are increasing becoming formal and costly. This research examined the stakeholders' perception of the Dispute Review Board (DRB) in managing conflicts in construction projects and assessed whether the performance of DRB may achieve a better dispute resolution outcome than other dispute resolution methods. This research involved construction professionals with experience in dispute resolution. Survey questionnaire was used to find out the perception on the use of the DRB using the ten criteria, namely cost, speed, outcome, enforceability, privacy and confidentiality, open and fairness, control, flexibility, creative remedies and relationships. The results found that DRB is perceived to have a comparative advantage in nearly all criteria over litigation and arbitration and has a higher comparative advantage in the capacity to maintain relationships when compared with mediation and conciliation. Structured interviews were also used to examine the perception of the DRB and found concerns regarding the use of DRB are costs, distrust as well as the general attitude of resistance to change in the adversarial Melbourne construction industry. Recommendations for areas where DRB can be improved are discussed to suit the Melbourne construction industry. This paper demonstrates that the suitability of the Dispute Review Board in Melbourne requires more than good faith and willingness to implement the mechanism as the Dispute Review Board is still an external party representing formal authority and governance over the complex process of the construction management.

Keywords:

dispute review board, alternative dispute resolution, Melbourne construction industry, performance of dispute review board, comparative advantage

1 Introduction

Disputes are a significant factor that causes project delays. Less than 50% respondents are satisfied that the dispute resolution methods used were effective in terms of cost,

outcome, time and process (Dawson, 2007). Project level negotiation and executive negotiation resolution methods were resolved disputes in less than three month and 16% of disputes using other methods such as mediation took over 12 months to resolve (Dawson, 2007). Litigation and arbitration are notoriously cost inefficient and time consuming but above all, it breaks goodwill between business relationships, which is detrimental to the nature of the construction industry, heavily reliant on collaborative teamwork (Sprague, 2006). Another problem associated with litigation and arbitration is that it can also have adverse effects on the construction programme and the quality of the works, irrespective of the size of the project (Cheung, 1995) (Bailey, 1998). Combined with the increasing formality of Alternative Dispute Resolution (ADR) these systems will eventually increase in the costs involved hence in future, most disputes will need to be resolved on site (Miles, 1996). For these reasons, the Dispute Review Board (DRB) may improve the current dispute resolution system if it is implemented in Melbourne.

The Dispute Review Board (DRB or DB) is a Dispute Avoidance Procedure method to settle various construction dispute claims (Gerber, 2001). Other ADR techniques include voluntary negotiations between the parties; third party assisted negotiations such as mediation, conciliation and adjudication; and adversarial approaches such as arbitration or litigation (Sprague, 2006). The Melbourne construction industry is based more on relationships than most others and as a result dispute resolution using ADR methods, such as mediation allow flexibility in addressing technical issues and preservation of relationships as well as minimising adverse publicity (Sprague, 2006) (Megens, 2005). However, sufficient attention should be directed to the dispute resolution clauses at the time of contract preparation to avoid costly, time consuming as well as distracting and ineffective dispute resolution processes later on. (Gould, 2006).

This research aims to explore the construction industry's stakeholders' perception regarding the use of the Dispute Review Board in managing conflicts in Melbourne construction projects. Additionally, this research aims to examine the potential effects of these conflict management mechanisms when compared with the other dispute resolution methods currently in use.

2 Conflict and Dispute

Conceptually a *conflict* is a difference between two or more beliefs, ideas, or interests (Collin *et al.* 1996). Based on the above definition conflict in construction may include dissatisfaction, disagreements over contract administrator's decisions, anger, hostility, and negative attitudinal propensities by parties (Aibinu *et al* 2008).

2.1 Disputes- When conflicts are unresolved

Dispute arises in a situation when a claim or assertion made by one party is rejected by another party and this rejection is not accepted (Kumaraswamy, 1998). A claim is an assertion of a right to money, and property, or a remedy and can be made under the contract itself, for breach of the contract, or for breach of a duty in common law (Powell-Smith and Stephenson, 1989). Construction claims can be in the form of money and time claims by the main contractor against the project owner for extension of contract time and additional payment arising from a specified event in the contract (Aibinu *et al* 2008). The claim can be any application to the project management team

pursuant to any relevant clause of the contract including any variation to payments, extension of time and or damages for any alleged breach of duty by the employer or employer's management team (Kumaraswamy, 1998).

3 Dispute Resolution Methods

The common dispute resolution methods operating in Melbourne are litigation, arbitration, mediation, conciliation, adjudication, mini-trials, facilitated negotiation, partnering and expert determination.

3.1 Litigation

Litigation is a legal proceeding in a court or a judicial context to determine and enforce legal rights (Hill, 2008). This is the least preferred method in the construction industry as the courts act on the adversary system (Bailey, 1998) and damage business relationships (Sprague, 2006). Besides the slow, expensive, time consuming, risky and stressful procedure which litigation brings, there is no real certainty of results other than a certainty of at least one loser (Merritt, 2006).

3.2 Arbitration

Arbitration is a mini-trial for a law suit ready to go to trial, held in an attempt to avoid a trial and is conducted by an independent person, usually with some relevant skill or knowledge, to determine the dispute (Bailey, 1998). During the arbitration process, parties make submission to an arbitrator and are bound by the arbitrator's decision (ACDC, 2005).

3.3 Mediation

Mediation is a prominent ADR method used in the Melbourne construction industry and is now a firmly established preferred dispute resolution tool for construction claims (Megens, 2005). Mediation is an attempt to settle a legal dispute through an active participation of a third party, a mediator, who works to find points of agreements and make those in conflict agree on a fair result (Hill, 2008). Resolution is attempted but settlement is not always achieved (Hill, 2008).

3.4 Conciliation

Conciliation is similar to mediation however the main goal is to conciliate by seeking concessions.

3.5 Adjudication/Security of Payment

Adjudication is the process where an independent person, the adjudicator, makes a determination as to the amount, if any, which the respondent owes to the claimant, on a specific date it was (or will be due) to be paid and on what interest applicable (IAMA, 2006). The objective is to impose a settlement on parties.

3.6 Mini-Trials

Mini-trials are a structured information exchange attended by representatives authorised to settle the dispute and are used where a dispute exists between the key decision makers of both parties (Sprague, 2006).

3.7 Facilitated Negotiation

Facilitated negotiation involves an independent and objective person which enters the negotiation session to assist the parties in reaching agreement (Berman, 1995). The purpose is to facilitate a mutual understanding of both parties rather than settlement (Sprague, 2006).

3.8 Expert Determination/Appraisal

Expert determination is a person who a specialist in a technical subject who may present his or her expert opinion without having been a witness to any occurrence relating to the lawsuit or criminal case (Hill, 2008). The critical areas of importance for the 'expert' are to remain independent of, and act fairly and impartially between parties and to adopt a suitable procedure whilst avoiding unnecessary delay and expense in the given circumstances (Sprague, 2006).

3.9 Partnering in Alliance Contracting- towards proactive dispute avoidance

Partnering is a project procurement method where the parties to the contract share a common goal aim to complete the project successfully (Sprague, 2006). This is achieved by sharing both the benefits and risks of the project. Partnering is a proactive dispute avoidance technique. It is based on relationships and trust that all parties share a common goal (Eilenberg, 1996). Under this procurement method, a contract is set up with an agreed target price and incentives for parties.

4 Dispute Review Board-Overview of the structure, components and use

The Dispute Review Board (DRB) consists of three *qualified* members committee, nominated by *both parties*, formed at the *start of the project* and meet periodically *on site* to discuss issues (DRBF, 2007). Then they form non- binding recommendations. If the parties are *unsatisfied*, they can turn to other methods of binding or non-binding methods of such as mediation and conciliation or any other ADR methods (DRFB, 2007).

4.1 Selecting, nominating and appointing Board Members

The three members nominated by both parties (Gould, 2006) :

They must not have any financial ties to any party either directly or indirectly involved in the contract, not be currently employed by any party directly or indirectly in respect of the contract, and

Not have a close professional or personal relationship with a key member of any party directly or indirectly involved in the contract that could give rise to the perception of bias

Each party selects one member which is approved by the other party and then a third member is chosen by the two selected members. The three DRB members then selects one as the chair with the approval of both the contractor and the owner.

Members must be qualified in both the technical and legal facets of construction practices and methods.

4.2 Formation of DRB clause into the contract at the commencement of the project (Gaitskell, 2005)

When DRB is established before the commencement of the project, the members will have the relevant design documentations, specifications and project scope as well as understanding the contract conditions.

4.3 Periodic visits on site to resolve issues (Gaitskell, 2005)

Meeting 3 to 4 times a year or more frequently as agreed by both parties

Issues are seen, heard and resolved as they arise on site.

4.4 Issuing non-binding recommendations (Gaitskell, 2005)

DRB can act as a flexible and informal advisory panel. Before issuing a recommendation, the DRB may be asked for general advice on any particular matter. The DRB would then look at documents and or visit the site as appropriate and most usually, provide an informal oral recommendation, which the parties may choose to adopt.

If the parties were not satisfied, the DRB would follow the formal procedure of exchange of documents and a hearing and afterwards issue a formal written recommendation.

The decisions made by the board are non-binding but are generally accepted by the parties due to the merit of the expert opinion been admissible of the matter proceeds to arbitration or litigation.

4.5 Costs associated to implement the Dispute Review Board (DRBF, 2007)

The fees will be shared by both parties.

The fees will range between 0.05%- 0.25% of the project value and will act as an insurance premium against potential heft dispute costs if the claim progresses to litigation and arbitration.

5 Factors which impact upon the performance and selection of Dispute Resolution Methods

There are ten factors used to test the performance and selection of dispute resolution methods namely, cost, speed, outcome, enforceability, privacy and confidentiality, open and fairness, control, flexibility, creative remedies and relationships as identified by Cheung *et al*, (2002).

5.1 Cost

The direct fees for the DRB ranging from 0.05% to 0.25% of the total construction cost. The fees are shared by both parties which mitigate the conflict of interest and perception of bias that *all three* DRB members will take one particular side. In mediation,

conciliation and other current ADR methods operating in Melbourne, there is only *one* member facilitating the negotiation for settlement between two parties.

5.2 Openness, Neutrality and Fairness

Neutrality, openness and fairness are the core values of the DRB. The board members must not have financial ties with any party. If there is a conflict of interest, it must be disclosed to all parties. The selection process for the DRB members is a consensus approach.

5.3 Speed

The DRB is established before the commencement of the project. It will involve the experts every early on the project and potential claims dispute may be identified *before* the issues surfaces as the conflict is resolved as they arise *on site* where as the current ADR methods in Melbourne resolve disputes *after* the event has occurred. This solves the problem of delaying the time to sort out missing documentation and historical information to make an accurate determination. Additionally, the periodic site visit will improve the adversarial nature between conflicting parties when liability can be determined before the conflict turns into a dispute.

5.4 Outcome

The DRB has the flexibility of acting as an advisor as well as issue non-binding recommendations. The use of lawyers on the board is discouraged to avoid an adversarial climate however the question of liability is ruled upon by *three* members. This should encourage the parties to accept the board decisions especially if the contract language includes a provision for the admissibility of a DRB recommendation into any subsequent arbitration or legal proceeding.

5.5 Privacy and Confidentiality

The code of ethics for DRB stipulates that the DRB must keep all information arising from the DRB review and hearing confidential and since the dispute is resolved on site, no external party will know that an issue exists. This should preserve business relationships and prevent any unnecessary complexity which may arise from external parties after hearing about the dispute.

5.6 Enforceability

The DRB is non-binding however, the goal of the DRB is facilitate the conflicting parties to resolve their differences so that construction works can continue on site.

5.7 Preservation of Relationships

Both parties agree on the selection of the DRB members at the appointment of the board. This means that all parties are willing to cooperate with each other in good faith and trust the board's decision making abilities when a conflict arises. If the parties are unsatisfied with the decisions of the DRB, they are free to sort dispute resolution methods.

5.8 Flexibility

The DRB can act as a flexible panel acting as an advisor which will facilitate the negotiation process more than the current ADR methods which can only act as a neutral

facilitator as with mediation or act to make a judgement of a technical issue as with expert determination. Litigation and arbitration are the least flexible methods as it is only interested in the issue which relate to a point of law and does not take into account of any other factors.

5.9 Creative Remedies

The DRB is a panel of three experts with different but relevant qualifications, skills and more than ten years of experience within the construction industry. The blend of qualifications and experience of the three-person DRB can provide a powerful combination of decision-making abilities than one person trying to make a judge within their limits of understanding and experience which is the case with expert determination.

5.10 Degree of Control

As mentioned before, the DRB members are agreed upon by both parties and the board resolves issues on site. The board can also act as an advisory panel which is not possible with the current operation of ADR methods. These factors give both parties a feeling of being control of the outcome and processes involved to reach an agreement.

6 Methodology

The entire process comprised of a a structured interview and a questionnaire.

Questionnaire: There were 10 survey questions asking the respondents to rank from the likert scale of 1 to 5 (1 for extremely disagree, 5 for extremely agree) using the ten criteria factors, the respondents were asked to rank each of the criterion on whether they agree or disagree that the performance of DRB has a comparative advantage over the eight other dispute resolution methods.

Interview Questions: The respondents were asked to read some information regarding the use of DRB and they were asked questions regarding their perception of the DRB as well as any concerns regarding the implementation of the mechnism in the Melbourne construction industry.

6.1 Population and Sample

The population sample was restricted to the Melbourne industry. The research sample consisted of twenty one respondents which undertook both the structured interview and questionnaires. The research sample included: five architects, three engineers, three quantity surveyors, two development managers, three project managers, one project director, one CEO, one site foreman and two construction managers. Fifteen of these participants had over ten years of experience in their respective field of work. Eighty percent of the respondents answered that the project size their company generally undertake is in excess of $10 million. The average number of disputes that each building professional had been involved in over the last five years was five which confirms that these respondents have had a reasonable level of experience.

6.2 Data Analysis Tool

6.2.1 Structured Interview Analysis

The structured interview has been analysed using the 'grounded theory' approach, an example can be referred in Strauss and Corbin (1998).

6.2.2 Questionnaire Survey data analysis

To measure the performance of the conflict management mechanisms of the DRB in comparison with other dispute resolution methods two mathematical equations were used for the analysis of the quantitative data. There are Relative Performance Index (RPI) and Relative Attractiveness (RA) for each dispute resolution method.

Step 1. Relative Performance Index

To determine the performance of any dispute resolution method when compared with DRB on each criterion, the respondents' ratings are transformed in Relative Performance Index (RPI) for each criterion. RPI is computed using the following mathematical expression:

$RPI = \Sigma Wi/(A \times n)$……equation 1

Where ΣWi is the total score assigned importance of a decision criterion by all the respondents;

A is the highest weight (5; and

n is the number of respondents

The computed RPI are then ranked for each dispute resolution method on each criterion. The areas of comparative advantages of the DRB over dispute resolution method on each criterion were identified.

Step 2. Relative Attractiveness

The next step is to evaluate the relative attractiveness (RA) of each dispute resolution method on each of the 10 criteria. This may be obtained by combining the Relative Importance Index (RII) of a criterion and the Relative Performance Index of that criterion. This may be obtained using the following model:

$$RA_a = (RII_a)(RPI_a) / 25\ (\%)$$……equation 2

Where:

RA_a = Relative Attractiveness of a dispute resolution method on criterion 'a'

RII_a is the Relative Importance Index of criterion 'a'

RPI_a is the Relative Performance Index (RPI) of a dispute resolution method on criterion 'a'

7 Results

7.1 Interview responses-Perception and concerns of the Dispute Review Board method

After reading the information regarding the structure, components and use of the DRB, sixty two percent of the respondents had concerns regarding the practicality of achieving the qualities of neutrality, impartiality and independence in the selection, nomination and appointment of the DRB members. These respondents felt that the Melbourne construction industry is relatively small therefore it is even more reliant on relationships than compared with the US market. One respondent had concerns regarding the adequate knowledge of the DRB members. The construction process is made up of different stages requiring different specialists in each stage. The three members may not be knowledgeable for all facets and stages of project management.

Another respondent stated that the selection process was open but did not necessary achieve fairness as humans are always influenced by political interests. Ten percent of the respondents perceive the DRB's function being very similar to a panel three expert witnesses providing technical knowledge therefore they do not have full faith in the impartiality of the board members although the board is paid by both parties. The negative attitudes highlight the lack of trust among the parties within the highly adversarial Melbourne construction industry. However, twenty percent of the respondents felt that independence could be achieved as the board members have no financial ties with any party. Furthermore, the both parties agree on the other party's chose of member so fairness is achieved in this extent.

Eighty five percent of the respondents agreed that the formation of the DRB clause into the contract at the commencement for the project will involve the experts very early on the project as they will have the relevant design documentations, specifications and project scope as well as understand the contract conditions. It will also incorporate a spirit of cooperation among the parties. However, twenty percent of the respondents also noted that for potential claims dispute to be identified before the issue surfaces is dependent on the particular job, type of contract used, the parties involved as well as the effective management of the board. The use of Design and Construct contracts may not be suitable for the DRB as the selection of the board members may be time consuming and delay the commencement of the works. Furthermore, in a Design and Construct contract, design is not fully documented before the construction starts therefore the experts' knowledge of the design documentation is limited.

Fifty percent of the respondents felt that the periodic site visits needed to be weekly and at the end of every milestone to effectively mitigate conflicts transforming into disputes.

No respondent felt that the adversarial nature between conflicting parties will improve with the DRB members settling conflicts quickly whilst the job is in progress when the liability can be determined as the notion of liability is subjective. Thirty percent of the respondents expected the project manager to be able to identify any risks which may develop into a dispute.

Ninety five percent of the respondents felt that the DRB member's fee of 0.05%-0.25% of the total project costs was too high to be factored into the overall construction cost planning budget. However, one respondent believed that a lump sum would be viable.

Eighty percent of the respondents feel that the DRB will enhance cooperation among the project manager, the owner and the contractor as all parties have the intention to abide by the board's ability to make decisions and investigate any unreasonable behaviour when the board is formed at the start of the project. However, the preservation of relationships is not a strong enough incentive for most respondents to implement the DRB at the current cost structure. Thirty percent of the respondents argued that certain small matters can inflate unnecessary with the existence of the DRB whereas before, the matter could have been resolved through private negotiation. All the respondents felt positive that the use lawyer is discouraged.

7.2 Performance of Dispute Resolution Methods on the 10 criteria

Results from the analysis of the Relative Performance Indices (RPI) are displayed in table 7.1

Table 7.1 Performance of any dispute resolution method in relation DRB on each criterion

Dispute Resolution Methods	Cost		Open and Fairness		Speed		Privacy and Confidentiality		Outcome		Enforceability		Relationships		Flexibility		Creative remedies		Control	
	RPI*	Rank*	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank	RPI	Rank
Mediation	0.562	5	0.676	5	0.676	5	0.686	5	0.676	3	0.552	3	0.752	3	0.705	3	0.705	3	0.676	5
Conciliation	0.562	5	0.676	5	0.676	5	0.686	5	0.676	3	0.552	3	0.752	3	0.705	3	0.705	3	0.676	4
Mini-Trail	0.591	3	0.714	3	0.714	4	0.705	3	0.657	6	0.561	2	0.733	5	0.705	3	0.686	6	0.657	6
Expert Determination	0.581	4	0.705	4	0.724	3	0.7143	4	0.676	3	0.6	1	0.672	7	0.705	3	0.705	3	0.705	3
Litigation	0.752	1	0.752	1	0.752	1	0.8	1	0.695	1	0.467	7	0.762	1	0.724	1	0.724	1	0.724	1
Arbitration	0.752	1	0.752	1	0.752	1	0.8	1	0.695	1	0.467	7	0.762	1	0.724	1	0.724	1	0.724	1
Partnering (Procurement Method)	0.552	7	0.638	8	0.552	7	0.629	7	0.6	7	0.513	6	0.695	6	0.657	7	0.6	8	0.543	7
Negotiation	0.391	8	0.676	7	0.448	8	0.6	8	0.572	8	0.543	5	0.6	8	0.439	8	0.657	7	0.533	8

*RPI= Relative Performance Index factors. *Rank=The higher the ranking, the higher the DRB has comparative advantage over other dispute resolution methods on the criterion.

Results from the RPI demonstrate that for the criterion of cost, the DRB was perceived to have comparative advantage over litigation and arbitration, followed by mini-trial and expert determination. However, when compared with negotiation, the DRB was perceived to have no comparative advantage.

For the criterion of open and fairness, the DRB was perceived to have a comparative advantage over litigation and arbitration, followed by mini-trial and expert determination. But when compared with partnering, the DRB was perceived to have no comparative advantage.

For criterion of speed, the DRB was perceived to have a comparative advantage over litigation and arbitration, followed by mini-trial and expert determination. Again when compared with negotiation, the DRB was perceived to have no comparative advantage.

For the criterion of outcome, the DRB was perceived to have a comparative advantage over expert determination, litigation and arbitration but have no comparative advantage over negotiation and partnering.

For the criterion of enforceability, DRB has no comparative advantage over litigation and arbitration but when compared with expert determination, followed by mini-trail and mediation and conciliation the DRB has a comparative advantage. The non-binding nature of DRB was perceived to be similar to the non-binding nature of mediation and conciliation but preservation of relationships was perceived to have a higher comparative advantage in DRB than mediation and conciliation.

For the criterion of privacy and confidentiality the DRB was perceived to have a comparative advantage over litigation and arbitration but no comparative advantage over mediation, conciliation, negotiation and partnering.

For the criterion of creative remedies the DRB was perceived to have a comparative advantage over litigation, arbitration, conciliation and mediation but no comparative advantage over partnering, negotiation followed by mini-trial. Mini-trial allows parties to get an insight into the potential outcome which might be generated if the case progressed into a real litigious trial which may explain why the DRB was perceived to have no comparative advantage.

For the criterion of degree of control, the DRB was perceived to have a comparative advantage over litigation, arbitration, mini-trial, expert determination, as well as mediation and conciliation but have no comparative advantage over negotiation and partnering. This is due to the perception that board members are agreed by both parties upon the appointment of the board. However negotiation and partnership is a private process where there are no set rules, process and outcome of dispute resolution therefore 80% of respondents still feel more in control in the ‘muddy pool’ of negotiation.

For the criterion of relationships, the DRB was perceived to have a comparative advantage when compared with litigation, arbitration, mediation and conciliation. This demonstrates that resolving issues on site is perceived to enhance the cooperation between parties to settle issues quicker than resorting to an external third party.

For the criterion of flexibility, the DRB was perceived to have a comparative advantage over litigation, arbitration, followed by expert determination, mediation, conciliation

and mini-trial but no comparative advantage over negotiation and partnering. This result confirms that the DRB can act as a flexible panel acting as an advisor which will facilitate the negotiation process more than the current ADR methods which can only act as a neutral facilitator as with mediation or act to make a judgement of a technical issue as with expert determination. Litigation and arbitration are the least flexible methods as it is only interested in the issue which relate to a point of law and does not take into account of any other factors.

For the ten criteria, there is a pattern that the DRB has no comparative advantage over negotiation and partnering but has a comparative advantage over litigation, arbitration and mini trial. The pattern demonstrates that the respondents still perceive the conflict management mechanisms of negotiation and partnering potentially performing a better dispute resolution using all ten criteria excluding enforceability.

7.3 Attractiveness of DRB when compared with other dispute resolution methods.

Results from the analysis of the Relative Attractiveness (RA) of each ADR methods are displayed in table 7.2

Table 7.2 Evaluation of the Relative Attractiveness (RA) of the dispute resolution methods on each criterion

Dispute Resolution Methods	Cost		Open and Fairness		Speed		Privacy and Confidentiality		Outcome		Enforceability		Relationships		Flexibility		Creative remedies		Control	
	RA*	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank	RA	Rank
Mediation	2.248	5	2.523	5	2.523	5	1.699	5	2.523	3	1.744	3	2.521	3	1.692	3	1.371	3	1.804	4
Conciliation	2.248	5	2.523	5	2.523	5	1.699	5	2.523	3	1.744	3	2.521	3	1.692	3	1.371	3	1.804	4
Mini-Trail	2.364	3	2.665	3	2.665	4	1.746	4	2.452	6	1.773	2	2.457	5	1.692	3	1.277	6	1.753	6
Expert Determination	2.324	4	2.631	4	2.702	3	1.768	3	2.523	3	1.896	1	2.253	7	1.692	3	1.371	3	1.881	3
Litigation	3.008	1	2.806	1	2.807	1	1.981	1	2.594	1	1.476	7	2.554	1	1.738	1	1.408	1	1.932	1
Arbitration	3.008	1	2.806	1	2.807	1	1.981	1	2.594	1	1.476	7	2.554	1	1.738	1	1.408	1	1.932	1
Partnering (Procurement Method)	2.208	7	2.381	8	2.06	6	1.558	7	2.239	7	1.621	6	2.33	6	1.577	7	1.056	7	1.449	7
Negotiation	1.564	8	2.522	7	1.672	7	1.486	8	2.135	8	1.716	5	2.011	8	1.054	8	1.036	8	1.422	8

*RA= Relative Attractiveness of factors

Results from RA indicates that for the criteria of cost, open and fairness, speed, privacy and confidentiality and outcome, respondents perceived the DRB as relatively more

attractive when compared with litigation, arbitration, followed by mini-trial and expert determination. But for the criteria of negotiation and partnering, the DRB has no comparative advantage in terms of attractiveness of preference.

For the criterion of enforceability the DRB was perceived as relatively more attractive when compared with expert determination, mini-trial, mediation and conciliation but have no comparative advantage over litigation, arbitration, partnering and negotiation.

For the criteria of creative remedies and degree of control the DRB was perceived as relatively more attractive when compared with litigation, arbitration, expert determination, mediation and conciliation but have no comparative advantage over mini-trial, negotiation and partnering.

Results combining the RPI and RII together demonstrated a perception of the respondents' preference in the selection of dispute resolution methods.

8 Conclusion

The results from the analysis of interview responses and questionnaire survey demonstrates that when compared with litigation and arbitration the DRB is perceived to have a comparative advantage in 9 out of 10 criteria which are namely cost, open and fairness, speed, privacy and confidentiality, outcome, relationships, flexibility, creative and control. The DRB is perceived to have a comparative advantage in the capacity to maintain relationships when compared with mediation and conciliation. This indicates that the building professionals feel that *on site* resolution of issues improves communication and cooperation between parties. When compared with negotiation and partnering the DRB was perceived to perform have no comparative advantage indicating that informal negotiation is still the preferred method of dispute resolution in Melbourne. The concerns which building professionals in Melbourne have regarding the use of DRB arise from the high costs of employing DRB members, a lack of faith in the board's ability to achieve qualities of neutrality and impartiality in the selection of board members resulting from the perception that Melbourne construction industry is so reliant on networks and relationship, and as well as the general attitude of resistance to change in the adversarial construction industry.

If DRB is to be implemented successful in the Melbourne construction industry, site managers and site foreman will need to be directly involved in the process of decision making for dispute resolution to effectively resolve issues on site. The advantage is that they understand the subcontractors as a large proportion have a trade background in their training. This will improve the adversarial climate between conflict parties as lot of subcontractors do not like to deal with office personnel but will communicate with the site managers because they feel that site managers are the only ones who understand how a building is physically built.

The DRB will not be very effective if the project manager with the power of decision making and reporting obligations only found out about an arising conflict at the same time the DRB was informed to investigate an issue. This may involve an adjustment in the organisational structure of decision making and consequently, pose challenges for the project managers to accept a partial proportion of their decision making power to be shared by site managers.

Industry bodies such as Masters Builder Association Victoria (MBAV) and the Housing Institute of Australia (HIA) need to get involved to convince the government to initiate a DRB project. The DRB may have some impact to how the union currently operates in construction. Any potential conflict of interest in power will require legislation to resolve any potential clash.

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Barriers to Alternative Dispute Resolution in the Construction Industry - the Kuwaiti experience

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Abstract:

Litigation as a formal way of dispute resolution is time consuming, costly, adversarial and damages, if not destroys, relationships and reputations. There are many alternative forms to litigation and arbitration, also in Kuwait different organisations prepared regulations for different forms of alternative dispute resolution. These forms have been rarely used due to cultural difficulties and to lack of awareness of these forms of dispute resolution.

In addition to exploring the advantages of using the alternative dispute resolution forms with construction projects disputes, this paper presents the findings of what alternative dispute resolution strategies are currently been implemented by different organisations in Kuwait. These finding are reinforced by interviews conducted in Kuwait, with workers in the construction industry, to identify the main reasons, in terms of culture and awareness aspects, for not adopting ADR in construction disputes. The barriers to use mediation are found to be, mainly, lack of awareness and another six cultural aspects. However, elimination instruments to the barriers were revealed in this study.

Keywords:

alternative dispute resolution ADR, awareness, Kuwait construction industry KCI, culture, mediation

1 Introduction

Although two forms of alternative dispute resolution ADR (mediation and conciliation) exist in two different documents produced by two bodies in Kuwait, these ADR guidance are rarely been used because of some barriers. A two-stage interview survey was conducted in Kuwait to investigate the need for ADR in the construction industry and the preferred form of ADR by industry and the reasons of preferring the named form. Furthermore, the causes of the delay of employing the existing forms of ADR in construction industry were under focus.

The cultural and knowledge barriers to employing different ADR forms in Kuwait were explored during the conducted interviews. Different themes from the open ended

questions were found. In addition, several suggestions to eliminate these barriers were recommended from the interviewees.

As a part of an ongoing PhD which explores the possibility of implementing different forms of ADR to settle construction disputes in Kuwait, this study highlights the barriers to employing the existing forms of ADR in settling construction disputes. In particular, barriers to the use of mediation were researched through two sets of interviews conducted in Kuwait with 27 specialists in the construction industry of Kuwait from different sectors. The interviewees' perspectives provide a representation view and were picked randomly. All 27 interviewees, in both stages, were chosen randomly from different sectors based on their experience in the construction industry as well as their familiarity with construction disputes in the private sector.

Briefly, findings of this study can be summarised under two main headings: lack of awareness in mediation; and cultural concerns to use mediation. These matters were found to be the main barriers to the employment of mediation in order to resolve construction disputes in Kuwait. Afterwards, the resolutions to these barriers to mediation were indicated in this brief study.

1.1 Aim and objectives of this study

This paper arises out of a PhD study seeking to improve dispute resolution in the Kuwaiti construction industry. The main aim of the paper is to explore the barriers to ADR in the Kuwaiti construction industry, which has been achieved through the following objectives are as follows.

To explore the requirements of Kuwaiti construction industry (KCI) in terms of resolving construction disputes in Kuwait.

To identify the barriers to ADR in KCI.

To recognise ways to overcome the identified barriers.

To identify and explore good practice and the role of ADR (mediation).

The mentioned objectives, of this paper, are the vital objectives of the whole PhD research, which are concentrating on the data collection and analysis chapters of the mentioned PhD.

1.2 Research limitations/difficulties

Respondents to such studies are difficult to be found, particularly in Kuwait, where the culture makes them keep their conflicts and disputes to the highest level of confidentiality. In which, small number of respondents who have got the desire to be interviewed replied to both interview stages' calls. Some respondents, because of confidentiality, have not answered every question that was asked in the interview. Some other interviewees declined to mention their project's titles, furthermore, some wished to remain anonymous. All respondents and the company names have thus remained confidential in this study, due to the commercial sensitivity of the subject.

Because of the low level of knowledge and lack of awareness in ADR, a preliminary session for the actual interviewees was used to ensure that they understood the concept

and principles of ADR and the aim of the whole session was to ensure non-bias and reliable data to eliminate the possibilities of unreliable outcomes. To ensure true judgement of the outcomes after the explanation session which was based on literature and been given before each interview, both interviews' questions and the above mentioned session was prepared by the authors and translated, from English to Arabic, with the assistant of independent expert. Additionally, during the transcription and analysis periods, translation (from Arabic to English) was a must. Translation in the transcription period was conducted directly by the authors and was checked by an independent body.

2 ADR forms in Kuwait

A review of the literature in Kuwait, in depth, proved that there are amicable alternative dispute resolution ADR regulations already in existence. These were prepared by: Kuwait Chamber of Commerce and Industry (KCCI) issued a document called (Nedham Al-Tawfeeq w Al-Tahkeem Al-Tejari: Conciliation and Commercial Arbitration System); and Kuwait Lawyers Association (KBAR) issued (Al-La'eha Al-Ejra'eyah w Al-Nedham Al-Asasi: The Procedural List and The Basic System). In addition, Kuwait Society of Engineers (KSE) which established a department called 'Kuwait Mediation and International Arbitration Chamber - under construction' they are preparing to issue a document called (Qawaed Al-Wasatta w Al-Tahkim Al-Ekhteyari fi Al-Masharie Al-Handasia: Regulations of Mediation and Optional Arbitration in Engineering Projects).

2.1 Conciliation

The Arabic translation of conciliation is "Al-Tawfeeq". Conciliation, as a commercial alternative dispute resolution in Kuwait has been provided by Kuwait Commercial Arbitration Centre which was established on the 14th of November 2000 as an accredited centre in KCCI. Although this document does not give the conciliator(s) in Kuwait the right to produce binding decisions, conciliator(s) can contribute towards convergence of views. To have the ability to consult The Kuwait Commercial Arbitration Centre, to use conciliation as a type of alternative dispute resolution, there needs to be the following clause included in the contract.

> Any dispute arises upon this contract to be referred to the conciliation in accordance to the provisions contained in the Conciliation and commercial arbitration system of Kuwait commercial arbitration centre.

In addition to having this clause in the contract, to resort to conciliation, the disputants should have the desire to settle their dispute amicably and agree about conciliation. Agreeing to participate in the ADR processes is the most important movement towards choosing conciliation. This was found to be the main reason to why the usage of this and other types of ADR was poor. This conclusion was based on the interviews which will be discussed soon. The procedure of 'conciliation' in Kuwait is found to apply the conciliation regulations of the United Nations Commission on International Trade Law (UNCITRAL). The board of the centre forms an executive committee out of five members, which nominates the conciliation body in accordance with clause 14 of the previously mentioned document. The conciliation body contains either one member or more, who can be selected from the committee itself or externally, to conciliate in the dispute.

Clause 18 of the document states that the party who has the desire in conciliation submits a request to the secretariat of the centre. The request must include a list of the dispute's facts together with the applicant's point of view reinforced by supporting documents. From their side, the centre's secretariat informs the other party about the conciliation request within seven days from the submission day, the other party should reply within fifteen days from the date they were informed, expressing their point of view about the dispute.

The conciliation body studies the case and then invites the disputants for a hearing; the body's main mission is convergence of views, if they agreed about the final version of settlement, then this agreement should be signed. The conciliation body must finalise its mission within three months after their first meeting, extendable to another three months (if needed) by the committee's decision. In the case of a conciliation failure, the disputant's rights would not be affected with any shown or written during the conciliation processes. Finally, the centre provides the disputants, based on their request, with a certificate which describes how the centre viewed this dispute, the reasons why the conciliation trial was failed to settle it, without expressing any comments or views about the dispute.

2.2 Mediation

A role of mediation has been provided, on January 2004, by Kuwait Lawyer's Association Arbitration Centre which is a centre at the KBAR. In the introduction of their document, the general manager of the Centre, approved that "employing ADR is not ware or brand that we should mention its advantages anymore but it is a must which been imposed by the reality of today's international commercial".

Opposite to conciliation, the mediator is not contributing to the decision, nor are they pushing any of the disputants towards a settlement. Based on the previously mentioned documents, the main role of the mediator is to neutrally propose the effective procedure(s) towards an effective settlement for the dispute, as if they could do with resorting to expert determination in some points or to resort to arbitration in others. Resorting to *Al-Wasatta*, which is the Arabic translation of mediation, should be agreed by disputant parties of any contract. Again the following clause has been proposed by the general manager of the Kuwait Lawyer's Association Arbitration Centre.

> In case of a conflict between parties upon explanation, application or implementation of this contract to be referred to the mediation process of the Lawyer's \Association Arbitration Centre in the State of Kuwait in accordance to the procedural list and the basic system of the centre.

Another future role of mediation is under preparation and will be provided by The Kuwait Mediation and International Arbitration Chamber which was established on September 2010 by KSE. The main purpose of this chamber is to initiate roles of mediation and arbitration in construction disputes of Kuwait. Similar to conciliation, resorting to mediation should be agreed between parties in all cases, which can face different types of barriers although the role of mediation exists and useful. The barriers to mediation will be discussed in details derived from interviews held in Kuwait with workers in the construction industry who had experience in solved and unsolved disputes.

2.2.1 Regulations of mediation at Kuwait society of engineers

By late 2010, the KSE had established a department called The Kuwait Mediation and International Arbitration Chamber which is still under construction, this department is aiming to issue a document called (Qawaed Al-Wasatta w Al-Tahkim Al-Ekhteyari fi Al-Masharie Al-Handasia: Regulations of Mediation and Optional Arbitration in Engineering Projects) which should be concerning the dispute resolution in construction projects in specific and all types of engineering projects in general.

The Kuwait Mediation and International Arbitration Chamber's chief revealed that the main purpose of establishing this chamber under the society of engineers in Kuwait is to decrease resorting to litigation in order to resolve construction disputes. As they have found that litigation is an impediment to a project's progress and growth, they are intending to adapt the spirit of UNCITRAL regulations to be consistent with the *Kuwaiti Civil Code*. By then they will be ready to mediate in construction disputes. He added that the chamber will train mediators in the future to fill the needs of the construction industry in Kuwait.

2.2.2 Doubts to mediators

Brooker (2007) suggests that when a mediator 'gives advice or offers opinions' for any party in the dispute, this will affect the credibility of the mediator in which risks 'alienating' the whole process. Apparently, this is the case in the Kuwaiti culture, since it is a small community, which makes finding mediators without any type of relationships with one or both parties rare, if not impossible. In this regards, interviewees in Kuwait have been asked about the mechanism of trusting a third party while resolving construction disputes in Kuwait in terms of culture.

2.3 Section 2 in brief

The above recent findings gave the PhD research a new direction, since these regulations are not well-known and not been used regularly in resolving construction disputes. The essential issue of this study is that for some reasons the above detailed forms of ADR are not widespread, however, causes of this shortage were asked in the second stage of the interviews. It is always easier to resort to either mediation or conciliation if it is printed in the contract on the bases of previous agreement between parties, however, resorting to any amicable method of ADR (e.g. mediation and/or conciliation) is always voluntary for all disputants and it is all about the conformity between parties.

In fact, it is all about agreement between parties either before the occurrence of dispute, during the contracting phase, or yet after the dispute occurred between parties. In both cases, before or after the occurrence of dispute, the construction parties are always faced with existing barriers towards ADR. Although some interviewees preferred arbitration, just because it has a binding decision, most interviewees preferred mediation as an alternative dispute resolution in construction disputes. This suits the traditional Kuwaiti culture. For this reason, in this research, barriers to mediation in construction disputes will be considered only.

3 Methodology

A set of 11 qualitative interviews, furthermore, another set of 16 qualitative interviews were conducted in Kuwait with workers in the construction industry during October to December 2009 (1st set) and November to December 2010 (2nd set). Interviewees were selected based on their experience in construction disputes based on preliminary interviews conducted in Kuwait during December 2008 to February 2009 (Sayed-Gharib et. al., 2010). Face-to-face interviews are the most suitable method to collect data in Kuwait, for the sole reason that culture and the social environment in Kuwait depend on eye contact and direct conversation. That is why another stage with more detailed questions has been conducted latter on.

The first set of interviewees was selected randomly on the basis of their professionalism in construction projects and familiarity with construction disputes, regardless the sector that they were working for. Consequently, interviewees in this stage were selected from different sectors. For this reason, this stage of interviews was broad and open not as specific as the next stage of interviews, however, in the second set of interviews, all interviewees were selected for experience in construction disputes in the Private Sector. Finding interviewees, who have had experience in construction disputes, was with the help of the KSE and the KBAR in which these two organisations have got data of different types of workers in the construction industry who have been involved in disputes previously. The interviewees, in this stage, ought to be categorised as follows: three were reported as investors in construction projects; four consultants in construction field; and a further four experienced contractors in construction projects. Others were: three lawyers experienced in construction disputes; and two experts who act as third parties (i.e. mediators, conciliators and adjudicators) in construction disputes.

The data of the interview revealed that most workers in the construction industry believe that mediation gives a better deal, compromises a solution, shows neutrality, has a non-binding agreement unless signed, is a non-adversarial method, takes a shorter time, is a confidential process, is a flexible procedure, maintains relationships and it is a voluntary process.

Although most of the interviewees agreed that mediation offers massive amounts of benefits, participants commented on the barriers to workability of mediation in construction disputes in Kuwait. The data analysis established an approach to improve employing mediation against the mentioned barriers which frustrated the implementation of mediation in spite its existence in different industries institutes of Kuwait.

3.1 Data analysis

Both sets of interview data were analysed manually by taking matching themes from interviewees' responses. Considering that different words have different synonyms, and sometimes different synonyms have got different meanings. Nonetheless, translating the data from Arabic to English, added a difficulty of different translations. (See 'Research limitations/difficulties' section below).

3.2 Broad-spectrum of the outcomes

3.2.1 First stage of interviews

Signs of preference of mediation.

During identifying the requirements of KCI found that there is a cultural problem and lack of understanding of ADR.

Justification of focusing on construction disputes resolution in private sector.

3.2.2 Second stage of qualitative interviews

Poor usage of the existing ADR forms.

Having a preference of mediation rather than any other ADR, in order to resolve construction disputes.

Suffers of Lack of awareness in the amicable alternative dispute resolution (mediation).

People in Kuwait need edification of ADR and the benefits of ADR.

Not only workers in the construction industry but the whole public of Kuwait need this type of education, because each individual will be involved in construction of at least their own house.

Important concerns (based on culture) for instance: trust and integrity of "ordinary" third party dispute resolution process.

Specific data analysis, detailed outcomes description and discussion are specified soon, just after the research limitations/difficulties and literature review.

4 ADR not litigation or arbitration

Six interviewees, out of 27 interviews with professionals in construction industry, preferred not to resort to ADR in case of dispute in construction projects and keep the existing applicable route (five interviewees preferred arbitration and only one interviewee preferred litigation). The interviewee (a senior lawyer) who preferred litigation had doubts about the workability of voluntary nature of ADR in Kuwait, as people there do not have the will to use such process and they have got used to adversarial forms of dispute resolution. In addition, the interviewee praised the dignity, integrity and impartiality of the judicial authorities. He added "middle eastern culture trusts judicial authorities, and believes in their integrity and impartiality which makes it too difficult to trust neither a third party nor accepting the idea of ordinary person". Finally, because this respondent was interviewed in the second stage, he shared some barriers to ADR with other interviewees, which will be discussed later (see barriers to mediation below).

The other 5 interviewees, who preferred arbitration, have not refused ADR because they are not good alternatives to litigation and/or arbitration; their key reason was in preferring arbitration that 'it is binding'. In other words, they have got doubts to the success of the non-binding processes. However, they have all shown their disapproval

towards the high amount of arbitrators' fees and the long time procedure of arbitration (minimum six months) in Kuwait, which is longer than litigation in some cases. Since (82%) of interviewees agreed on ADR and as the objectives of this paper are to explore and study the barriers to ADR (mediation), so the interviewees who refused resorting to ADR in construction disputes will be neglected for now.

5 Mediation in Kuwait

The 15 interviewees out of 27 (71%) who agreed on ADR, preferred mediation as an alternative to litigation and/or arbitration in construction disputes, which suits the situation in Kuwait due to different reasons (will be discussed soon). Nevertheless, they mentioned some barriers to mediation, which will be revealed later. Another 11 interviewees (29%) were distributed as follows: only one (5%) selected conciliation whereas another five (24%) had no clue what to choose, notwithstanding they have agreed about ADR. However, the five interviewees who did not decide what ADR to choose, they were not able to make a decision because of their lack of knowledge in ADR (see barriers to mediation below).

5.1 Conciliation in Kuwait

Only one expert interviewee selected conciliation because of the involvement of the third party in terms of advising the disputants, this interviewee (a lawyer/ex-consultant) had real concerns about the neutrality of the third party. In which the interviewee preferred to give the opportunity for the independent third party to express their views frankly, so both disputants can discover whether the third party is neutral or not, that was why he have not chosen mediation as the best practice

Furthermore, all interviewees have agreed about the barriers to ADR and they do believe in the same barriers to mediation with believers of mediation. The next section demonstrates the 'raison d'être' of mediation which was presented in the literature reinforced by the interviewees perspectives.

5.2 Why mediation?

Although mediation was preferable in both stages of interviews, detailed reasons of preferring mediation were asked during the second stage of interviews only. That is why only twelve interviewees out of sixteen (who decided that ADR is more convenient than litigation and/or arbitration in the second stage of interviews) will be taking into account for this section. Out of 12 interviewees only nine insisted that mediation is the most suitable form of ADR for construction dispute resolution, one preferred conciliation and two interviewees have not had any clue what sort of ADR to choose. Different factors have been argued by the interviewees (i.e. duration and cost of dispute resolution, different effects of the settlement and the nature of the process and the third party in between).

5.2.1 Shorter time

All respondents insisted that mediation saves parties' time which can be wasted through long process and routine of litigation. Two interviewees, a contractor and a consultant, declared that "actually we are looking for shorter process to settle our disputes", whilst other interviewees' opinion was not far away from that. Four interviewees (an investor, two contractors and an expert) agreed about that arbitration did not achieve the purpose

that it was found for. Arbitration was found to make process shorter and faster, contrary it made it longer, slower and more expensive (the cost will be discussed below).

5.2.2 Cheaper/cost effective

Disputants are always seeking for lower costs to resolve their disputes. An investor confirmed that "Gaining money is what we are working for, and thus there is no reason to waste it in courts". Although the court's fees are very cheap comparing with the claim's amount (0.01% in best cases), the cost of lawyers are too high (50-60% of the claimed amount). In the words of an interviewed contractor "lawyers cost is an extortion". Two out of three interviewed lawyers objected about the high cost of lawyers and demonstrated that 'lawyers can be in long-term contract with firms, so they take their disputes with no extra fees, it is just the yearly agreed payment!' On the other hand, when arbitration produced to be an alternative to litigation, it was meant to be cheaper and faster as mentioned above, but in fact it became approximately equivalent to litigation in terms of cost if not more expensive, however, lawyers agreed with other respondents (100%) about the effective cost of mediation.

5.2.3 Maintaining relationships

Relationships are always an issue in any kind of conflicts. To maintain relationship (either social or business) disputants must show tolerance and forgiveness toward each other and the conflicted case in between. Nine interviewees (all contractors, consultants and investors) have had the potential to waive their rights in the sake of maintaining their relationships with other parties furthermore their reputation in the market, since it is small community. Definitely, lawyers and mediators have not had an opinion in this part simply because they have not got a right to be waived. Yet, all respondents thought that resorting to mediation offered an advantage to the construction industry, in which it keeps the favourable relations between the parties. Moreover, the mediation option preserves the disputants' reputation between other workers in the industry. Also, mediation can improve the reputation of the parties in some cases, in the sense of they are flexible in emulation to conflicts and do not go extreme in antagonism.

5.2.4 Compromising better deals/flexibility

Negotiating around a dispute most likely gives a better deal, whether parties reached an agreement or they have not. Richbell (2008) insisted that "mediation provides the opportunity for the whole story to be told" wherein disputants will have the chance to listen to each other rather than facing each other in the court or arbitration process. The best deal can be reached while going through litigation process is (Win/Lose) situation, and most likely its (Lose/Lose) situation (Sayed-Gharib et.al. 2010). However, because mediation is not a legal argument, both/all parties can be winners, (Win/Win) situation, since in mediation all of the disputants have to agree and say YES to the deal.

Nine interviewees, who agreed about mediation, concurred that having the negotiation opportunity with other parties, with the attendance of a neutral third party, always gives them more comfortable and stronger position in their standpoint. In addition to that, mediation process could reveal for them their own mistakes, if any.

All interviewees, even the ones who did not prefer mediation as ADR to construction disputes, believed in dealing with the dispute by mediation, definitely, results (Win/Win) situation. Not only money wise, but maintain relationships and keeping

reputation can be accounted as winning matters in the case of mediation succeeding. This confirms that, the interviewees who did not agree about mediation, either did not accept as true that mediation is booming, or they did not understand what is mediation and how does it work.

Parties resort to dispute resolution in order to defend their possessions and rights. Aiming to get hold of the whole rights might cause losses in other sides of the projects itself or parts of the whole organisation. Disputants can share the (Win/Win) position by compromising a solution, assuming that achieving hundred percent solution, (Win/Lose) situation, is impossible by confrontation. 8 of the interviewees granted that mediation is all about compromising a suitable solution, which might not fit most of the disputants' desires, but it is a fair agreed solution.

5.2.5 Non-adversarial

"Move away from adversarial methods" (Ilter and Dikbas 2009) because adversarial schemes in dispute resolution irritated parties in terms of their stability in the market and relationships with other parties. Eleven interviewees believed that their organisations definitely will be effected if they had a case in the court, one of the interviewees described being in court as "a headache". Additionally, number of interviewees preferred, in previous disputes, to neglect their rights rather than going through litigation procedures.

5.2.6 Confidential

Confidentiality is very important issue in construction disputes, since it reflects on the parties' reputations and relations with others. Reputation in construction industry is case sensitive; it can be affected by having many cases in the court, and "in fact libellous nature of litigation may perhaps damage anybody's reputation" said by an interviewed investor in construction projects. Protecting parties' reputation is all about confidentiality of the dispute resolution process. Eight respondents agreed that mediation provides the meant confidential process.

5.2.7 Non-binding

The mediation's agreement is not binding for disputants, unless they have signed an agreement, which allows the disputants to resort to litigation during the process or even after the decision was made (before signing the agreement). The non-binding nature has encouraged six respondents to prefer mediation as a trial to settle their dispute before falling into arbitration/litigation routine. Yes, some interviewees argued that this opportunity can be misused (i.e. to delay the opponent and/or to decrease their chances of winning) but mediation worth trying in which it can save massive efforts.

5.2.8 Voluntary

Although mediation is known as a voluntary process, it has been addressed as an advantage to mediation by only four interviewees in Kuwaiti construction industry. The humble percentage indicates lack of acceptance of voluntary mediation and they do prefer mandatory mediation instead which will be revealed soon.

5.2.9 Neutrality

The neutrality of an ordinary third party, not judicial body, is always a question, however, barely two of interviewees accepted that a well trained third party (mediator) is trustworthy, and these two were mediators no doubt. The low percentage can be considered as a deciding factor to mediation. There is a significant percentage of interviewees show doubt on neutrality of mediators (read doubts on neutrality below).

5.2.10 Summary

Nine deciding factors to mediation (see Figure 1) have been agreed by interviewees, the level of agreement varies due to lack of awareness on mediation, however, the short illustration brief sessions were enough for the interviewees to recognise the appropriateness of using mediation to resolve construction disputes. The deciding factors to mediation in this study were picked up from the general speech with the interviewees as themes, with consistency to the advantages of mediation in the literature. The last three factors, which had results of 50 per cent and less, were faced with some disagreement by number of interviewees. The disagreement will be discussed below as 'difficulties to use mediation'.

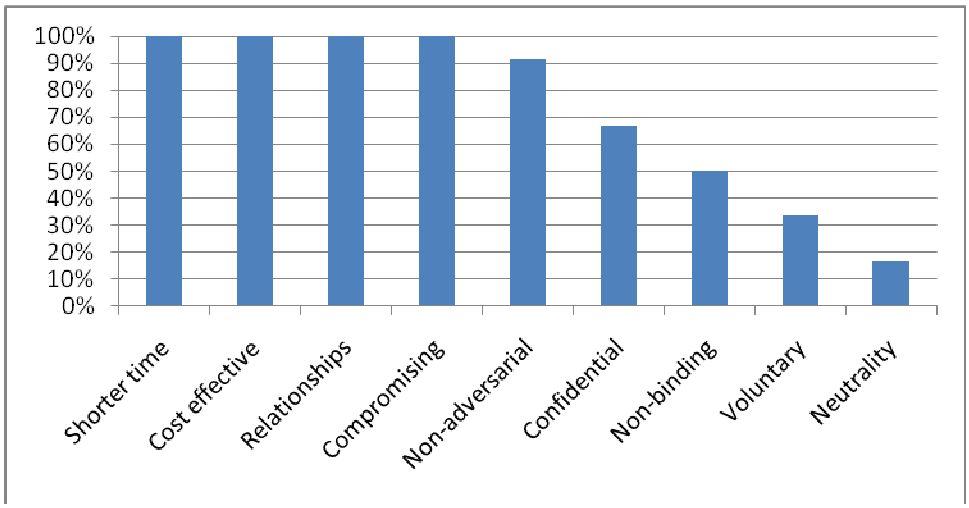

Figure 1: Deciding factors to mediation (advantages)

5.3 Recognition of appropriateness

A huge percentage of interviewees (71 per cent) agreed about the appropriateness of mediation, but due to lack of awareness about it, the usage of mediation was poor in construction disputes. The above mentioned documents conditioned resorting to ADR by certain clauses should be in the contract. Richbell (2008) concluded that 'just because the contract does not specify mediation, it does not mean parties cannot use it' parties can always agree to resolve their dispute in any form of dispute resolution, however, mediation or any other sort of ADR must be agreed in due course before it is too late. On the other hand, respondents consented that resorting to mediation, initially, sounds like an easy choice and a smooth process but in fact it is not. There are other difficulties to employ mediation in Kuwaiti construction disputes, these difficulties will be called barriers to mediation. The following sections demonstrate the Kuwaiti perspective upon the barriers to mediation in construction disputes from the interviewees' experience.

5.4 Difficulties to use mediation

Although the last three (above mentioned) advantages of mediation are common in the literature, and agreed by small percentage of the interviewees but they led the authors to a significant problem toward employing mediation. The data provided indications of difficulties to use mediation. Authors have recognised lack of approval towards ADR due to the lack of acceptance of the said advantages as advantages from large percentage of interviewees, furthermore, some other difficulties to use mediation found during the second stage of the data collection period.

5.4.1 Binding vs. Non-binding

Half of the interviewees were encouraged to prefer mediation to its non-binding nature. Despite the fact that 33 per cent claimed that the decision after mediation trail must be binding once disputants agreed to resort to mediation, no doubt, they do not know enough about mediation. Disputants always, not only workers in the construction industry, have got concerns of their opponents' intentions. The rest of the 17 per cent did not have any clue in this regards because of their lack of awareness.

In addition to the above mentioned 33 per cent of the twelve interviewees who agreed about mediation but not it is non-binding nature, there are the interviewees who have chosen arbitration for this reason which rises that percentage to 47 per cent out of the whole set of interviewees. This high percentage puts a question mark in front the non-binding nature of mediation, however, Richbell (2008) insisted that is dangerous to give the mediator the chance to recommend a binding decision for many reasons; the mediator may use or reveal confidential information given by parties, it can destroy the mediator's neutrality for one of the parties or both, and by binding decision of mediator parties abdicate the opportunity of having a (Win/Win) situation because any third party's decision can be, often, (Win/Lose) to one of the parties.

5.4.2 Mandatory vs. Voluntary

Only 33 per cent considered the voluntary nature as an advantage to mediation, while 67 per cent thought making ADR compulsory by obligating disputants to go through ADR forms before resorting to litigation/arbitration was important, however, from this huge percentage it seems that ADR got to be a mandatory clause in the contract, not an optional choice, in case of dispute, and this could be one of the causes of limited spread of mediation so far.

5.4.3 Doubts on neutrality

Nearly 17 per cent of the interviewees (mediators only) believed in the neutrality of an independent and well trained third party. Surprisingly, 42 per cent of interviewees did show lack of trust in the third party's neutrality neither integrity, on the grounds of that this third party is an ordinary person not judicial body, in addition to that Kuwait is a small country and the opportunities of knowing each other are very high. The rest of the interviewees (41%) did not comment on this part as they are not aware of the situation.

The three above revealed difficulties pave the way for barriers to mediation's widespread in resolving construction disputes of Kuwait. The early findings (barriers to mediation) will be discussed below, in details, in order to diagnose the situation and limitations of employing mediation in the construction disputes.

BARRIERS TO MEDIATION IN KUWAITI CONSTRUCTION DISPUTES FROM INTERVIEWEES PERSPECTIVE

During the second stage of interviews and after discovering, from the first stage of interviews, that the existing ADR process' in Kuwait are rarely used, number of disincentives of implementing ADR were revealed by interviewees in the second stage. The themes of disincentives were categorised based on the redundancy. Two main barriers to employing ADR were shaped; lack of awareness and cultural aspects. Moreover, six different barriers were classified under cultural barriers as the mentioned barriers are well related to the culture.

6 Lack of awareness in ADR (mediation)

6.1 Level of knowledge

Ilter (2009) pointed to the level of knowledge on mediation in the Turkish construction industry, she explored that there is a severe lack of knowledge upon mediation. Although level of knowledge is an important issue, authors discovered from the preliminary interviews that there is major lack of awareness of mediation in the Kuwaiti construction industry. All interviewees, in both stages, (27) were asked about their knowledge or awareness of mediation. None of their responds were out of the following choices:

Don't know about mediation, and need brief explanation about it.

Know about mediation, but not in detail.

Know about mediation fairly, but not used it.

Know about mediation very well, and used it.

They have answered this question as follows in Table (1):

Table 1: level of knowledge/awareness on mediation

Respond	Frequently	Percentage
Don't know about mediation (needed brief explanation session before the interview)	10	37 %
Aware about mediation, but not in detail (procedure and process)	8	30 %
Know about mediation fairly (but never used it yet)	5	18 %
Know about mediation very well (used it at least once)	4	15 %

Although 30 per cent designates the low level of knowledge on mediation, 37 per cent is a significant indicator of lack of awareness of mediation.

6.2 Interest of improving the knowledge and usage

Sixteen interviewees, during the second stage of interviews, were asked about their need and desire to learn more about mediation. The asked questions and detailed answers are discussed below.

Q: If there is an opportunity to learn more about mediation will they go through it? Answers (in Table 2) indicate that 75 per cent have got the desire to improve their knowledge in mediation, which identify the lack of understanding of the mediation mechanism.

Table 2: workers' desire in learning more about mediation

Respond	Frequently	Percentage
Yes	12	75 %
Maybe, if needed.	2	13 %
No	1	6 %
Do not know	1	6 %

6.3 Interest of using mediation

Another question was asked to the respondents about their consideration of using mediation in resolving future disputes. The results are presented in Table 3 which shows that 63 per cent confirmed resorting to mediation in order to settle their construction disputes in future.

Table 3: Future view of resorting to mediation

Respond	Frequently	Percentage
Definitely	10	63 %
Maybe, if needed	3	19 %
No	1	6 %
Do not know	2	12 %

7 Different cultural aspects

All interviewees, in the second stage interviews, agreed about six cultural barriers to ADR (mediation in specific). Certainly, the respondents revealed on signs of the following six barriers (Figure 2 below) while answering about the advantages of mediation. In fact, views are always vary from place to place, there are some factors

which can be addressed as advantages somewhere and can be disadvantages somewhere else, it depends on many aspects (i.e. Culture). So, what can be a deciding factor to use mediation in UK (for instance) can be a barrier to mediation in Kuwait. Below a brief discussion of cultural barriers which revealed by the sixteen interviewees in the second stage:

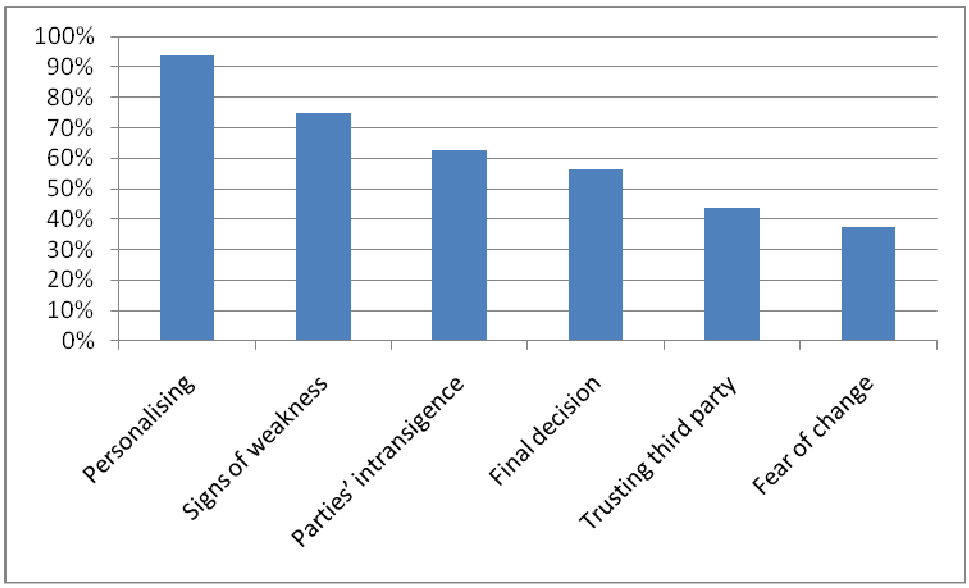

Figure 2: Cultural barriers to mediation

7.1 Personalising

One of the cultural aspects in construction disputes is taking projects' conflicts personally, in which this conflict turns into a personal conflict. Some interviewees found such an incident as normal human being phenomenon. Ninety three per cent of respondents thought that disputants always take their disputes as personal issues due to the prevailing adversarial methods of dispute resolution. A lawyer suggested that "people always think of revenge if they did not get hold of their desired rights". Disputants always seek justice in addition to the 'winner' feeling, so it is all about righteousness.

Mediation can provide the two above mentioned criteria 'justice and feeling'. Yes it might not be the feeling of 'winner' but it is the feeling of 'satisfied', an investor declared "why should I take it personally if we had a smooth resolution". However, mediation is not widespread actually most people never tried it or even heard about it, they never seen a result to be able to judge on the process abilities. An expert suggested 'Successful practice by influencing famous bodies to be revealed to public' by then people may accept to change their view towards taking disputes as personal issues.

7.2 Signs of weakness

The existing contracts do not contain clauses for ADR which shows proposing mediation, or any other form of ADR, as a sign of weakness. Proposing mediation gives, indirectly, feeling of defeat/victory for both parties. In this case, who offers mediation? This is an important question at the beginning of every dispute. In fact offering mediation in due course is a vital, however, none of the disputants have got the potential to offer resorting to mediation due to their prestige. Precisely, 75 per cent of

interviewees agreed that offering mediation shows signs of weakness to their opponents, it is a common thought. The only found solution for this barrier is to articulate mediation in the contract at the beginning, so mediation will not be an optional choice any more it will become a compulsory in case of dispute.

7.3 Parties' intransigence

Intransigence is a cultural matter; parties in Kuwaiti construction industry sometimes do have the desire to break their opponent. Sixty two per cent admitted that they had this feeling during disputes and thought they could do it by litigation, however, professionals with their long experience have discovered the impossibility of such a desire, elderly and experts suggested this barrier can be eliminated by obligating parties to resort to mediation.

7.4 Concerns of the final decision's effectiveness

While the mediator's decision is not binding for parties, unless an agreement has been signed, parties have doubts of the reaction of their opponent. Fifty nine per cent of the interviewees noticed their concerns of the finality of the decision, a consultant stated "what if we agreed upon a settlement then the opponent felt uncomfortable and took their actions the next day". Clearly, this is can be addressed as misunderstanding (or low level of knowledge) of mediation. In fact the decision, of mediation, is binding after signing the settlement agreement; indeed nobody signs such an agreement timidly.

7.5 Concerns of trusting non-judicial bodies

Forty two per cent had doubt in ensuring the neutrality of the third party if s/he was not a judicial body. Three interviewees shared the same sentence "we do trust a judicial third party but not an ordinary third party". Hesitations towards the fairness of a third party came on surface because: low level of knowledge of the mediation process, lack of trained mediators and essential reason is *Kuwaiti judicial body's* Impartiality, as a lawyer in construction disputes insisted. Finding trusted, experienced and well trained mediators is definitely the perfect solution.

7.6 Fear of change

There are always fears of trying something new. Litigation and arbitration are readily available, even if these procedures are not convenient, smooth, slow and expensive. But they feel that they know these procedures very well, there is an old Arabic saying says *"what you know is always better than what you do not know"*. Even though the fear of change between workers in the construction industry is 40 per cent and this percentage is not as high as other barriers (see Figure 2) but it should be improved. It seems that the fear came on top almost due to the lack of awareness in mediation, some interviewees suggested helpful solution (i.e. edification and training courses). Although solutions to eliminate barriers are beyond the target of this study but some suggested solution will be discussed below.

8 How to eliminate the mentioned barriers to mediation

As a result, this study paved the way for further studies. Wherein some interviewees suggested new directions for supplementary studies; to eliminate the above mentioned barriers to mediation, and to improve the employment of the existing ADR in Kuwaiti construction industry's disputes:

8.1 Suggested instruments of cultural improvement and edification:

The interviewees suggested different ways to demolish the mentioned barriers. Some of these tools were revealed by other researchers:

Education: (Schools or Illiteracy Centres);

Training courses: (Academic or Coaching) trainings for (Long or Short) periods;

Information: (Books, Booklets, Leaflets, Brochures, Electronics or Internet);

Media: (TV, Radio, Newspapers or Internet);

Practice: (by famous organisations and influential people); and

Events: (Conferences, Workshops or Seminars).

These instruments have the ability to influence the culture and people's awareness.

8.2 Other suggestions to improve the employment of ADR in KCI's disputes

Thirty four per cent of the interviewees agreed that the government must obligate projects' parties to add clauses to the construction contracts in order to force disputants to go through ADR by law. Obligating parties towards ADR was discussed in the literature in different countries. Some researchers found that this approach might affect the voluntary nature of ADR in which does not achieve the goal of ADR (i.e. flexibility), and some other researchers found it as a must for construction contracts due to the massive cost of litigation and/or arbitration and the time overrun in adversarial types of construction dispute resolution.

9 Further discussions and Conclusions

9.1 Mediation in Kuwaiti construction industry and barriers

Although it is not specially designed for construction disputes, a role of mediation exists in Kuwait (see Table 4). Future role(s) of mediation in Kuwaiti construction industry can be considered in further studies. Particularly, while this study focused on the barriers to employing mediation, expectations of exploring future role(s) of mediation would be easier and available.

Table 4: ADR forms in Kuwait

Document name (English)	Provided by	Under (Institute)	Methods discussed	Issued (year)	Usage (based on interviews)
Conciliation and Commercial Arbitration System	Kuwait Commercial Arbitration Centre	Kuwait Chamber of Commerce and Industry KCCI	Conciliation and commercial arbitration	2000	Poor
The Procedural List and The Basic System	Kuwait Lawyer's Association Arbitration Centre	Kuwait Lawyer's Association KBAR	Mediation and arbitration	2004	Very poor
Regulations of Mediation and Optional Arbitration in Engineering Projects	Kuwait Mediation and International Arbitration Chamber - under construction	Kuwait Society of Engineers KSE	Should be mediation and optional arbitration	Under preparation expected late 2011	N/A

This is an in progress research which aims to substantiate the effectively of mediation to resolve construction disputes amicably, neutrally, cost effectively and within shorter duration than litigation. A settlement which keeps reputation of disputants, maintains their social and future business relationships. The above mentioned advantages of mediation were described, by the interviewees, as the deciding factors to mediation.

On the other hand, the interviewees highlighted the lack of awareness and the cultural barriers to use mediation in the construction disputes (i.e. personalising, signs of weaknesses, parties' intransigence, concerns of the final decision's effectiveness, concerns of trusting non-judicial bodies and the fear of change)

9.2 Barriers elimination vs. mediation implementation

Technically, in order to employ mediation as a trail to resolve construction disputes, parties should have agreed to resort to mediation in the case of dispute. The main reason of the pre-agreement is that disputants always feel weakness if they have offered mediation during dispute phase, which makes the agreement upon mediation as dispute resolution process is a must to be articulated as a clause in the contract. Other barriers can be eliminated partially; however, reducing the effect of the mentioned barriers could

take long time especially the cultural aspects. Changing culture considered to be impracticable in short time periods. This ongoing research is intending to discover new ways of removing the barriers to mediation, in sequence to implement mediation in construction dispute.

10 Acknowledgements

This study faced two main limitations; low level of knowledge and lack of awareness on ADR; and the need for independent translation and editing. The authors of this article thank the interviewees for their time and efforts, and the 'society of engineers' and the 'society of lawyers' for facilitates finding respondents. The authors also are grateful for the anonymous translator and editor of both stages of interviews and the short sessions' notes, her efforts in both stages are appreciated. Finally, special regards to the proof reader, who finished his task quickly in a record time.

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Resolution Of Disputes Arising From Major Infrastructure Projects In Developing Countries

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Abstract:

Multilateral Development Banks including the World Bank have identified infrastructure development as a crucial component of any poverty alleviation strategy in developing countries. The last two decades have seen tremendous increase in the percentage of resources developing countries have invested in infrastructure development. About £755 million was committed to private-public infrastructure development in the developing world between 1990 and 2001. Unfortunately, as exemplified by the Dam Construction Project in Lesotho, disputes often arise from major infrastructure projects in the developing world that are resolved at great cost by courts and arbitral tribunals constituted from the most expensive legal professionals in the developed world. This research presents a critical review of the literature on the experience of such disputes and the methods used in resolving them. It derives from the preliminary phase of a study aimed at developing the knowledge and understanding necessary for more cost effective resolution of such disputes. The key findings of the review so far are as follows. What literature exists is limited largely to resolution by international commercial arbitration. As to be expected of the size of these projects, governments or state entities are often parties to the underlying contract and, therefore, the disputes from the projects. In the overwhelming majority cases, the parties from developing countries are often the respondents and rarely the claimants. There is a perception that developing countries are always at a considerable disadvantage in the conduct of arbitration proceedings, which is a source of disaffection with the process on the part of these States. However, what is most remarkable about the literature is that, although there is a rapidly growing use of alternative dispute resolution (ADR) methods other than arbitration to resolve similar disputes in the developed world, the literature is silent on the use of such methods on projects in developing countries. The paper also considers the implications of the findings of the review for the design of the study.

Keywords:

case study research, developing countries, disputes resolution, infrastructure, international

1 Introduction

In 2000, when one hundred and forty-seven heads of States met at the United Nations (UN) Millennium Summit, poverty reduction was high on the agenda (Sachs and McArthur, 2005). Among the goals agreed was to halve those surviving on a dollar a day by 2015. Many of the world's poor are in the developing countries[1]. The International Bank for Reconstruction and Development (the World Bank) and the other Multilateral Development Banks (MDBs) have identified infrastructure development (road, water treatment, plants, power generation/transmission plants and irrigation projects) as a essential part of any effective strategy for alleviating poverty in the developing world (World Bank, 1994; Briceno-Garmendia *et al.*, 2004). At the heart of infrastructure development in developing countries are the major construction projects, often dominated by foreign contractors with the State as the main client (Chen et. al, 2007). It is usually the case that these projects are funded by MDBs such as the World Bank, and the various regional development banks (African Development Bank (AfDB), Asian Development Bank (AsDB), European Bank for Reconstruction and Development (EBRD) and Inter- American Development Bank (IDB)). The parties involved, the specific economic and political context and the peculiar features of major construction projects make disputes inevitable.

Often, disputes arise from these projects that are resolved by arbitral bodies outside the jurisdictions of these developing countries at great cost and expense to the respective States. It is rather worrying that the citizens of these impoverished states have to bear the brunt of expensive arbitral processes with the concomitant effect of project delivery delays and increased project cost. This research presents a critical review of the literature on the experience of such disputes and the methods used in resolving them. It reports on the early stages of an on-going study aimed at developing the needed knowledge and understanding for efficient and more cost-effective resolution of such disputes. The review is organised into three main sections. The first section briefly examines recent trends in infrastructure development in developing countries and its relationship with the construction industry. This is followed by a critical review of the literature on the resolution of disputes arising from major projects in developing countries. The final section examines the implications of the outcome of the review on the design of the rest of the study.

2 Infrastructure Development and Construction in Developing Countries

2.1 Characteristics of Infrastructure Projects

Infrastructure, in the broader sense of the word, means more than a physical project. It has been defined as comprising the physical facilities, institutions and organizational structures, or the social and economic foundations, for the operation of a society (UNCTAD, 2008). In this research the definition of infrastructure focuses on physical infrastructure. The World Bank (2004) defines infrastructure, in economic terms; as public utilities (power, telecommunications, piped water supply, sanitation and

[1] Developing countries as used here refers to all countries classified by the World Bank as developing economies (low income and middle income economies). More information on the World Bank's classification of economies is available at: http://data.worldbank.org/about/country-classifications.

sewerage, solid waste collection and disposal, and piped gas), public works (roads and major dam and canal works for irrigation and drainage) and transport facilities (urban and inter-urban railways, urban transport, ports and waterways, and airports). The World Bank's definition however is steeped in the historical view of infrastructure as "public utilities" and/or "public works". This characteristic of infrastructure is not all-encompassing as there are many infrastructure projects today which do not fit the "public" tag. However, one can agree with the World Bank on the examples of infrastructure projects which were cited in the definition above. Many authors such as Prud'homme (2004) and Kessides (1993) provide similar definitions of infrastructure projects. Facilities such as roads, irrigation projects, dams, power generation plants, transport (airports and seaports) share some common characteristics as infrastructure. The United Nations Conference on Trade and Development (UNCTAD) (2008) list five characteristics of infrastructure. Firstly, they are capital-intensive. Secondly, they often involve physical networks. They also are major determinants of the competitiveness of an economy. Fourthly, in many societies, services associated with infrastructure are thorny social and political issues. Finally, infrastructure projects are relevant to economic development and global integration. Prud'homme (2004) adds that infrastructure projects are capital goods in themselves; they are often "lumpy" and not "incremental"; they are long-lasting and space-specific. He concludes that they often benefit both enterprise and households. To the above, one may add disputes; these projects are often laden with all kinds of disputes which may occur some time between the commencement of the project and its commissioning or even thereafter (Cheung and Yiu, 2007).

2.2 Investments in Infrastructure Projects

As a consequence of their importance and the huge investment required, infrastructure projects have historically been the preserve of States (World Bank, 1994; UNCTAD, 2008; Briceno-Garmendia *et al.*, 2004). As of 1994, developing countries were investing about two hundred billion United States dollars ($200 billion), amounting to about four per cent (4%) of their national output and a fifth of their total investment in infrastructure development (Kessides, 1993; World Bank, 1994). In spite of efforts by States, much has not changed in terms of the percentage of resources they commit to infrastructure development over the years. UNCTAD maintains that States will need to spend between seven per cent (7%) and nine percent (9%) of their national output on infrastructure if the huge infrastructure gap is to be bridged (UNCTAD, 2008).

In response, many developing countries have opened up the sector, which once was the preserve of the State, to the private sector. Since the 1980s, there has been an increase in private sector participation in infrastructure development across the globe (World Bank, 1994; UNCTAD, 2008). Indeed it is said that with the trend of public-private participation in infrastructure development on the ascendency, about 2500 infrastructure projects in developing countries attracted private sector investment commitment of more than $755 billion between 1990 and 2001 (Harris, 2003; Kirkpatrick *et al.*, 2006). The increase in private sector involvement in the provision of infrastructure has been attributed to the retrenchment of the State from infrastructure development as a result of inefficiency and inability to expand to meet rapidly growing demands(Harris, 2003). From twenty- one projects involving an amount of about $11, 787 million between 1984 and 1987, private sector investment in infrastructure projects in East Asia and the Pacific rose to 871 projects with total investment amounting to $ 135.5 billion between 2000 and 2009 (World Bank, 2010).These projects in addition to investments in existing

projects in the region brought the total for the region to $181 billion constituting 36% of the total investment in infrastructure with private participation for the period 2000-2009 in developing countries (Park, 2010). According to the World Bank, forty-three out of forty-eight Sub-Saharan African Countries implemented 238 infrastructure Projects between 2000 and 2009 with private participation (PPI) and a total investment commitment of $ 47.6 billion (Izaguirre, 2010). Added to existing investment, the total for this region was $79 billion, accounting for about 10% of total investment in infrastructure in developing countries for the period (Izaguirre, 2010). Eight developing countries in the South Asian region implemented 361 infrastructure projects with PPI during the last decade. This constituted 15% of the total PPI investment in developing countries with a total investment of $174.4 billion (Jett, 2010). Compared to the relatively negligible investment in the 1980s, PPI have seen astronomical increase over the past two decades. Figure 1 shows the global distribution of PPI investment commitment to infrastructure in developing countries by region from 1990 to 2008.

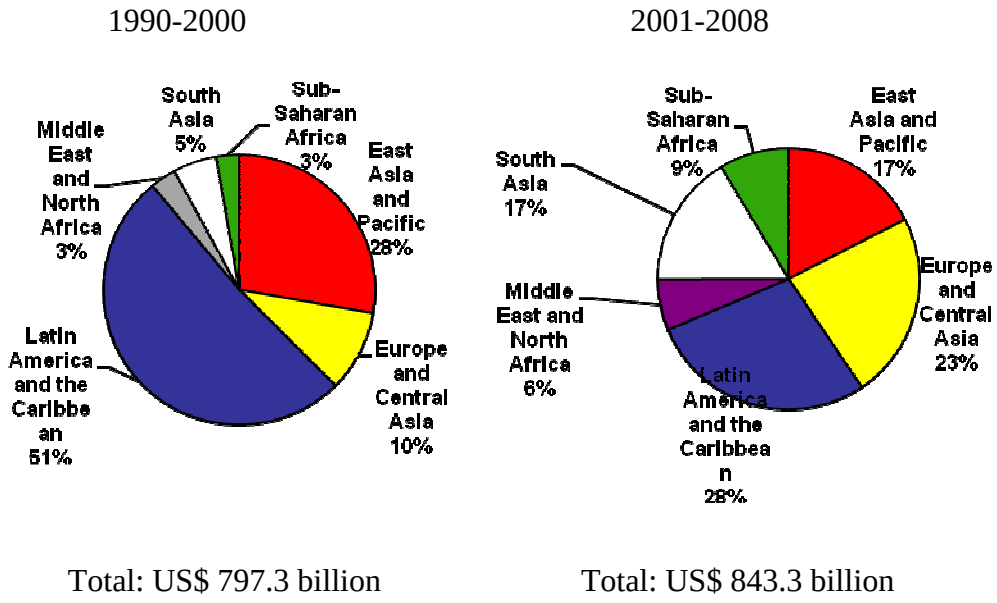

Figure 1: Total investment commitments to infrastructure projects with private participation in developing countries, by region, 1990–2008. (Source: World Bank and PPIAF, PPI Project Database)

From the discussions on infrastructure development so far, some trends can be observed. Firstly, States still remain the primary providers of infrastructure development. Secondly, States since the early 1990s have been more willing to allow private sector participation. This has resulted in billions of dollars of investment commitments in infrastructure development in developing countries. Even with the involvement of the private sector, States still maintain some share or interest in such developments. Where States divest themselves of interest in projects, they still retain regulatory oversight (Kirkpatrick *et al.*, 2004; Kirkpatrick *et al.*, 2006). Finally, the past two decades has seen phenomenal increase in investment in infrastructure by States and the private sector in developing countries.

The reason for the increased investment is, in part, attributable to the perceived impact of infrastructure development on economic development. Many authors have acknowledged the fact that infrastructure development is crucial to economic

development (Canning and Pedroni, 1999; Kessides, 1993; Kirkpatrick *et al.*, 2006; Harris, 2003; Briceno-Garmendia *et al.*, 2004; World Bank, 1994; UNCTAD, 2008; Calderón and Serven, 2010). Research examining the relationship between infrastructure development and economic development identifies a correlation between the two (Sanchez Robles, 1998; Canning and Pedroni, 1999; Tan, 2002; Briceno-Garmendia *et al.*, 2004; Giang and Sui Pheng, 2011). Kessides and Prud'homme have argued that much of the literature on the relationship has been focused on infrastructure capital and not services. To them, infrastructure services should be the main measure of impact of infrastructure development. Kessides argues further that whilst most of these studies are fixated on economic growth, not much is explained about the impact on the welfare of people. Prud'homme asserts, in agreement, that impact of infrastructure development affects both enterprises (economic growth) and households (welfare of the people). His explanation of the linkages is illustrated by him as shown in Figure 2. below.

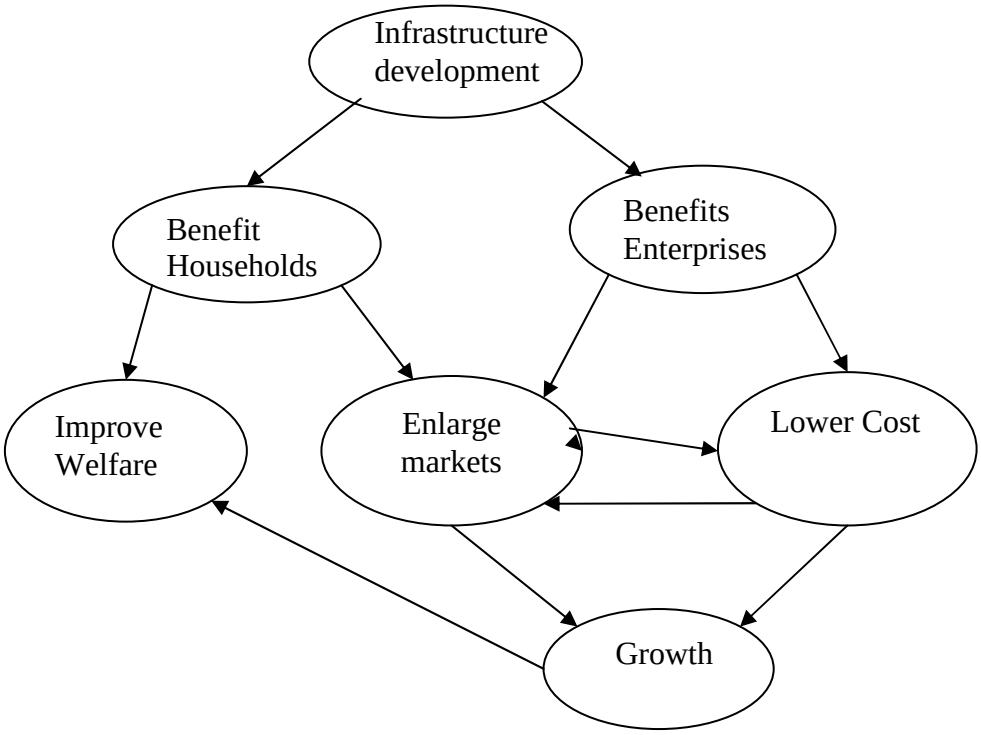

Figure 2: How infrastructure contributes to development. (Source: Prud'homme (2004).

The provision of infrastructure for potable water, electricity, health and sanitation will directly and dramatically benefit and improve the welfare of households and thereby impact poverty reduction (Briceno-Garmendia et al., 2004). The importance attached to infrastructure makes the process by which they are developed a matter of utmost importance.

2.3 Infrastructure Development and Construction: The Relationship

At the heart of the ever expanding infrastructure in developing countries is the international construction industry. Whether it involves building from the scratch or rehabilitation, infrastructure development involves construction. As a result of the huge capital outlay required many infrastructure projects have been awarded to foreign

construction companies and experts who have the capacity to execute these projects (Chan, 2005). In Africa, for instance, many American, European and Asian construction companies have been involved in infrastructure project construction for decades. A table compiled from Engineering News Record by Chen et al (2007) spanning the period 2001-2005 reveals that American contractors had 15.42% market share of construction projects on the African continent in 2005. Whilst British firms had 5.04% of the share of the market, European contracting firms collectively had 49.33% of the construction market share. In recent years many Chinese construction companies have joined the competition for construction projects on the African continent (Chen et al., 2007). A study conducted into the operations of Chinese construction firms in Africa found that there is a huge increase in the number of Chinese construction firms operating in the region. From the building of soccer stadia and dams in Ghana to the construction of roads in Zambia, the influence of the Asian construction companies is being felt. The Chinese construction firms as of 2005 controlled 21.36% percent of the market (Chen et al., 2007).

The involvement of international construction firms in infrastructure development in developing countries is a global phenomenon not limited to Africa. This has resulted in the emergence of a huge international construction industry with implications for *inter alia* law and dispute resolution. Disputes often arise as a result of land acquisition for the projects, re-settlement of communities affected by projects, employment and labour concerns, health and safety issues or indeed shareholding challenges. In this research however, the focus is on construction disputes and their resolution.

3 Resolution of Construction Disputes Relating to Major Projects

3.1 International Construction Disputes

By the very nature of infrastructure projects as outlined earlier, and the peculiarities of the construction industry whether domestic or international, disputes are bound to occur (Hibberd and Newman, 1999; Gaitskell, 2006). Dispute may arise between clients (who are often States) and designers of the project, in respect of unsatisfactory or poor quality designs; between Clients and main contractors for instance in relation to excess works, unforeseen works or subsequent works (Matijevic, 2008). Issues of quantity and quality, extension of time and claim payment are often associated with such projects. From the ICSID Caseload Statistics for 2011(ICSID, 2011) geographic distribution of new ICSID Cases registered in 2010 by State Party involved are as follows: Eastern Europe and Central Asia, 27%; Sub-Saharan Africa, 27%; South America, 31%; South and East Asia and the Pacific, 8%; and Central America and the Caribbean, 7%. The sectors affected by these disputes included power generation, transport and construction. These statistics give an indication that many disputes relating to projects involving developing countries are being submitted to international arbitration.

Currently, the perception is that developing countries are spending huge sums of money in dispute resolution across the arbitration centres of this world. Disputes can have very devastating consequences for the contractors and more importantly the clients, whether it is a State or both a State and an investor in a joint venture. Delays can occasion huge cost overruns and retard the progress of other economic activities. It has been found through analyses of large engineering projects that in the areas of arms, petrochemical, energy and power projects cost overruns range between 30% to 700% (Miller and

Lessard, 2000). Whilst these overruns may be attributed to several factors, inflation, and poorly defined contract terms are also cited as causes of such overruns (Merrow et al., 1988 in Miller and Lessard, 2000). The impact may reach far beyond the parties involved. Resource constraint has always been an issue with the developing world. For developing countries, an effective system of resolving such disputes is indispensable. What then are the experiences of developing countries regarding how dispute from major infrastructure projects are resolved?

3.2 Developing Countries and Construction Dispute Resolution

Disputes arising from transactions within a State fall within the jurisdiction of the State and are often tried by national courts. However, with the upsurge of cross-border and international commercial activities, national courts in developing countries have lost their appeal as the preferred choice for settling disputes arising from such transactions (Leahy and Pierce, 1985-86). Domestic litigation has been costly and time-consuming (McLaughlin, 1979). Undeveloped laws, political risk, perceived bias against foreign parties, over-crowded national courts, lack of familiarity of foreign parties to local procedure, lack of confidentiality, forum-shopping, conflict of law complications and issues of enforcement of foreign judgments (Leahy and Pierce, 1985-86; Perloff, 1992; McLaughlin, 1979) are but a few of the reasons which have been advanced in support of a system which can render fair, effective, efficient and final decisions in cross-border transactions (Leahy and Pierce, 1985-86).

International Commercial Arbitration has emerged as a preferred mechanism for dispute resolution in international commercial[1] transactions globally (Ehrenhaft, 1977; McLaughlin, 1979; Al-Baharna, 1994; Leahy and Pierce, 1985-86; Perloff, 1992; Blackaby *et al.*, 2009; Fowler *et al.*, 1980; Cotran *et al.*, 1996). The word "commercial" is often defined to include construction transactions. Features of ICA such as jurisdictional neutrality, its consensual nature, flexibility in procedure and process generally, confidentiality (Ehrenhaft, 1977), reduced cost, speed and party autonomy have made it suitable for the emerging global system of commerce which have parties from different countries, cultures and legal systems(McLaughlin, 1979; Perloff, 1992).

The development of ICA in developing countries can be examined from two perspectives; legal developments and institutional developments. In respect of the former, two international instruments have been crucial; the Convention on the Recognition and Enforcement of Foreign Arbitral Awards, 1958 (the New York Convention) and the United Nations Commission on International Trade Law (UNCITRAL) Model Law on ICA. The main objective of the New York Convention has been to commit States who signed on to it to give effect to agreements to arbitrate and to enforce within their territories foreign arbitral awards which satisfy certain agreed criteria for validity and legitimacy[2]. The possibility of enforcement of a binding arbitral award not just at the seat of the arbitration but also internationally has endeared ICA to the international business community. Currently, 145 countries are parties to this

[1] See the notes accompanying the United Nations Commission on International Trade Law (UNCITRAL) Model Law on International Commercial Arbitration, 1985 (as amended in 2006). It suggests that the word "Commercial" be interpreted broadly to include all matters arising from relationships of commercial nature. The list provided as part of the note include construction of works, consulting, engineering, and investment.

[2] See Article III of the New York Convention, 1958.

treaty[1]. Even in Latin America, a region noted for its support of the Calvo doctrine[2], it is reported that all countries within the region have signed on to the Convention as of 2003 (Bernal, 2009). The UNCITRAL Model Law on International Commercial Arbitration, 1985 (as amended in 2006) on its part, aims at eliminating the inadequacies of national laws and disparities between them. To this end it sets out special procedural regime for international commercial arbitration[3]. Currently, about sixty countries, many of them developing nations, have adopted local arbitration legislations based on the UNCITRAL model.

Beyond these global efforts, there have been regional efforts to develop the law on international arbitration. For example, the Organization for the Harmonization of Business Law in Africa (OHADA), an international organization set up by treaty in 1993, with sixteen mainly West and Central African francophone member States, aims at harmonizing business laws among member States. As part of its activities it has adopted a uniform Arbitration Act, set up a court, and developed its own arbitration procedures.

International arbitral institutions in Europe have served as venues for ICA between many developing countries and foreign entities. The role of national courts in international commercial arbitration has been ancillary. Arbitral institutions such as the International Court of Arbitration of the International Chamber of Commerce, the London Court of International Arbitration, and the International Centre for Settlement of Investment Disputes (ICSID) in particular, have arbitrated hundreds of cases between private entities, States and private entities and between States for several decades. In relatively recent times, other arbitral institutions have been set up in Hong Kong, Singapore, China, Dubai, Cairo and Nigeria to serve Asia and Africa. The African-Asian Legal Consultative Committee (AALCC) has been very instrumental in the effort to 'regionalise' arbitration centres (Asouzu, 2001; Asouzu, 2006; Sempasa, 1992). AALCC's efforts led to the setting up of the regional centres in Cairo and Nigeria in Africa and in Kuala Lumpur and Tehran in Asia. The rationale is to bring ICA closer to countries in Asia and Africa.

Generally, very little exists by way of literature on ICA in developing countries as compared to the developed world. The little literature relating to developing countries identified so far have revealed that ICA remains the dominant resolution mechanism in all commercial transactions (Cotran *et al.*, 1996; Asouzu, 2001; Blackaby *et al.*, 2009; Tiewul and Tsegah, 1975; Sempasa, 1992). Virtually all standard form contracts governing construction transactions in developing countries, notably those published by the International Federation of Consulting Engineers (FIDIC) contain provisions on ICA (Tackaberry and Marriott, 2003). It is stated that the dominance of the use of ICA has created "a *de facto* universality of it as the normal method of dispute settlement and parties sometimes choose it without much thought as to its suitability to the circumstance". (Tackaberry and Marriott, 2003). For Latin America however, ICA has not been the popular choice. Many Latin American countries until recently have insisted on subjecting international transactions taking place within their jurisdictions to national

[1] See the New York Convention, 1958, Status of Parties. Available at: http://www.uncitral.org/uncitral/en/uncitral_texts/arbitration/NYConvention_status.html. Accessed on 18th May, 2011 at 11:30am.

[2] This doctrine essentially insists on "the non-intervention and absolute equality of foreigners with nationals" in dealings by States with foreign nationals.

[3] See notes accompanying the UNCITRAL Model Law, 1985 (as amended in 2006).

judiciaries. This practice, deeply ingrained in their constitutional practices, take its roots from the Calvo doctrine (Bernal, 2009). However, the trend is gradually shifting to international commercial arbitration (Bernal, 2009).

What literature exist thus deals generally with ICA without any specific treatment of how it operates in the context of international construction disputes relating to major projects. The focus of the literature has been on the challenges posed by ICA to developing countries (Yelpaala, 2006; Asante, 1993; Asouzu, 2001; Sempasa, 1992). These challenges can be divided into the generic and the peculiar. Key issues under the generic category are cost and delays (Asouzu, 2001). Regarding cost, disputes arising from major infrastructure projects are often resolved at great cost to developing countries whose citizens are made to bear such expenditure eventually. A good example of this is the case relating to the construction of the Katse Dam in Lesotho. The facts of the case are aptly set out in the opinion of the English Supreme Court (then, the House of Lords) in *Lesotho Highlands Development Authority (Respondents)* v. *Impregilo SpA and Others.*[1] In 1991 (after a sixty year preparatory period), the Lesotho Highlands Development Authority engaged a consortium of seven companies from the United Kingdom, South Africa, Italy, Germany and France to construct the Katse Dam in Lesotho. The contract was made on 15 February 1991 under standard FIDIC Conditions of Contract (4th edition) with terms and additions. The contract was governed by the law of Lesotho. After the conclusion of the project in 1998, the Contractors made a claim for reimbursement of increased costs and for upwards adjustments to prices and rates. The dispute was eventually referred to Arbitration in London under International Chamber of Commerce (ICC) rules as provided for by the contract after the Engineer's decisions on the claims were rejected. The decision of the arbitrators was also appealed to the Supreme Court.

The focus of this reference is not on the substance of the claims. What is worrying however, is the fact that Lesotho, a small landlocked developing country with human development index ranking in 2007/2008 of 138 out of 177[2] had to spend resources on registration fees, administrative expenses, counsel's fees, arbitrator's fees and expenses, witnesses expenses, court, travelling, accommodation and feeding expenses for local representatives and lawyers to pursue the above-described dispute. For a developed economy, the impact of the cost may be negligible. The situation with a developing economy is however different. It may be argued that such cost may be recovered eventually if the State wins the "contest". This however is not always the case as parties often do not recover their entire cost.

UNCTAD, in a related study on the issue of cost in investor-State arbitrations (UNCTAD, 2010) has found that the cost of arbitration generally has increased drastically. Whilst legal fees constitute about 60% of the expenses, the arbitrators' fees, the administration fees of arbitral centres, expenses of witnesses and experts also constitute substantial cost. Referring to previous UNCTAD reports (UNCTAD 2005b, 2006a, 2008a and 2009) the report cited four cases as examples. In *Plama Consortium* v. *Bulgaria*[3] , the legal cost for the claimant amounted to US$4.6 million whilst that of the respondent amounted to US$ 13.2 million. In the second example cited, the claimant

[1] [2005] UKHL 43
[2] See data on Lesotho at http://www.unohrlls.org/en/orphan/98/. Accessed on 15th May, 2011
[3] ICSID Case Number. ARB /03/24.

legal cost in *Pey Casado v. Chile*[1] relating to the jurisdictional and merit phases of the arbitration amounted to US$ 11million, whilst that of the respondent amounted to US$ 4.3 million. In *ADC Affiliate Limited and ADC & ADMC Management Limited v. The Republic of Hungary*[2] the respondent country had to pay US$7.6 million in legal cost. Finally, in *Waguih Elie George Siag and Clorinda Vecchi v. The Arab Republic of Egypt*[3], the respondent was obliged to pay an amount of $6 million as legal costs, expert and other expenses.

Though relating to investment, these examples are not far-fetched. Many international investment agreements define investment to include, "claims to money and claims under a contract having a financial value*"(UNCTAD, 2011).* Indeed, international construction transactions and disputes share some common features with Foreign Direct Investment (FDI) and investment disputes. Firstly, the clients involved in international construction transactions in developing countries are often Sovereign States. The decisions which may be challenged by an international construction firm are decisions taken by the State or its agencies. Often, whilst the State will prefer that its courts resolve disputes arising, the Contractor on the other hand will be wary to have a matter involving the State tried before its own courts. The amounts involved in these transactions are huge. FDIs and investment disputes share these attributes. The issue of the rising cost of ICA is a common attribute. The confidentiality of these arbitral processes sometimes make it difficult to obtain figures on cost. However, for both developed and developing countries and indeed even investors (UNCTAD, 2008), cost of arbitration has been an issue.

Regarding delays, ICA was reputed for its swiftness (Ehrenhaft, 1977). However, this feature of ICA has been questioned as cases take more time to resolve (UNCTAD, 2010). Indeed, one author has described ICA as a highly complex commercial litigation (Oh, 1981). Though this description is dated, it remains true. Nearly all the procedural complexities associated with a court proceeding can be found in most arbitral hearings involving huge projects. The consequences of these are delays. The impact of delays on project delivery and increased project cost is hackneyed, and particularly severe on developing countries.

The second category of concerns with ICA relate to those peculiar to developing countries. Asouzu (2001) draws attention to some factors in the current international regime for dispute resolution which are causing serious disaffections in the developing world. He mentions that there is a perceived bias against African States and by extension, other countries in the developing world in the international dispute resolution process, enforced by the relationship between the World Bank, a major lending institution for most of them, and the International Centre for the Settlement of Investment Disputes (ICSID). This perception, he asserts, is further fuelled by the following factors: absence of African arbitrators on arbitration panels in the West; the fact that in nearly all cases involving African States or companies, they often are the respondents and hardly the appellants; the choice of American and European venues or arbitration centres over equally well established ones in Africa, for example those in Cairo and Lagos; and the long-standing arguments of lack of judicial infrastructure, qualified personnel and fair hearing which are still maintained without any basis. He

[1] ICSID Case Number. ARB/98/2
[2] ICSID Case Number ARB/03/16
[3] ICSID Case No. ARB/05/15

concludes on the note that whiles staying the current course, African arbitration centres and governments need to publicize the current wave of change in the industry in Africa (English, 2002).

Asouzu's recommendations focused on regionalizing arbitral centres and awareness creation, but were relatively passive and bland in relation to the development of alternatives such as mediation, dispute boards and establishment of dispute early resolution systems, which may be crucial to the international construction industry especially at the initial stages of a conflict. On the absence of African arbitrators on arbitration panels, articles 12 to 16 of the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (ICSID Convention), 1966, for example, provide that member States are allowed to designate four qualified persons to be part of its panel of arbitrators and panel of conciliators respectively. Beyond the ICSID situation, most Arbitration Rules permit parties to nominate an arbitrator, whether the requirement is for one or three arbitrators. Again it may be argued that often, developing countries end up selecting arbitrators from the developed world, and thus can not probably turn around and raise concerns about their own choices (Asouzu, 2006). The reality on the ground however, as conveyed by the ICSID case load statistics (ICSID, 2011), is that Africa and many developing countries still have a lean presence on the ICSID arbitration and conciliation panels.

Characteristically, the existing literature focus generally on ICA with no specific attention paid to the construction industry per se. This is so whether at the national (Cotran et al., 1996) or regional level (Asouzu, 2001) , with the exception of a few from the Asian region where some efforts are being made to examine international construction disputes distinctively (Cheung and Suen, 2002; Chau, 2007; Chan and Chan, 2002; Chan, 2005a; Chan and Suen, 2005; Chan, 2006; Chan, 2005b).

Two conclusions have emerged from the literature so far. First, the literature existing on resolution of infrastructure disputes in the developing world are generic in nature and deal with international commercial arbitration generally. There is dearth of literature dealing specifically with construction disputes arising from major infrastructure projects and the processes involved in their resolution. Secondly, there is a huge knowledge gap in relation to what transpires immediately a dispute arises and when formal ICA process commences. Whilst one may look up to the dispute clauses in the various standard form Construction contracts for an answer, those answers are merely theoretical as what pertains in practice may differ drastically. No empirical evidence has been found on the issue. As the story of Adjudication in England has shown, good early dispute mechanism(s) of interim or permanent nature, prior to arbitration may be useful for the construction industry in developing countries. Incipient disputes may be nipped in the bud should there be a clearly existing system which parties can resort to prior to International arbitration. Further, the materials so far reviewed do not consider in detail the viability and the role that alternative dispute resolution mechanisms can play in resolving such disputes. These emerging conclusions have implications for the design of the research as next discussed.

4 Research Design

What type of research approach will be suitable for the kind of enquiry envisaged? It is submitted that a qualitative / an interpretivist approach is best suited for this kind of research for several reasons. Firstly, the subject-matter of the research- dispute resolution- is a social phenomenon which occurs in a real world setting. Secondly, the views of participants in major infrastructure projects are crucial to our understanding of the complexities associated with the extant dispute resolution mechanisms. Thirdly, apart from being heavily context-based, the phenomenon under study has not been explored. Further, the appropriate instruments required in studying complex human interactions such as efforts parties make or steps they take pending ICA proceedings must be those which offer some flexibility in terms of administration on the field. This accords with the social constructivists or the interpretivist view of research (Berger and Luckmann, 1967; Lincoln and Guba, 2000). Most of the major treatises on research design, such as the *Handbook of Qualitative Research (Denzin and Lincoln, 2005)*, point towards a qualitative research approach being most appropriate for research with the types of features outlined above.

Qualitative research offers various approaches for data collection and analysis. Ethnography, Phenomenology, Grounded theory (Corbin et al., 2008), the biographical method, Narrative Research(Creswell, 2009) and Case Study (Yin, 2009; Stake in Denzin&Lincoln,1998; Flick,2006) are all qualitative strategies of enquiry. It has been stated that where there is a need for an in-depth investigation into a contemporary phenomenon in its natural context, Case study may be the appropriate strategy of enquiry (Yin, 2009). Yin adds further that case study research is useful where the aim of the research, among other things, is to explain, explore, or describe an intervention in its natural setting. He argues that in making a choice between case study and other social science strategies, consideration should be given to the research questions to be investigated and the type of study envisaged. If the enquiry is about "how" and "why" some social phenomenon works, and extensive and in-depth study envisaged, then case study will be a good choice of strategy.

An in-depth study of the extant dispute resolution system for disputes arising from major projects, the gaps in the system and possible remedial strategies for all developing countries is not feasible in this research. However, an in-depth study of the situation in a typical developing country sharing common attributes with the rest will make vital contribution to knowledge, which *mutatis mutandi* will be informative and useful to the others (Flyvbjerg, 2006; Yin, 2009). This type of study raises a number of challenges; sample or case(s) selection, the theoretical implications of a context-based study, issues of verification and generalizability. The subject of the choice of a case(s) and the complexities that go with such a venture have been discussed by authors (Eckstein, 1975; Achen & Snidal, 1989;(Flyvbjerg, 2006; Gerring, 2007; Collier and Mahoney, 1996; Stake, 1995; Seawright and Gerring, 2008; Yin, 2009). It is expected that this research will examine these challenges and their impact on the plausibility of the research design envisaged.

5 Conclusion

The importance of infrastructure development to poverty reduction and economic growth in developing countries cannot be over-emphasised. Substantial resources are currently being invested in projects in developing countries by both States and the private sector. Crucial to the provision of infrastructure is the international construction industry. With its peculiar features of multiple parties, varied works, quality and quantity of work and issues relating to payment among others, disputes are bound to occur. The literature related to developing countries point to international commercial arbitration generally as the main dispute resolution mechanism. Gaps have been identified in respect of; (1) the absence of specific study relating to resolution of construction disputes arising from major projects; and (2) the absence of empirical evidence on what transpires between the time disputes arise and when the processes of international commercial arbitration commence. The phenomenon to be studied is context-based and to fully appreciate it, the views of participants are required. Due to lack of previous exploration of the field, an in-depth study will be more useful. This makes qualitative study the preferred approach and case study, the preferred strategy of enquiry. However, other research approaches are likely to be considered for their suitability as new evidence emerges. It is expected that the outcome of the study will be useful not only to the case studied but also other developing countries.

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Asset, property and facility management

Promoting Energy Efficiency in Public Sector Commercial Buildings in Australia

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Abstract:

The State and Federal Governments in Australia have sought to lead by example and significantly reduce the energy consumed in public sector buildings. A number of reporting and benchmarking schemes have been developed, over the past two decades, to encourage and require property and facilities managers to reduce energy consumption and the emission of greenhouse gases. This paper investigates the process employed to implement savings and analyses the reported outcomes of the schemes both in terms of public sector savings and in influencing private sector behaviour. The paper will also look at recent legislative changes in Australia which mandate the measurement of energy use and greenhouse gas emissions by private sector owners and occupiers yet specifically fall short of including public sector assets within the reporting requirements. Implications of this legislation on the management of both public and private sector buildings will be evaluated.

Keywords:

Australia, energy efficiency, office, sustainable building management,

1 Introduction

The cost of energy and its impact in terms of contribution to the emission of greenhouse gases has long been recognised by the Australian Government. This paper will track the development of government policy over more than two decades and will evaluate the outcomes of those policy decisions on the efficiency of the public sector asset management strategy which implements the energy saving initiatives.

There is wide global recognition of the potential adverse effects of climate change and the Australia Government has been a strong advocate for adaptation of our industry to meet the challenges which increasing levels of CO_2-e will have on the earth's climate. Australia recognises that with less than half a per cent of the world's population, it contributes around 1.5 per cent of total global greenhouse gas emissions. Even before the UN Rio Declaration the Australian Federal Government had begun a systematic reduction of its energy consumption across its property portfolio having recognised that energy use represents 95% of the governments greenhouse gas emissions, targeting building energy consumption was seen as a valid target to achieve savings.

The Brundtland Commission Report in 1992 and its definition of sustainability which was endorsed by the 1992 UN Earth Summit in Rio became a catalyst for change. The Earth Summit culminated in the global agreement within the Rio Declaration and Agenda 21 which requiring all member states to develop a national sustainability development strategy (UN 1992). The practical application of these stated sustainability goal gave further impetus to the government's energy policy.

The early recognition that buildings play a major role in contributing to CO_2-e emissions has over the years been recognised by many researchers with estimates of the role which buildings play worldwide accounting for somewhere between 40% and 70% of global energy consumption, and have a resulting carbon footprint significantly exceeding those of all transportation combined (WBCSD 2009; McDonagh 2011). Thus there is considerable focus placed on the building management and development sectors to reduce energy consumption. The WBCSD (2009) see buildings as: 'Large and attractive opportunities to reduce energy use at lower costs and higher returns than other sectors.' These are recognised as fundamental to achieving the International Energy Agency's (IEA) target of a 77% reduction in the planet's carbon footprint against the 2050 baseline to reach stabilised CO_2 levels called for by the Intergovernmental Panel on Climate Change.

2 Literature Review

The Australian Federal Government in October 1990 introduced a policy to reduce greenhouse gas emissions. This policy included a number of initiatives designed to improve energy efficiency in government buildings. The main features of this policy were:

- the appointment of energy managers in government departments and authorities;
- the annual reporting by government departments and authorities of energy use and energy efficiency improvement initiatives undertaken;
- the establishment of, and adherence to, high standards of energy efficiency in the construction and leasing of Commonwealth buildings;
- energy management training;
- the use of Commonwealth buildings for demonstrations of energy efficient technologies; and
- the establishment of a database of Commonwealth energy use. (ANAO 1996)

In July 1992 the Government Buildings Energy Audit Program (GBEAP) was launched for all Commonwealth occupied owned and leased buildings. The program provided funding for energy audits of Commonwealth buildings. Later in the same year the Prime Minister announced that; 'using 1992-93 as a base year, departments and budget funded agencies would reduce energy use in Commonwealth occupied buildings by 15 per cent before 1998-99 and by 25 per cent before 2003-04' (ANAO 1996).

The Australian National Audit Office, which has a management overview responsibility to the parliament, undertook a detailed evaluation of the government's energy management policy in 1992. This audit reviewed the management of energy in both owned and leased Commonwealth buildings. The audit estimated the cost of energy in

Commonwealth buildings at that time to be in the region of $258 million per annum. The report also estimated that there was the potential for savings in the region of between $29 million and $46 million per annum. The audit made twenty-six detailed recommendations for the implementation of savings measures across the portfolio (ANAO 1992). These recommendations included requirements for agencies to report on energy consumption and efficiency the report also found that the Department of Primary Industries and Energy (DPIE) had no formal plan for implementation of the government's energy efficiency targets which had been previously set. These recommendations were restated in a further audit the following year of the Department of Administrative Services which at the time was responsible for the management of all owned and leased commercial buildings (ANAO 2003).

One of the primary recommendations of the 1992 Audit Report was the requirement that departments should publish their energy use and energy efficiency improvement initiatives in their annual reports to government. Changes were made to the Guidelines for the Preparation of Departmental Annual Reports with specific energy management reporting requirements implemented (ANAO 1992). This reporting regime was altered for the reporting year 1993-94 when the Department of Primary Industries and Energy assumed responsibility for the collection of this data from all agencies. This change was criticised in a follow-up audit undertaken in 1996 when ANAO stated 'Since then DPIE has instituted alternative mechanisms to collect this data but the ANAO found that the data is often late, varies in quality and excludes important information and may or may not cover budget dependent agencies' (ANAO 1996).

The ANAO 1996 report concluded that that progress on the implementation of the Government's energy management targets by DPIE had been 'slow and inadequate' in that 'savings targets, are unable to be measured because of the paucity of performance information' (ANAO 1996). This follow-up audit made a series of recommendations regarding improved reporting and data collection by DPIE.

With a change in government a new energy efficiency scheme was announced in 1997 the Government's greenhouse gas emissions policy, was another initiative aimed at improving energy efficiency in Commonwealth operations. The policy established agency energy use targets which were to be achieved by 2002–03. Details of the scheme released in 1998 established a number of requirements for agencies to meet. Key among these was a requirement that agencies meet energy use performance targets in which all agencies were to ensure that all commercial office space owned or leased meets Commonwealth energy use performance targets by 2002–03. These standards are:

- 10 000 mega joules per person per annum energy use target set for office buildings tenant lighting and power;
- 500 mega joules per square metre per annum target set for office building central services.

In addition requirements to undertake further energy audits of office building and to meet energy guidelines for all new buildings were also introduced (ANAO 2002).

The follow up audit of 2002 reported that agencies had made good progress in implementing the recommendations of the 1999 Audit Report recommendations and

that the 2002-03 energy efficiency targets set by government in 1997/98 were likely to be met before the 2002-03 reporting year with respect to tenancy level light and power consumption (ANAO 2002)

The 1997 policy Measures for Improving Energy Efficiency in Commonwealth Operations was superseded in 2006 by the updated policy Energy Efficiency in Government Operations (EEGO) which remains the current government policy and the objectives against which all government departments are mandated to report (Australian Greenhouse Office 2006). The key aims of this policy were to achieve a 25% reduction in energy intensity for office tenancy light and power use and a 20% reduction in energy used by central services. These reductions are over and above the 1997 targets as these were no longer seen as providing an incentive for continuous improvement and more challenging targets were required to increase savings (Australian Greenhouse Office 2006).

The new energy intensity targets aimed at achieving 7,500 MJ/person pa, for tenancy light and power and 400 MJ/m^2pa for central services. In addition it introduced a requirement that all new tenancies over 2,000m^2 should meet the Australian Building Greenhouse Rating (ABGR) 4.5 star rating. ABGR has subsequently been incorporated into the National Australian Built Environment Rating System (NABERS) and taken over by the New South Wales Government. The 2006 policy also recognised that to achieve energy savings in central services of leasehold property, that cooperation with the landlord would be necessary. The policy thus launched a Green Lease Schedule, a document which clearly articulates the energy saving goals of government and which was intended to form minimum green lease requirements in any new leasehold agreement.

The Federal Government having established a clear policy directive and reporting mechanism which tables a consolidated energy report in parliament each April and publishes these results both in a written report and in data spread sheet format.

In order to further expand the energy saving objectives of central government and to link these with a number of similar policies developed by each of the State and Territory Governments a meeting of the Council of Australian Governments (COAG) in July 2009 developed a policy document 'National Strategy on Energy Efficiency.' This strategy document outlined a large number of initiatives to reduce greenhouse gas emissions across a number of industries not just the public sector. With respect to owned and leased government buildings the strategy set objectives for developing a national reporting framework and to establish national benchmarking and green lease standards across all jurisdictions. Currently each state and territory sets their own benchmark standard, although all currently have a minimum NABERS standards as shown in Figure 1.

	NABERS Energy	NABERS Water	NABERS Waste	NABERS Indoor Environment
Commonwealth *	4.5 stars for new buildings, new leases and major refurbishments.	Nil	Nil	Nil
NSW^	4.5 stars (by July 2011)	4.5 stars (by July 2011)	Policy in development	Policy in development
ACT	4.5 stars (BB) for new leases 4.5 stars (T) - for new fitout in leased offices 4 stars (T) – for refurbishments in leased offices	Nil	Nil	Nil
VIC	4.5 stars (BB) for new buildings 4 stars (BB) for existing buildings 5 stars (T) for new fitout in leased offices	Nil	Nil	Nil
SA	5 stars (BB) for new buildings Preference for 5 stars (BB) for leased offices in existing buildings	Policy in development	Nil	Nil
WA^	4.5 stars (BB/WB) for new buildings 3.5 stars (BB) for new leases in existing buildings 4.5 stars (T) new fitout/new leases in existing buildings 4 stars (T) for existing tenancies	Nil	Nil	Nil
NT^	5 Star (BB) for newly leased office buildings through a commitment agreement Existing buildings encouraged to achieve 4.5 (BB) by 1 July 2012	Nil	Nil	Nil
QLD*	4.5 stars for new buildings, new leases and major refurbishments	4 Stars for new buildings/leases/ refurbishments	3 Stars for new buildings/leases / refurbishments	3 Stars for new buildings/leases/ refurbishments
TAS	Policy in development			
* Applicable to office spaces over 2,000m² ^ Applicable to office spaces over 1,000m²	BB - Base Building rating T - Tenancy rating WB - Whole Building rating			

Figure 1 Government Minimum NABERS Rating

It is not possible to make direct comparisons between the NABERS rating of a building and the Federal Governments 2006 target based on MJ/person pa. or indeed the central services target of 400 MJ/m^2 pa. as the NABERS methodology includes a number of undisclosed correction factors which weight different regions of the country utilising a benchmarking factor, in addition the measurement of area of the building does not follow the same definitions used in general lease agreements or the EEGO policy which uses Net Lettable Area (NLA) as the basis of measurement. The star rating awarded under NABERS is a measure of environmental impact and a relative assessment against other properties within a region and as such is not a direct measure of energy consumption.

It is not possible for example to place the Federal government targets within any individual NABERS rating and it is thus not possible to show that if an individual building archives the desired rating set out in the state and territory targets shown in Figure 1 that the building would also meet the EEGO policy targets. Indeed a brief analysis of the published NABERS Star ratings for a variety of buildings show a wide range of results in terms of MJ/m^2 for a base building rating. A base building NABERS rating measures central plant energy consumption and is broadly similar to the central services definition contained within the EEGO Policy (Australian Greenhouse Office 2006; DECC 2010). The range of results shown for individual commercial buildings located in major Australian cities show that for a five star NABERS rated building the base building energy intensity is typically in the range 200 MJ/m^2 to 400 MJ/m^2 although some building have energy intensity figures in the early four hundreds. A four star building falls in the range of 300 MJ/m^2 to 500 MJ/m^2 but individual buildings with figures as high as 740 MJ/m^2 are evident in the results. Three star properties fall in a range between 407 MJ/m^2 and 850 MJ/m^2 with most in the middle of this range. What is evident from these figures is that the star rating under NABERS is not an energy

intensity rating it is, as it states a measure of greenhouse gas emissions. Thus any comparison between the EEGO policy targets and the NABERS targets is not practical as the energy intensity target of 400 MJ/m^2 set in 2006 could conceivably be achieved in anything from three to five star rated building.

3 Research Methodology

The data for this study is made freely available by the Department of the Environment, Water, Heritage and the Arts in its annual reports. Government departments are required to provide their energy use data together with space use and employee numbers in order for the whole of government reporting to parliament to be undertake. This research project has collated published data since reporting year 2003/4 in order to enable analysis of the portfolio performance. In addition the data is also analysed to permit comparison on a per square meter basis as well as permitting benchmarking between departments on the basis of employee numbers.

The Federal Government data is then compared with publicly available data published on the NABERS website in order to compare the stated energy intensity of government buildings with a sample of those in the private sector.

4 Energy Intensity Data

The Department of the Environment, Water, Heritage and the Arts (DEWHA) which is charged with management of the EEGO policy collates data from across the Federal Government portfolio and publishes an annual report on progress against the policy objective. The most recent report for the period 2007-2008 states, with respect to the office portfolio, that the a reduction of five per cent was achieved on the previous year with respect to tenant light and power and a four per cent improvement was achieved in central services. The average results across the entire portfolio saw the average reach 8,113 MJ/person/annum for tenant use and central services was at 461 MJ/m^2 a (DEWHA 2009). The report goes on to predict that both of the EEGO policy targets could be met by June 2011.

The data reported to government at an agency and portfolio level, which is used to compile the annual DEWHA report is made publicly available and allows a deeper evaluation of the government portfolio of assets and analysis of the outcomes of the energy targets. In analysing this data the focus is on the office estate as this has the most bearing on the wider economy and serves as a benchmark against which the private sector can measure itself. Thus in this analysis the defence portfolio is excluded as are properties other than office use.

In analysing the available data the first issue which becomes apparent is that the size of the public service has significantly increased since the government targets were established in 2006. In 2003/4 the government portfolio under review comprised 2.3million m^2 of office space in which 109,868 staff were employed. Four years later the area of office occupied had grown by 22.4% to 2.8 million m^2 of office space with a corresponding 27% increase in occupancy to 139,598 people. Figure 2 below shows the growth in area occupied and occupancy across the government portfolio. Along

with an increase in office space there is inevitably an increase in the central area which grew by 25% over the period.

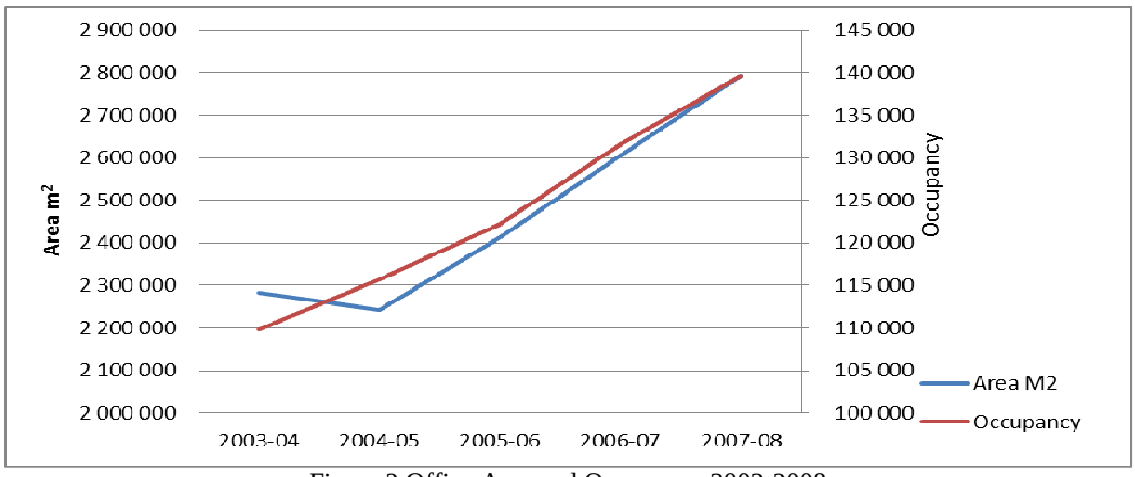

Figure 2 Office Area and Occupancy 2002-2008

While the occupancy and area occupied has significantly increased the energy intensity of the central services has decreased marginally over the period having initially increased in 2005/6 the energy intensity is now at a level 2.8% below the 2003 figures but remains 43 MJ/m^2 above the target rate.

Figure 3 shows the change in central services energy intensity over the period.

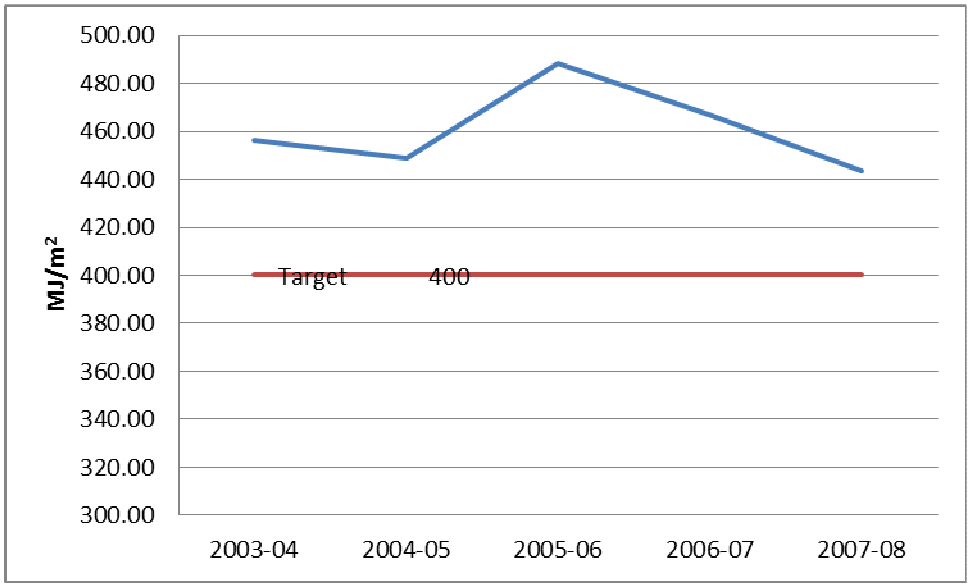

Figure 3 Portfolio Central Services Energy Intensity

In order to achieve the target rate of 400 MJ/m^2 the portfolio will need to make a further 10% reduction over and above the 2007/08 year results.

A similar picture exist for the energy intensity in terms of tenancy light and power on a per occupant rate.

Figure 4 shows a similar pattern of increase in the period 2004/05 and then a steady reduction over the three periods between 2005 to 2008.

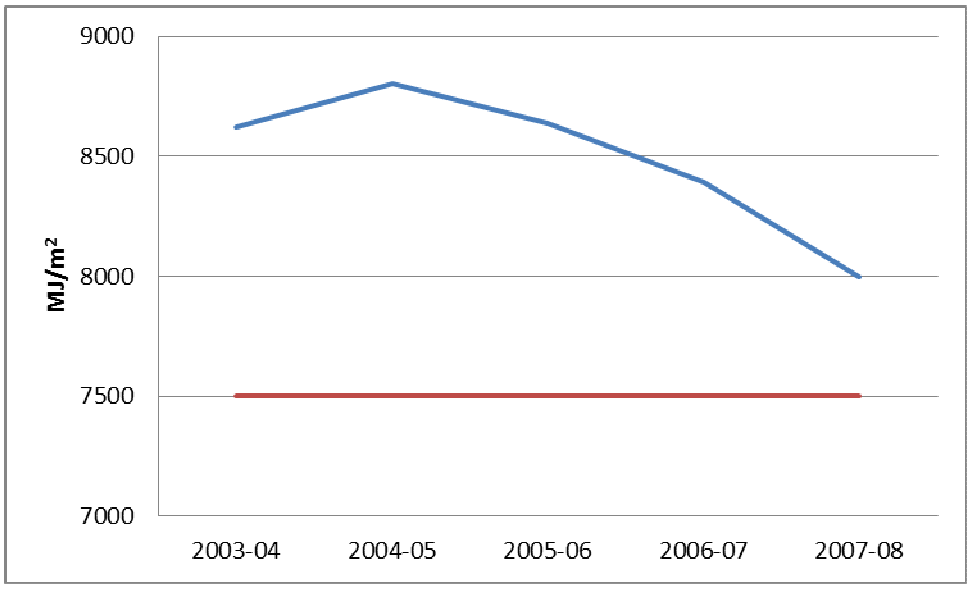

Figure 4 Portfolio Light and Power Energy Intensity per Occupant

The total reduction over the study period is just 7.24% and the energy intensity still remains almost 500 MJ/m^2 above the target level of 7,500 MJ/m^2 . In order to achieve the target a further 6% saving will need to be achieved.

This analysis on a portfolio wide basis clearly shows that the introduction of the government policy has had a positive outcome in terms of savings in energy intensity over the period and the government is on track to meet its target by 2011-2012.

5 Conclusion and Further Research

The Australian Federal Government has pursued a policy of energy reduction within its office portfolio for over two decades. During this period of time there have been several changes of government and realignment of ministries responsible for implementing energy policy. This paper has documented the history of this policy objective and Australian Government's commitment to reducing energy consumption and consequential CO_2-e emissions to the atmosphere. The research has shown that through mandating target energy intensity levels government has managed to achieve the goals established and demonstrated its ability to reduce its carbon footprint. In reducing the energy demand government has not only made significant cash savings and reduced CO_2-e emissions it has also been able to demonstrate to the wider community that significant energy savings can be made within an office portfolio.

The positive outcomes of this government policy are having an effect on the wider property industry. The federal government in 2010 legislated in order to require a greater level of energy transparency in the private sector. All office buildings over 2,000m^2 are now required to display a NABERS rating when leasing or selling office space. While the scheme is being phased in from November 2010 to full implementation in November 2011 there has already been a significant increase in the numbers of buildings seeking to obtain a NABERS rating for their buildings in order to comply with the legislation. The likely outcome of this will be a greater focus on energy saving in order to attract tenants or investors in office proper.

The Federal Government has also been able to work with the State Government's in order to encourage their greater participation in energy savings and sustainable office use. This has led to work being undertaken to establish a national energy benchmarking process for all public sector office buildings. This joint initiative will have even greater influence on the public sector both in demonstrating how savings can be achieved and also in ensuring that any owners seeking to lease office space to the public sector meet minimum sustainability criteria.

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To a new Dutch Service Life Database of Building Products

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Abstract:

Obtaining information on reliable service lives of building products is of great importance when completing environmental life-cycle assessment (LCA) reviews, for life-cycle costing (LCC) and for maintenance planning tasks. In the Netherlands a catalogue for the reference service lives of building components exists since 1995. The catalogue covers all common building components and building services.

There is a lack of reliable reference service life data of building products. All available international service life databases are not in accordance with criteria for reliable data, set down in the ISO 15686-series dealing with service life planning. In the Netherlands a review of the existing service life catalogue was made by expert judgements. The experts expressed a lot of objections to use the factor method for deriving mathematically a bandwidth of estimated service lives of a building product from the reference service live of the product. However the factor method described in the ISO 15686 series offers good opportunities to take the project or design specific situation of building products into account. Generic data about the service lives of building products can be tailored to specific project circumstances by describing the factors and underlying criteria, and the reference in-use conditions.

Keywords:

factor method, life-cycle assessment, life-cycle costing, maintenance planning, reference service lives

1 Introduction

Obtaining information on reliable (standardised) service lives of building components and products is of great importance for, amongst others, building owners, designers and consultants when completing environmental life-cycle assessment (LCA) reviews, for life-cycle costing (LCC) or whole-life costing (WCC), and for maintenance planning tasks. Other reasons to obtain reliable service life data are the development of national and international standards and legislation (e.g. the Construction Products Directive of the EU and Environmental Product Declarations), and new procurement routes like PPP and PFI.

For maintenance planning purposes one has to know the service lives of the building components. If replacements cycles are known, the financial forecast can be made. This financial forecast for maintenance is of great importance for service life planning and life-cycle costing of new buildings and (renovated) existing buildings.

Life-cycle costs are the costs of an asset ort its parts throughout the life cycle, while fulfilling the performance requirements (ISO 15686-5: 2008). Generally these are the cost for construction (including design and engineering), operation (including energy), maintenance and end-of-life (disposal and demolition). Life-cycle costing and whole-life costing methodologies are increasingly being used to compare new design and redesign alternatives. In refurbishment irreversible decisions with major consequences for the costs in the use phase, for example cleaning, maintenance and energy, are made too. In new procurement routes performance requirements instead of descriptive specifications are being used and operating and maintenance risks of built assets are transferred from clients to contractors. Working with performance requirements necessitates the provision of reliable information about alternative building products, including technical specifications with indications of service life and performance over time (Trinius and Sjöström, 2005). Reliable data about service lives of building component may reduce the calculated risk by the contractors.

Life-cycle assessment (LCA) can be used to quantify the contribution of building activities to environmental effects (ISO, 1997). LCA should concern the entire life cycle of the assessed product (ISO, 2004). In an LCA study, the effects that the production, use and disposal of products have on the environment are calculated. In construction the environmental effects are determined by first making an inventory of the flow of all substances to and from the environment over a building's complete life-cycle (e.g. Blom *et al.*, 2010). Each substance's potential contribution to pre-defined environmental effects is calculated. In order to do this, for each environmental effect, the impact of a particular of substance flow is compared with that of a reference substance, a process that is referred to as the 'impact assessment'. The quantified effects are usually abiotic depletion, global warming, ozone layer depletion, photochemical oxidation, human toxicity, fresh water aquatic eco toxicity, terrestrial eco toxicity, acidification and eutrophication. The complete set of environmental effects is known as the 'environmental profile'. Klunder and Van Nunen (2003) provide some solutions for including the factor time, including technical service lives of building products, in building LCAs, e.g. by sensitivity analysis.

The lack of reference service lives of building components and products led the Dutch Building Research Institute (SBR) in the 90s of the last century to the publication of a service life catalogue of often applied building products (Huffmeijer *et al.*, 1998). This catalogue gives reference service livers of roughly 600 building products. Data was gathered from various sources and judged by experts. Only service lives were include on which consensus was reached by these experts. One average technical service live of general building products is given. Specific attention is given to needed interim maintenance. An update of the data was considered since.

To make the life-cycle cost calculations and the outcomes of LCA-studies more robust and to estimate the risk of shorter and longer lifespans of the building components a research project was set up to answer the following research questions: (1) What are

reliable service life data of current used building products, and (2) How can generic data about the service lives of building products be tailored to specific project circumstances? To tailor the generic data the 'factor method' described in the ISO 15686-serie Buildings and constructed assets – Service-life planning – (ISO, 2000) has been used. The second research question is made operational in the question how the factor method practically can be used to take into account specific in-use conditions of building components.

2 Research methodology

The research methodology comprised a literature review and expert meetings. The experts were appointed by a research steering group, constituted by the Dutch Building Research Institute, the Ministry of Internal Affairs, the Government Buildings Agency, The Ministry of Defence Support Command Real Estate, and scientists. The eight experts are working at universities, consultancy firms and large property owners. They cover all disciplines of real estate and building products and materials (timber, roofing, masonry, building services) and are well respected in their discipline.

In the first place service life data of building products collected by standardized verifiable procedures in different countries and the use and criticism of the factor method in other countries (UK, Germany, Italy, and France) was analysed, based upon a literature review and contacting scientist in these countries. In the second place ways to use the ISO 15686 methodology were explored during expert meetings. The experts were also asked to judge the (reference) service lives of the building components expressed in the existing catalogue of 1998.

Finally the service life data of building products will be part of the National Environmental database that is being established to standardise the data for environmental life-cycle assessments used in environmental assessment tools (e.g. BREEM-NL). In 2011, industry organisations for building materials and products will value all the data of the National environmental database, including the service lives.

3 Literature review

3.1 Reference service life

Generally three forms of service lives of built assets are distinguished: functional, technological and economic (e.g. Van Nunen, 2010). The technical service life is the only service life that is tied to a building product or component. A functional or economic service life is defined by other influences, for example the society (the demand for a product), or the price of fuel (Van Nunen, 2010). Therefore if the reference service live of a building product or building component is mentioned, it is the technical service life. The ISO standard 15686 defines the reference service life (RSL) as the service life that a building or parts of a building would expect (or is predicted to have) in a certain set (reference set) of in-use conditions (ISO, 2000). In addition is the estimated service life (ESL) the service life that a building or parts of a building would be expected to have in a set of specific in-use conditions, calculated by adjusting the

reference in-use conditions in terms of materials, design, environment, use and maintenance.

3.2 Service life prediction

There are different methods to gather reference service life data: long-term testing, accelerated testing and analytical models. Analytical methods for service life prediction assume that all factors in quantitative terms are known and that the relationships between the influencing factors or processes can be described in mathematical models. Fundamental and empirical research that make use of standard test models is needed to develop these models (see e.g. Daniotti and Re Cecconi, 2010; Shohet and Paciuk, 2004). Several EU-funded international research projects were conducted on durability, service life models and service live prediction of building materials and components, e.g. LIFETIME (see Bamfort, 2005) and EUROLIFEFORM (see Kirkham *et al.*, 2004). ISO 15686:2 (ISO, 2001) gives a systematic methodology for service life prediction. Daniotti and Re Cecconi (2010) give an overview of test methods for service life prediction.

3.3 Environmental Product Declaration (EPD)

Reference service lives are often provided by the manufacturers of building components. In the near future they are obliged to provide these data to be used in Environmental Product Declarations (EPD) (CEN, 2010). Here a relationship with the ISO 15686-serie is being made: “RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with specific rules of European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving RSL, such guidance shall have priority.” (CEN, 2010).

4 Service life data of current used building products

4.1 Criteria

The aim of the SBR was to use data sources that meet the ISO 15686 standard. The ISO standard gives the following criteria to the data records (ISO, 2008):

- general information;
- scope (including purpose);
- material /component;
- methodology;
- reference in-use conditions;
- degradation agents;
- critical properties and performance requirements;
- reference service life;
- data quality;
- reliability of data;
- additional information considered;
- references.

The ISO standard also gives the rules for validation of data sources that are not fully in accordance with the standard. Depending on the quality of the data source, a laborious process with more extensive research and validation by experts has to take place.

4.2 Available databases

Although the whole range of research initiatives systematic international data records of reference service lives of building components hardly exist. Some take the used materials as a reference, others the compounded building products.

The availability of RSL data of building products that already meet the ISO standard criteria is very limited. For reliable data at least the methodology, the reference in-use conditions and the critical properties should be clear. A complicating factor is that the conditions and properties in one country valuated as being ‘normal’, might for a another country is not normal at all.

In Germany some limited databases exist, without any information about the reference-in use conditions and the properties (e.g. IEMB, 2009). Especially service life data bases in the UK are meant for contractual liabilities and insurance purposes, e.g. the HAPM Component Service Life (HAPM Publications, 2003) and the Building services component manual (Building Performances Group Limited, 2001). The research centre CSTB of France and the Research Group on Durability of Building Components of the Polytechnic of Milano is establishing a French-Italian database for reference service lives of building components, based upon the ISO standard (Daniotti *et al.*, 2010.

The UK Life Expectancy of Building Components; Surveyors' experiences of buildings in use (BCIS, 2006) meets some of the ISO criteria but not all. A list of generic components (over 300), used in normal conditions was presented in a questionnaire to surveyors who are experienced in inspections of existing property. The results are based upon 92 respondents. They were asked for the average or typical life span, and the minimum and maximum lifespan of building products. Assumptions that they examiners had to take into account were:

The components are installed according to instructions of the supplier or best practices (this is partially verifiable in practice, if visible).

The components meet the requirements of installation and use.

The components are subject to average exposure.

The components are maintained according to instructions of the supplier or as directed by trained personnel.

Although the methodology of this UK database looks very sound, a number of problematic issues related to expert judgements remain, like the unknown experience of the surveyors with the building products and for instance their geographical location. They were not asked for statements about the causes for a shorter or longer life, but only the life expectancy. Unfortunately it lacks clear statements for interim maintenance

The comparability with the Dutch situation of conditions and properties for (part of) construction seems problematic. The SBR decided to take the existing publication as the starting point.

4.3 New Dutch service live database

The publication provides service lives of 600 general building products, which is an average based on given assumptions. In practice, the service life of the building products will be around this average with a certain distribution. The average service lives of building components and products are the best available estimates made by the group of experts. The service life of many structural parts are determined by the experts at least 100 years. Recorded service life data concerns substructure and frame, external walls, upper floors and floor finishes, roofs and roof finishes and window and external doors.

Paints are not included as separate products. Paintwork is an activity necessary to maintain the life of a large number of construction groups in external walls, and windows and external doors. Compared to the existing catalogue internal components, fittings, sanitary appliances and building services were left out. Table 1 gives an example of the data records.

Table 1. Example of service lives of building components: Flat Roof Coverings
(Source SBR, 2011, forthcoming)

		RSL
Metals	Steel, trapezium, galvanized, coated	50
	Steel, trapezium, galvanized	15
	Aluminium, folded, enamelled	60
	Aluminium, folded, coated	40
	Copper, folded	75
	Zinc plates, 10% overlapping	25
	Zinc	40
Bitumen Felt	APP 2-layers; stuck	25
	APP 2-layers; mechanical	25
	SBS	25
Synthetics	PVC-foil	25
	PVC 1-layer; clued	25
	PVC strips; mechanical, overlapping 8%	25
	EPDM 1-layer; clued	25
	EPDM, SBS-cached; mechanical	30
	EPDM membrane; mechanical	30
	POCB strips	25
	POCB; mechanical	25
Divers	Green roofing (moss) on bitumen felt	40
	Green roofing (moss) on EPDM	40

5 Practical application of the factor method

5.1 Factor method

The factor method modifies reference service lives by factors to take account of the specific in-use conditions. “The factor method does not provide an assurance of a service life: it merely gives an empirical estimate based on what information is available. It is different from a fully developed prediction of service life.”(…)”‘Certain parties involved in building projects may be concerned about liability for forecasting future performance. For the avoidance of doubt, the recommendations of this part of ISO 15686 are not intended to implement contractual liabilities and the expectation is that “best efforts” will be applied, but that forecasts cannot be expected to always be either accurate or precise.”(ISO, 2000). The factors are:

A. Quality of components;
B. Design level;
C. Work execution level;
D. Indoor environment;
E. Outdoor environment;
F. In–use conditions;
Maintenance level.

The factor method offers the possibility to make a correction of the reference service life using the factors and criteria. Each factor has the default value 1.0. An effect that leads to life extension results in a value greater than 1.0, lifetime shortening gives a value lower than 1.0. Factor values less than 0.8 or greater than 1.2 imply that the chosen reference service life (RSL) is not suitable and should not be used (ISO, 2000). The factor values are determined by the underlying criteria. For each factor several possible criteria exist. The factors are multiplied giving the estimated service life (ESL). In a formula: ESL = RSL * a * b * c * d * e * f * g.

The obtained ESL is focused on a specific situation. This allows for a building to indicate specific influences. Two identical products, applied at different locations or otherwise used, will also get a different lifespan. The key is to know the situational factors (which does not involve incidents) and value them. If the situation is similar to the described principles of the RSL, the value is 1.0 and the reference service life (RSL) and the estimated life (ESL) are equal.

5.2 Shortcomings of the factor method

The experts expressed doubts about applying the factor method. The most important are:

- the factor method is not intended to determine the service life of a product. The availability of reliable data RSL precedes knowing the bandwidth of the ESL. To know the RSL of building products a lot of (longitudinal) research has to be executed (See ISO, 2001 and ISO, 2006);
- the RSL of each building product has a certain unknown bandwidth;

the question is whether the factors can be expressed in numbers. The attention points can be mentioned, but they are difficult or impossible to quantify;

the question is whether the factors themselves can and should be multiplied. The (value) factors may be interdependent;

questioned is the use of the method and described factors for building services.

In Germany some similar shortcomings of the factor method were detected. Bahr and Lennerts (2010) say that the ISO 15686 does not give any information on reference service lives or the values of the factors. The proposed German model does give statements with regards to the application of reference service life parameters. They suggest also to differentiate between primary and secondary influencing factors. The values of the influencing factors are, opposed to the ISO, restricted in the new model, enhancing transparency and significance. To minimize the subjectivity of the factor method, The French-Italian database contents grids, that will drive users in choosing the right values of each factor according to the context conditions in which building components are placed (Daniotti and Lupica Spagnolo, 2008; Daniotti *et al*., 2010).

5.3 Factors and criteria

It was chosen to make a practical application of the factor method that meets the concerns expressed and that makes a connection to international research into service lives of building products possible in the future. The factor method described in the ISO 15686 series offers the possibility of using a reference service life of a building product and seven correction factors to take the project or design specific situation into account. The factors are classified into properties and inherent performance level, in-use conditions and stages. The described reference situation, gives the most common construction practice used in the Netherlands. Deviations from the reference situation will result in a longer or shorter estimated service life of the building product. Figure 1 shows how the estimated service live of a building component could be deduced from the reference service live.

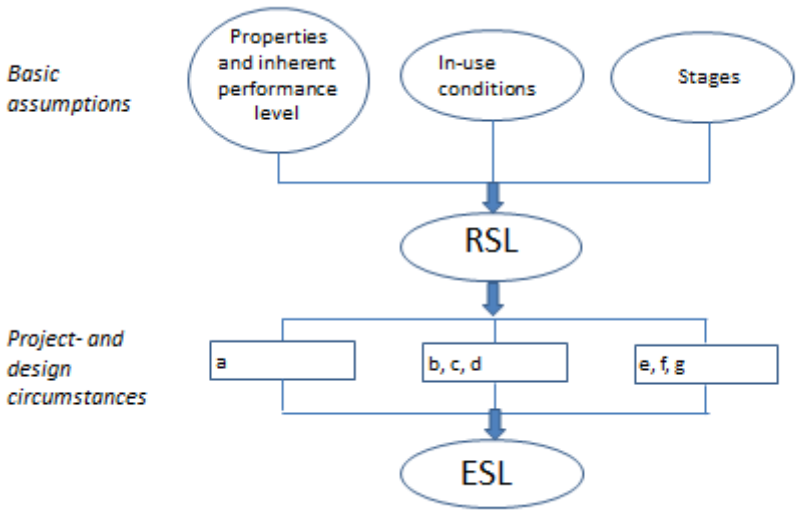

Figure 1. From RSL to ESL

5.3.1 Properties and inherent performance level

The properties and inherent performance level of the building product determines whether the required or desired performance can be achieved. The reference service lives of specific building products are based on the properties and inherent performance level of these specific building products. If another product alternative is being applied belonging to the same group of building products without notice of the reference service life of this alternative, one has to judge the properties and the inherent performance level compared to the known one. One has to think about the resistance to deformation, durability, stability and sensitivity for aesthetical, mechanical, biological agents and degradation, and sensitivity for incorrect use.

5.3.2 Indoor climate

The life of building products used indoors are subject to the conditions of the indoor climate. See Table 2. The average Dutch indoor environment is the basis assumption: a relative humidity between 30-70%, with no external sources of moisture present. The indoor humidity can not only be displayed in a percentage, it also has to do with time of wetness and variations therein. The reference is that temperature ranges between 15 and 25° C and that the temperature fluctuations are limited. In the reference situation there are no contaminants in the air. The air velocity is within 'acceptable limits'. Assumed is ample opportunity to ventilate, so no favourable environment for biological agents is formed and fungi will not occur.

Table 2. Factors and criteria Indoor climate

Criteria	Specification
Humidity	Extent, variations, condensation, rising damp, cold bridges
Temperature	Air temperature, variations
(Chemical) substances	E.g. CO2, carbon, chlorine
Air flows	In relation to pollution
Biological agents	Presence and preventing agents
Light	In relation to discoloration and aging

5.3.3 Outdoor climate

The life of building products used outdoors are subject to the conditions of the outdoor climate (Table 3). The soil can affect the life of certain components (foundation, walls). Basic assumptions are that no (extreme) variations in the soil occurs and the absence of external stresses. If extremes in humidity and temperature occur, may this negatively affect the life of the product. E.g. frequent variations in temperature can (by swelling and shrinkage) may reduce the service life. Shelter of the project by for instance trees, can prevent for extreme temperature changes.

Table 3. Factors and criteria Outdoor climate

Criteria	Specification
Humidity	Duration, variations, associated with the building orientation
Temperature	Air temperature, variations, shelter
(Chemical) substances	E.g. CO2, soot
Biological agents	Presence and preventing agents
Soil	Variations
External load	Vibrations from nearby (rail) roads, factories etc.
Light	In relation to discoloration and ageing

5.3.4 Building function and use

The building function and use may shorten or extend the service life of the building products (Table 4). The reference is that a building product is applied according to the requirement of the manufacturer or supplier. This means for instance that building products for applications in public buildings have such properties, expected that the building products will be used very frequently. Application of this product in housing means a longer life. Also frequent variations in load can, if the building product as required by manufacturer or supplier is not explicitly taken this into account, negative effect the longevity. The basic principle is that loads are more or less continuous and practically no overload occurs. The reference is based on proper use and no vandalism.

Table 4. Factors and criteria Building function and use

Criteria	Specification
Intensity	Building function, private / public, commercial / residential
Loads	Variations, overload
Type of use	Incorrect, vandalism

5.3.5 Design

Building products are selected during the design stage (Table 5). Determined is how products are exposed during their lifetime. The positioning of the building component may be positive or negative. The reference is a 'normal' position for the product. A frame, for instance, is always part of a wall exposed to the elements. If the frame is strongly affixed inward (e.g. an indoor balcony), the estimated service life will be longer. Specific details and the presence of many connections with other components, can be negative for the life of the product. The reference assumes that the construction product is accessible for the necessary maintenance. Another assumption is that the

materials used in the selected building product are compatible with the materials adjacent to the building product. Think of galvanic corrosion of metals.

Table 5. Factors and criteria Design

Criteria	Specification
Positioning	Exposure, shielding from weather, drainage, orientation, height
Detailing	Connections
Provisions for maintenance	Accessibility, space to work
Material compatibility	Suitability of the (combination) of materials
Dimensioning	Construction, subdivision, excess

5.3.6 Execution

The production of the building can affect the life of the building product. See Table 6. The reference is production on site. Production methods such as prefabrication meaning production under controlled conditions, may increase the life of building products. To ensure that implementation occurs as previously thought, the execution takes place according to rules (processes, procedures and instruments). These rules do not guarantee, but encourage to ensure quality. In particular for the management and maintenance stage it is important to record any changes to the design and used materials and products. The reference is that the registration is made. Another reference is a limited exposure to the elements before installation. The products are delivered 'just-in-time' or being stored protectively.

Table 6. Factors and criteria Execution

Criteria	Specification
Production	Prefab, in situ, working conditions, method of execution and exposing during execution
Discipline regarding execution rules and skills	Quality systems, supervision performance, competences, expertise and experience staff
Tracking changes	Register (for maintenance)
Transport and storage on site	

5.3.7 Maintenance and management

Maintenance can be of great influence for the service life (Table 7). Reference is a well maintained building. This involves planned preventative maintenance, such as lubricating moving parts, cleaning and paintwork, and planned interim replacements of building parts with a shorter lifetime than the entire building product. Assumed is

proper preventive maintenance and corrective maintenance, carried out according to maintenance instructions. The reference is that spare parts remain available.

Table 7. Factors and criteria Maintenance and management

Criteria	Specification
Maintenance planning	Implementation of preventive maintenance on schedule
Discipline regarding maintenance rules and skills	Quality system maintenance contractor, supervision performance, quality of materials, competences, expertise and experience maintenance staff
Tracking changes	Register of maintenance
Availability of spare parts	

6 Conclusions

More knowledge about the service lives of building products is desired for environmental and economic reasons: for reliable environmental life-cycle assessments and life-cycle cost calculations.

There is a lack of reliable reference service life data of building products. All available international service life databases are not in accordance with criteria for reliable data, set down in the ISO 15686-series. In the Netherlands a review of the existing service life catalogue was made by expert judgements. In the near future, a data format according to ISO 15686-8 should be used by suppliers of building products to declare the service lives of their products and the reference in-use conditions and critical properties. This data could be combined with data by property owners and managers, consultants and surveyors, etc. in accordance with ISO 15686-7. Especially the Dutch Governmental Buildings Agency will do further research to the service lives of building services.

There are a lot of objections to use the factor method for deriving mathematically a bandwidth of estimated service lives of a building product from the reference service live of the product. However the factor method described in the ISO 15686 series offers good opportunities to take the project or design specific situation of building products into account. Generic data about the service lives of building products can be tailored to specific project circumstances by describing the factors and underlying criteria, and the reference in-use conditions.

European research communities should co-operate to develop an international service life database of building components and to address the factors and underlying criteria for service life estimation. The factors and criteria have to be placed in each national context.

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Assessment of the Determinant Factors of Do-It-Yourself (DIY) Maintenance Approaches to Housing: A Perspective of Owner-occupiers and Tenants.

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Abstract:

The study assessed the practice of do-it-yourself (DIY) maintenance as a means of improving housing stock in Lagos state.The study identified the factors influencing and militating against the practice. In achieving the set objectives, the study adopted research survey technique.A total of 300 questionnaires comprising 160 for owner-occupiers and 140 for tenants were administered for the study.The population was selected from fifteen (15) local government areas in Lagos state, based on stratified random sampling technique. Data collected were analysed using descriptive and inferential statistics. The findings of the study revealed that the factors influencing the practice of do-it-yourself (DIY) maintenance are; to provide a habitable environment, to retain the performance of facilities amongst others while the factors militating against the practice are; jobs involving special skills, health and safety issues, lack of technical know-how amongst others.The hypotheses postulated reveal that there is an association between the factors influencing the practice of do-it-yourself (DIY) maintainance by the owner-occupiers and the tenants.There is also an agreement between the factors militating against the practice as perceived by the owner-occupiers and the tenants. Based on the findings, the study recommends vocational training for building users, building products should be user's friendly, provision of DIY manual for products and tools that will facilitate the practice amongst others.

Keywords:

built-environment, DIY, do-it-yourself, habitable, user friendly

1 Introduction

The state of disrepair of housing and its auxiliary facilities in Lagos state is a concern to both the government and individual citizenry. Adenuga (2002) states in his assessment on built environment revealed that many publicly and privately owned buildings are in various states of disrepair and dilapidations. High proportions of residential buildings in Lagos are dilapidated resulting to increased slums. To meet up with the Millennium

Development Goals endorsement of "cities without slums" before the year 2015, proactive measures have to be embraced. Housing maintenance strategy has to be put in place in order to control the menace caused by slums in our cities today. For a building to retain it functionality and value throughout its life cycle, it must be well cared for through maintenance. Hence housing maintenance strategy to be adopted should involve the direct participation of building users.

Maintenance as a concept refers to all works relating to repairs, replacement and or redecoration performed on any building with the aim of increasing the useful economic life, enhance its value as well as promoting its beauty and functionality and preventing damage and injury (Olatubara and Adegoke 2000). Maintenance, according to Bello (1994) is the entire endeavour to keep physical facilities – structure equipment, machinery and services at a satisfactory level of technical performance and quality of the lowest total cost. Odudu (1994) sees maintenance with respect to building and their services as a continuum of the construction process. According to him, the level of maintenance governs the health of a building throughout its life cycle. Therefore, maintenance involves the total package of all activities taken in caring for a building and all its facilities and services in a state to continue to perform its intended functions to the benefits of the end users, owners and the environment.

Although, there are different types of maintenance outsourcing applicable in maintaining housing stock with factors that determine their applicability. But this study focus on do-it-yourself (DIY) maintenance which involves the direct engagement of the buildings users to tackle minor maintenance and improvement work issues in the home. The aim of the research is to assess the determinant factors of the practice of do-it-yourself (DIY) maintenance approach as a mean of improving housing stock while the objectives of the study is to identify the factors influencing and militating against the practice of the system in improving housing stock in Lagos state.

2 Do-It-Yourself (DIY)

The perusal of academic research works does little to help basic understanding of what specifically counts as DIY. 'DIY' crops up in references repeatedly in relation to fields such as law, health and IT maintenance, or in relation to anti-corporate counter culture. Across different fields of activity the term is used to refer to people providing for themselves services which they could otherwise (be expected) to pay a professional to do. However, as reflected in dictionary definitions, the term conventionally refers specifically to accomplishing home maintenance or modification tasks without the paid services of a professional.

3 Factors that Determines the Practice of Do-It-Yourself (DIY) Maintenance Activities

The nature of who carry out DIY is determines by various factors. Viby Mogensen (1990) highlighted the following variables as income, status in the labour market, type of occupancy, gender, age, marital status and life cycle category region and degree of urbanization. Gronau (1977) stated that substitution between white and black labour, leisure and DIY is thought to depend on wages, taxation, and the cost of working and

DIY productivity. The change in time, over geographical regions as its affects differences in hourly wage rates, explains the inclusion of geography as a variable.

3.1 Household Composition

Bogdon (1996) finds household composition as a major determinant of the likelihood of a household taking on DIY. With multiple adult households most likely to undertake it, single parent families the least likely, as well as finding that, people are more likely to take on a contractor where projects are of larger scale, complexity or risk. Baker and Kaul 2002, highlights the significant relationship of changes to household composition with the likelihood of home remodelling. Munro and Leather (2000) explore homeowner's accounts of why they take on specific home maintenance and improvement tasks, which was due to the problem of the declining condition of the British housing stock despite increasing home ownership.

3.2 The Role of Age and Marital Status

The older people get, the less likely they are to carry out minor repairs and maintenance or improvements in their own home (Brodersen, 2003). Marital status here defined as being married or cohabiting, as opposed to being single. Married / cohabiting people are more likely to carry out minor DIY than single people. Also having children does not have a statistically effect on major DIY, and does not increase the likelihood of using DIY for major home improvements and alterations according to Brodersen, 2003. Pollakowski (1988) also agrees that age affect DIY. Davidson & Leather, (2002) pointed out that the older heads of households especially; those over 75 were much less likely than average to carry out DIY work, and much more likely to make exclusive use of contractors.

3.3 Leisure

Mintel (2005) claimed that over a quarter of adults claim to enjoy DIY with 8% identifying DIY as a hobby. The report puzzles over why people prefer to spend time on the labours of DIY rather than more obvious leisure pursuits, highlighting that it exists as a leisure activity even for those able to afford to employ someone else to do the work.

3.4 Self Satisfaction / Pride

Keat and Abercrombie (1991) found a complexity in DIY when people clearly have the means to employ a contractor, but feel that the employed person may not be able to achieve the distinctive and innovative solution to which they aspire and which they can achieve their selves.

3.5 Gender

According to Brodersen (2003) in Denmark and Norway, there are no significant differences between men and women's about the practice of minor DIY. However, in Great Britain with regard to minor improvements and alteration, men specify significantly more DIYs than women do. However, in most studies there is a strong male dominance in minor repairs and maintenance (Flood 1990; Smith 1986). Male-Female differences have been reduced in both DIY activities and household work during the last decade according to Flood and Grasjo (1995).

3.6 Income

According to Brodersen (2003), income has no importance for the likelihood of carrying out DIY activities in Great Britain, and the correlation is only statistically certain at the 10% level in Norway for minor DIY. In Denmark, income is significant for major DIY, and in Sweden for both minor and major DIY. In these countries, the likelihood of carrying out minor and major DIY increases with income, while the opposite is true in Germany, where the likelihood of carrying out both minor and major DIY declines with income (Brodersen, 2003). Williams (2004) identifies a traditional assumption in retail studies to be that DIY is a rational response to an inability to pay for external labour, essentially fitting the model of rational consumer. Pollakowski (1988) finds a complex relation between income and the likelihood of a household undertaking DIY. According to Davidson and Leather (2002), in terms of income, poorer households were more likely to use a contractor and less likely to use DIY, while for higher income groups the position was reversed.

3.7 Occupation and Education

Soren Pedersen (2003) stated that it is precisely skilled workers or people with a vocational education who contribute most to the black economy in Denmark, Sweden, Norway and Germany. Ploug (1990) found that the short term unemployed men spent three hours more a week on repairs and maintenance than other males, while unemployed women spent slightly less time on these activities than either employed men or women.

Brodersen (2003), stated that apart from Germany, education in itself has no effect on the likelihood of minor DIY. That in Germany, people without vocational training are less likely to carryout minor DIY, while people who have gone to technical college are more likely to compared with people who have acquired their vocational training in a firm.

3.8 Unemployment

Obviously, the higher the unemployment is, the higher the incentive to be engaged in DIY activities. Unemployed people have less money for purchasing goods and services and therefore a higher incentive to engage in DIY activities. Additionally, DIY activities may enhance the unemployed's self-esteem, thereby further stimulating DIY activities.

3.9 Tools and Materials of DIY

According to Watson and Shove (2005) DIY stores are increasingly good at helping the consumer, or researcher, understand in what relations particular commodities might become useful. A basic problem in DIY retail is that the majority of products have multiple potential uses. Therefore, it is impractical to display products together to form the ensemble needed to realise a project. DIY economic is growing, there are number of ready-made kits of parts for common projects, such as putting up a shelf, including materials, fixings and instructions in a single pack. Information boards and free 'how to' leaflets highlight lists of 'what you need' together with an outline of the practical steps involved in affecting a particular project. DIY outlets are responding to long-standing criticism by increasing the expertise and availability of staff, not least to be able to advice on the constituent parts of a project. In providing such information according to Waston and Shove 2005, DIY stores are also making available, to some extent, other essential components of a DIY project, seeking to instil on consumers some of the basic

competence and confidence to take it on. Retail spaces themselves therefore reveal the practical relationality of the usefulness of the products they sell to be useful, most products have to be situated in proper relation, to other products, the materials and structures of the home, the competencies and capacities of the DIY practitioner and so on.

3.10 Competence

Campbell (2005) stresses that skill; knowledge and judgement need to be brought to the processes of craft consumption. Leadbeater and Miller (2004) place the satisfaction of acquiring skill and knowledge as one of the central attractions of 'pro-am' pastimes including serious DIY. Davidson and Leather (2002) stated that, in terms of socio-economic group, skilled and professional workers were more likely to use DIY or mixed arrangements and less likely to use contractors.

4 Research Methodology

To achieve the aim of the study, a survey research approach was selected. A structured questionnaire was designed as an instrument for data collection from 300 respondents. The data collected were analysed using both descriptive and inferential statistics. Mean score was used to ranked the determinant factors as they affects the practice of DIY in Lagos state. While regression analysis was used to test the hypotheses to establish if there is an association between the factors influencing and militating against the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and the tenants.

5 Analysis of Data and Discussion

5.1 Characteristics of Respondent's

According to table 1, 160 (53%) of the respondents were owner-occupiers while 140 (47%) were tenants. Majority of the household head were male with 75.3% and the female counterpart 24.7%.The household head age limit was mostly above 40years (55.3%), follow by those within 30-40 years old. Household head within 0-10 and 10-20 years old had percentage of 0.7 and 3.0 respectively. Financial income of most of the respondents was above N50,000 per month while 4.7% had a monthly income within N5000-N15,000. Family size i.e the number of household of respondents within 2-5 and 5-10 had 150(50%) and 103(34.3%) respectively. Respondents that occupied single rooms, a room and living room and duplex had 12.7%, 22.7% and 14.3% respectively, while 48% occupied flat apartments and just 2.3% occupied mansion. 46 (15.3%) of them were classified to be in high social level and 12.3% and 72.3% were in low and average social level respectively.

Table1. Characteristics of Respondents

ITEMS	FREQUENT	PERCENTAGE
Types of occupant		
owner-occupier	160	53.0
Tenant	140	47.0
Gender		
Male	226	75.3
Female	74	24.7
Age Limit		
0-10	2	0.7
10-20	9	3.0
20-30	42	14.0
30-40	81	27.0
40 above	166	55.3
Monthly Income		
5,000-15,000	14	4.7
15,000-30,000	47	15.7
30,000-50,000	70	23.3
50,000 above	169	56.3
Family size		
0-2	22	7.3
2-5	150	50.0
5-10	103	34.3
10 above	25	8.3
Apartment occupied		
single room	38	12.7
Room and living room	68	22.7
Flats	144	48.0
Duplex	43	14.3
Mansion	7	2.3
Social Class		
Low Class	37	12.3
Average Class	217	72.3
High Class	46	15.3

5.2 Determinant Factors that Influence the Practice of DIY Maintenance

From table 2, building owner-occupiers agreed that to make facilities remain functional (3.32), provision of a habitable environment and acceptable standard (3.30), minor maintenance jobs that can easily be tackle by them (2.98) and self satisfaction (2.95) were the major reasons why they DIY in their homes. In addition, issues like time and emergence reasons for repair of faulty facilities (2.80), availability of DIY tools and products (2.78), reduction of home maintenance cost (2.85) and competence of using DIY tools and products (2.84) were also agreed on as factors that influence their desire to practice the system. The tenants agreed that provision of habitable environment and

acceptable standard (3.22), making facilities remain functional (3.11), minor jods that can easily be tackle (2.77) and self satisfaction (2.76) were DIY practice motivating factors.

Table 2: Factors influencing the practice of DIY maintenance
(Source: Field Survey 2010)

Determinant factors that influence the practice of DIY maintenance	owner-occupiers		Tenants	
	Mean	Rank	Mean	Rank
Habitable environment and acceptable standard	3.30	2	3.22	1
Makes facilities remain functional	3.32	1	3.11	2
Minor jobs that can easily be tackle	2.98	3	2.77	3
Self satisfaction	2.95	4	2.76	4
Time and emergence reasons since faulty facilities have tobe repair immediately	2.80	7	2.72	5
Availability of DIY tools and building products	2.78	8	2.65	6
Save money and reduced maintenance cost	2.85	5	2.59	7
Technical know-how of using DIY tools and equipment	2.84	6	2.55	9
Technical knowledge of installation or removal of building products	2.68	11	2.57	8
High labour charges of skilled workers	2.69	10	2.48	10
Availability of information on DIY products and tools from the manufacturer	2.72	9	2.40	13
Degree of enjoyment and fun	2.68	11	2.41	12
Job involving special skills	2.66	13	2.45	11
Building maintenance rules and regulation	2.63	14	2.36	14
Leisure time activities and pleasure at home	2.59	16	2.32	16
Strength and ability to carry-out the activities	2.62	15	2.25	18
Law enforcement agencies and avoidance of fine charges	2.58	17	2.23	19
Interest in learning new skill works/trades	2.47	18	2.30	17
Large jobs taking more time	2.31	19	2.33	15
Unpleasant or dangerous task	2.24	21	2.15	20
Learned construction professional	2.25	20	1.90	22
Employed contractors/tradesmen may not achieve one acceptable standard requirement	2.14	22	1.95	21
Enjoy hard physical work	2.03	23	1.75	24
Unemployment	1.86	24	1.84	23

Note: Mean is based on a likert scale of Disagree (1), somehow (2), Agree (3), strongly Agree (4)

Futhermore, owner-occupiers also accepted that high labour charges of skilled workers (2.69), degree of enjoyment and fun involved (2.68), leisure and pleasure (2.59), physical strength (2.62) and law enforcement agencies (2.58) encouraged them to be a

DIY practitioner. But the tenants believed that such factors somehow influence them to be a DIY practitioner. Unemployment and incompetence of contractors and tradesmen among the respondent was not a strong reasons for the practice.

5.3 Determinant Factors Militating Against DIY Maintenance Practice

According to table 3, health and safety issues (2.84), job involving special skills (2.80), lack of information/awareness about DIY maintenance practice (2.80) were major factors that militate against the practice of the system among owner-occupiers. Among the tenants jobs involving special skill (2.69), health and safety issues (2.56), poor emergency preparedness plan in the built-environment (2.56) and stress due to day work (2.55) were major demotivator of the practice of DIY maintenance at home. Lack of availability of DIY tools and building products ranked same i.e (14^{th}) among the two groups of respondents with 2.54 and 2.35 for owner-occupiers and tenant's respectively. Then the non-availability of DIY tools and products had a negative effect on owner-occupiers than the tenants. The two groups of respondent believed that rapid rate of deterioration and damage of building fabrics, high cost of building materials and products, lack of provision of maintenance grants and tools loans and family economic somehow affect the decision of not engaging in DIY practice.

Owner-occupiers also agreed that age (2.59) and time constraint (2.53) were militating factors against the practice. But the tenants considered age (2.34) and time constraint (2.27) as factors that somehow discouraged them from the practice.

Table 3. Determinant factors militating against DIY maintenance

(Source: Field Survey 2010)

Determinant factors militating against DIY maintenance	Owner-occupiers		Tenants	
	Mean	Rank	Mean	Rank
Job involving special skills	2.80	2	2.69	1
Health and safety issues involved in DIY maintenance	2.84	1	2.56	2
Lack of technical know-how of installation and removal of building components and elements	2.76	4	2.52	6
Poor emergency preparedness plan in the built environment	2.71	5	2.56	2
Stress due to day work	2.70	6	2.55	4
Large jobs taking more time	2.70	6	2.53	5
Unpleasant or dangerous tasks	2.55	12	2.51	7
Sub-standard materials/products in the market	2.55	12	2.47	9
Lack of knowledge of the life span of building components	2.59	9	2.37	12
Problems of interfaces between building components/elements during installation	2.56	11	2.41	11
Have enough money to engage contractor and skilled labour	2.61	8	2.34	16
Lack of availability of DIY tools	2.54	14	2.35	14
Lack of availability of DIY building products	2.54	14	2.35	14
Involves hard physical work	2.50	17	2.44	10
Age limitation	2.59	9	2.34	16
Lack of builder list and DIY products manufacturers information	2.48	19	2.36	13
Lack of information/awareness about DIY maintenance	2.80	2	2.49	8
Faulty design and construction work	2.47	20	2.33	19
Time constraint	2.53	16	2.27	20
Rapid rate of deterioration and damage of building fabrics	2.41	21	2.34	16
Lack of home maintenance policy/plan	2.50	17	2.24	21
High cost of building materials and products	2.27	22	2.24	21
No provision for maintenance grants and tool loans	2.14	24	2.20	23
Family economic i.e. no capable person to handle DIY	2.16	23	2.10	24
Building maintenance is not necessary	1.46	25	1.43	25

Note: Mean is based on likert scale of Disgree (1), Somehow (2), Agree (3), strongly agree (4).

Also the owner-occupiers agreed that they we not DIY since they can pay a contractor (2.61).The hard physical work involved, unpleasant or dangerous tasks and problem of interfaces were also militating factors against the practice according to the owner-

occupiers. The two groups of respondents agreed that building maintenance is necessary.

5.4 Hypothesis One:

The study further sought to know if there is an association between the factors influencing the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and do-it-yourself (DIY) maintenance practice by the tenants.

H_o: There is no association between the factors influencing the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and the tenants.

Table 4: Spearman rank correlation coefficient of the association between the factors influencing the practice of DIY maintenance,

Variable	r	df	t_{cal}	t_{tab}	decision
Influencing factors	o.96	22	16.23	1.717	Reject H_o

At **0.05** level of significant and degree of freedom of 22, **t_{cal}= 16.23** and **t_{tab} = 1.717** since **t_{cal} > t_{tab}, H_o** is rejected. Therefore, there is an association between the factors influencing the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and the tenants. Also since **r=0.96** it shows a positive association between the variables as shown in table 4.Inaddition, figure 1.0 indicates the association between the variables graphically.

5.5 Hypothesis Two:

The study further sougth to know if there is an agreement between the factors militating against the pratice of do-it-yourself (DIY) maintenance by building owner-occupiers and do-it-yourself (DIY) maintenance practice by the tenants.

Ho: There is no agreement between the factors militating against the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and the tenants

Table 5: spearman rank correlation coefficient of the association between the factors militating against the practice of DIY maintenance

Variable	r	df	t_{cal}	t_{tab}	decision
Influencing factors	0.81	30	7.62	1.697	Reject H_o

According to the table 6, at **0.05** level of significant and degree of freedom of 30, **t_{cal}=7.62** and **t_{tab}=1.697**, since **t_{cal}>t_{tab}**, H_o is rejected. Therefore, there is an agreement between the factors militating against the practice of do-it-yourself (DIY) maintenance by building owner-occupiers and the tenants. Also since **r=0.81**, its shows a positive agreement between the variables as indicated in figure 2.0.

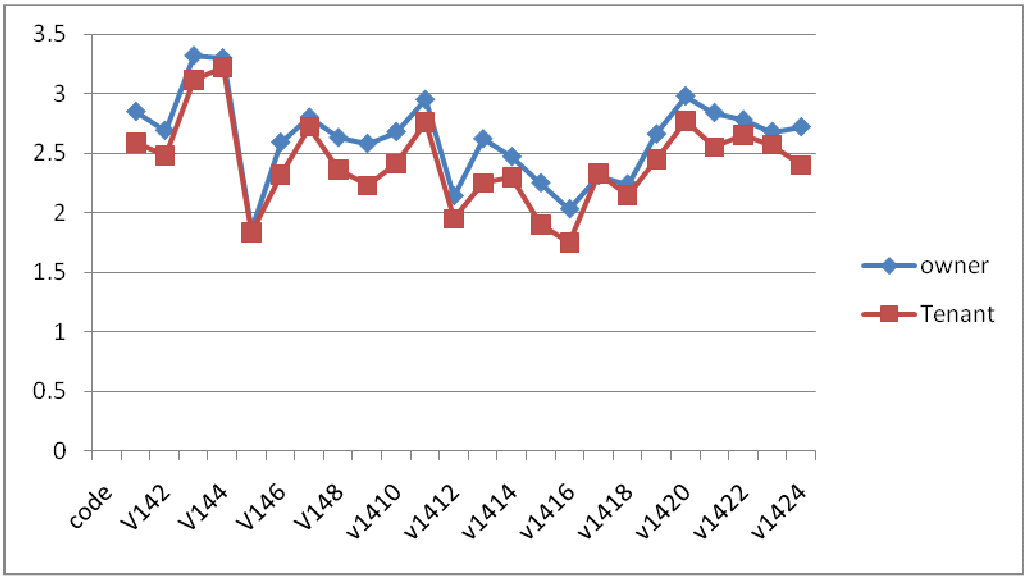

Figure 1.0: Shows the association between the factors influencing the practice of DIY maintenance in improving housing stock.

(Source: Field Survey, 2010)

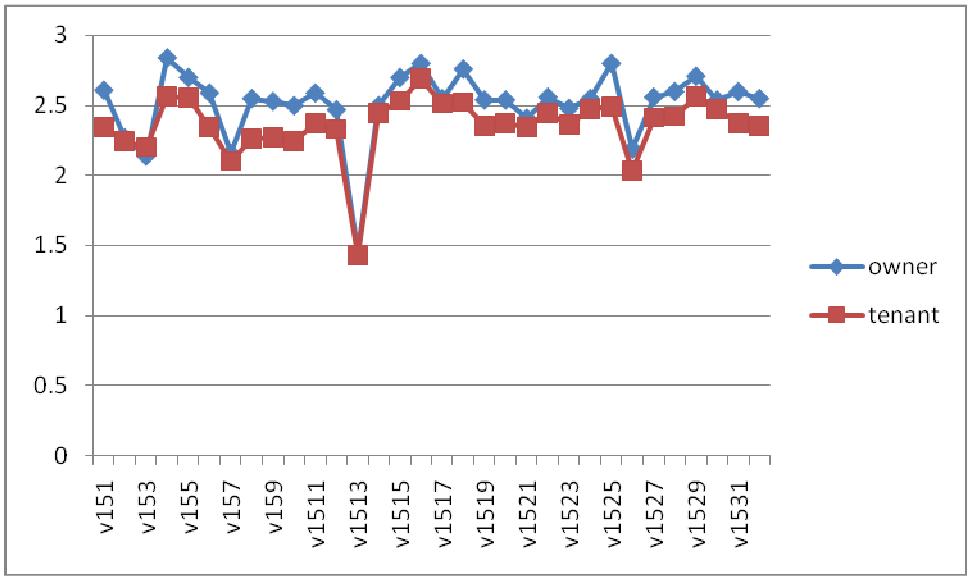

Figure 2.0: Shows the association between the factors militating against the practice of DIY maintenance practice in improving housing stock.

(Source: Field Survey, 2010)

6 Discussion of Findings

The study reveals that the factors influencing and militating against the practice among DIY home maintenance practitioner in Lagos State were the same according to table 4 and 5, that shows a positive association between the factors that determine the practice of the system.The effect of gender on the practice shows that more male household heads were involved more than the female counterpart in support of Davidson and Leather (2000).Age limitation somehow militate against the practice (table3).Gronau

1977, believed that age affect DIY productivity. DIY activities increase with unemployment according to Soren Pedersen (2003) but the study was in contrast, unemployment had no influence on practice. Bogdon (1996) find household composition a major determinant of the likelihood of taking on DIY maintenance, with multiple adult households most likely to undertake it. From table 1, most households head were adult within the age of 20 above.

Mintel (2005), stated that quarter of adults claim to enjoy DIY, with 8% identifying DIY as a hobby. Leather et al (1998) attested that people DIY as a choice often for enjoyment, as hobby, a means of self-fulfilment or self expression. Clarke (2000) and Wood (2003), described DIY as the construction and maintenance of self identity and self-esteem. Findings from the study also reveals the same trend of respondents opinion in table 2, habitable environment and acceptable standard, self-satisfaction, degree of enjoyment and fun derived from the practice were influencing factors. Also the issue of leisure time and pleasure at home somehow influence DIY practice.

The issues of competence cannot be overemphasis in DIY maintenance practice. Campbell (2005) stresses on skills, knowledge and judgement in the practice of DIY. Warde (2005) touches on significance of competence in enabling action and reproducing practices. These actually buttress the reasons why the major factors militating against the practice were skills, technical know-how and information.

Enhancing the practice of DIY maintenance in Lagos State, from the oral interview conducted respondents strongly agreed on public enlightenment campaign, educational and vocational training, adoption of modern DIY tools and products technology e.t.c back with an enactment of law by the State government that will mandate housing maintenance. Watson and Shove 2005, identify relatively formal knowledge acquisition such as school CDT (Craft, design and technology) lessons, by referring to DIY manuals, internet forums or being taught by an experience person. Based on the findings, the study recommends that educational and vocational training on DIY maintenance practice should be introduce to schools, craftwork and building end-users, building products should be users friendly and DIY compliances and landlord/tenant covenant should mandate proper building care for building users.

7 Conclusion

Conclusively, the issue of DIY maintenance approach to housing in the study area is subject to factors influencing and militating against it. DIYer's agreed that the major influencing factors for engaging the system were to create a habitable environment, maintain an acceptable standard, to make facilities functional, for self-satisfaction and enjoyment derived from the practice. The factors militating against the system were skills, technicality and information about the system. Both owner-occupiers and tenants were subject to these factors according to the tested hypotheses.

Due to the importance and need for maintenance in residential building. Grassroot participation i.e the direct involvement of building user's in maintenance practice will aid to retain and restore the state and value of housing in Lagos, Nigeria. This can be encourage by the engagement of do-it-yourself maintenance practice by all building user's in their own capacity. Eradicating or reducing the state of disrepair of housing stock experience in the study area today.

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Biodiversity and the built environment

Straw Bale Building
A Mechanism for the Promotion of Biodiversity Conservation

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Abstract:
In order to stimulate ideas and maximise biodiversity in the built environmemnt the proffession requires the correct skills to overcome barriers that prohibit its development. A concern surrounding straw bale building is the development of a robust and effective moisture monitoring system to provide evidence that a building made of straw is healthy. Existing monitoring devices are analysed and reviewed here within, the advantages are extracted and two new methods; a straw probe, and a wood disc are now proposed as suitably proficient. Initial findings are encouraging and demonstrate a stable and comparitavley cheap method to assess moisture within the walls of a building. With the development of new monitoring systems it will be possible to provide intensive credible scientific evaluations of straw bale buildings and therefore promote straw bale building as a viable option and enhance its proffessional status and skillset. This develoment will enable the growth and integration of key concepts such as the promotion of biodiversity conservation to become a holisitc approach rather than a reductionistic method. This will allow a crop, and a building in its construction, use, and eventual demolition to be viewed as a life cycle fully related to the enhancment of surrounding ecosystems linking rural and urban environments through Nature.

Keywords:
biodiversity conservation, built environment, moisture monitoring, straw bale building

1 Introduction

Straw bale building has the potential to become a promoter of biodiversity conservation within the built environment. The European Commission summarises biological diversity or biodiversity as the “variability among living organisms…They form the foundation on which we build our societies.” (European Commission 2011) and matter ethically, emotionally, environmentally and economically. An ecosystem provides emotional and aesthetic experiences, and offers opportunities for recreation. It cleans water, purifies air, maintains soils, regulates the climate, recycles nutrients, and provides food, raw materials, and resources for medicines and other purposes. Nature itself plays a vital role in human health and well-being (Maller et al. 2006).

Conservation is the art of careful management to reveal and share significant and special qualities whilst protecting and enhancing places for the enjoyment and understanding of present and future generations. (National Trust).

The built environment is “the physical world that has been intentionally created through science and technology for the benefit of mankind”. (National Assembly of the Republic Of South Africa 2008), it does not often exist in harmony with nature.

The effect of the built environment on biodiversity is an important consideration and straw bale building offers a mechanism to promote its conservation utilising a natural material. Consisting of the stems and leaf of harvested wheat, barley, oat, rice or rye and bound together to form a bale, straw can be arranged to form a structure.

Stacking straw bales to form a structure does not require skilled labour and therefore there is a perceived lack of professionalism surrounding the process, which brings into question the longevity of buildings. Without due care and attention to detail during construction and the design process there is more potential for moisture penetration and therefore degradation of the bales through bacterial and fungal attack. The problems are in identifying a defective build and in maintaining and developing a highly regarded reputation and skill set for the future of the straw bale building industry. Through careful professional development of this construction method confidence will grow and the promotion of biodiversity can be fully implemented.

Straw is a natural material and has a far greater relationship with Nature than most other building materials providing a direct link to Nature for rural and urban environments. During its lifecycle as a crop it has the potential to be an integral part of an ecosystem. In the form of a construction (as with any type of structure) it can provide shelter for birds and bats, and at the end of its life as a compost material it can provide a habitat for bacteria and fungus which will in turn provide nutrition for an extended ecosystem.

The promotion of this mechanism will encompass different disciplines including the farming community adopting more biodiverse agricultural practices with the addition of field boundaries, buffer strips next to watercourses, and hedgerows as encouraged in schemes such as the Entry Level Stewardship (Natural England).

Planning professionals estimate the social, economic, and environmental impacts of development; this must include ecology “land use, biodiversity and the strategic planning of ecosystem services.”(Jackson 2007). The UK government provides, under Section 40 of the Natural Environment and Rural Communities Act 2006 Section 41 to act as a guide for public bodies to ‘regard’ biodiversity conservation in their normal functions. (Department of the Environment, Food and Rural Affairs 2006)

It is also important that the end users or customers understands or equates to the concepts and decisions behind the building methodologies.

The aim of this paper is to consider the future of straw bale building and how its philosophy can be expanded to encapture biodiversity; its future relies upon the demonstration that it is a valid method of building. To demonstrate this, an accurate and robust technique for professional evaluation of the moisture content must be developed. This will go someway to establishing the building method’s reputation through credible scientific research and the ability to promote it to the wider public, with a focus of educating and inspiring people from all walks of life to invest in a more natural material and consider the greater environmental benefits of these actions.

2 Contextualisation

There can be no doubt that the built environment impacts on nature introducing problem species, water pollution, unsympathetic management, and inappropriate development all threatening wildlife with degradation and/or loss of habitats. (Wilby, Perry 2006)

2.1 Future populations

It is estimated that the world population is set to increase from 6.1 billion in 2000 to 8.9 billion in 2050,to 9.22 billion by 2075 (United Nations 2004). Rodman suggests that a subsequent increase in the amount and concentration of people in urban environment will encourage epidemics, and technical and environmental catastrophes; e.g. flu, nuclear accidents, and chemical spills. (Rodwell 2007)

The population of the UK is projected to rise from 61.4 million in 2008 to 71.6 million by 2033 (Directgov 2009) which will place greater demand on the built environment and even more pressure on the natural environment as the quest for resources and space intensifies, prompting many organizations and governments to review this effect with the purpose of making an informed decision on how to combat it. The Darwin Initiative and Global Youth Biodiversity Organization (GYBO) are some such examples of a move toward addressing this conflict. Straw bale building could also aid the cause.

For wildlife the impacts are already being recognised, the House Martin winters in Africa and returns to the UK to breed, they have become reliant on man made structures in preference to their original choice of cliffs and caves. Evidence suggests that house martin populations have declined by between 25% to 50% due partly to localised weather patterns and wider climate change, loss of nest sites, and reduced insects numbers caused by changes in land use. (Williams 2010)

2.2 Straw Bale Building

With the advent of the first baling machines in the mid-1800's straw could be bundled tightly together and tied to form a bale. Settlers of Nebraska (USA) began stacking them on top of one another to form walls, thus the art of straw bale building was born. King, B et al.(King, Aschheim 2006) and Jones, B (Jones 2002) explain further the history and art of building with straw bales and a number of builds have been featured on Channel 4's Grand Designs programme (Channel 4 2011).

As a construction material, straw bales can provide an excellent insulating medium for both sound and temperature (Lawrence, Heath & Walker 2009) and are an agricultural bi-product that can be locally sourced. Straw is a material with a potential low carbon footprint but using straw as a building material however is not without its drawbacks.

2.3 Drawbacks?

- Insect and animal infestation: They can be deterred by an application of render. (Lawrence, Heath & Walker 2009).
- Fire: The Ecological Building Network have released the following video demonstrating that rendered straw bale walls can have a two hours fire rating; http://www.ecobuildnetwork.org/resources/downloadable-fire-test-movie.
- Structural loading: Different building styles and methods of construction complicate this area of study. (Walker 2004)

- Earthquakes: the University of Nevada have published an earthquake simulation demonstrating that it performs well even under extreme shock: http://nees.unr.edu/projects/straw_bale_house.html
- Moisture: The current focus of research is in moisture, specifically at what level it presents a problem, how it is detected and what to do about it?

2.4 Moisture

To prevent the natural cycle that causes straw to decompose the moisture content must be restricted to a maximum of 20% (CMHC 2000). Some other reports and papers vary; King's book evaluates the properties of rice straw with relation to moisture and suggests that only bales with lower than 25% moisture content be used in building structures.

Lawrence et al. recommend a moisture content of less than 15% to prevent decomposition (Lawrence, Heath & Walker 2009) whilst Carfrae et al. state that the received wisdom amongst the straw bale community sets the safe maximum at 25% but emphasises that this be subject to length of time exposed. (Carfrae et al. 2009)

This inability to state an exact point at which moisture begins to cause degradation is partly “dependant on species, variety, climatic conditions, soil type and husbandry. These factors result in significant differences in physical, chemical and biological characteristics.” (Butterworth 1985).

2.5 So why use straw?

Wheat production equated to 54% of the total crop production in 2007 in the UK (Copeland, Turley 2008) partly due to its importance in human nutrition (Evans et al. 1981). Although the root of the plant is often ploughed back into the soil to reapply some nutrients it is not considered good practice to dispose of straw in this way as it provides an ideal breeding ground for specific pests and many diseases of cereals (Grossbard 1979). Consequently there is an estimated 5 to 6 million tonne/annum of straw produced in the UK and yet only 50,000-80,000 tonnes are traded (England Biodiversity Group 2008). Every year 450,000 houses of 150m^2 could be build with the remaining 4 million tonnes (Watson 2010). The UK National Housing and Planning Advice Unit cautiously predict that the demand for new housing by 2026 will be 223,000 per year average. (NHPAU 2007)

2.6 Straw and biodiversity

A field of wheat can sustain a substantial amount of life, from primary consumers of the wheat to secondary and tertiary organisms. The type of treatments applied to the plant and the way the crop is farmed can have a distinct effect on the local biodiversity. In a publication by the Soil Association evidence suggests lowland organic farming methods support a significantly higher biodiversity than conventional farming systems within the crop and the field margins.(Azeez 2000)

The eradication of weeds from an area around a crop can have a dramatic and negative effect on the local ecosystem causing a reduction in organisms further up the food chain culminating in a decline of top predators. (Boatman Unknown)

In the paper by Siddiqui, M.J.I. et al. organic and conventional wheat field systems were analysed for diversity concluding that agricultural sustainability could be achieved

through scientific manipulation of polyculture and the slow and careful removal of the dependence on agrochemicals. (Siddiqui et al. 2005)

Encouraging practices that are viable both economically and environmentally requires a large amount of skill and knowledge, and requires an understanding from all parties involved in a build, of the benefit analysis involved.

1.1 Justification

Utilising a natural, unestablished material in a construction method allows the promotion of biodiversity conservation. As the element of professionalism develops so to can its skill sets, standards, and credentials, requiring an expansion of the view relating to a product, its origins, use, and eventual deterioration integrated with a concern for the ecosystem it will affect. Timothy Morton has investigated the idea that

Modern Society has damaged the idea of Nature itself by viewing it as an 'object' surmising that it should instead be perceived as interconnected with everything. (Morton 2011)

Promoting straw bale building with biodiversity conservation as an integral interconnected part of its system will require the continued professionalism of the construction method and therefore greater research and evidence of the materials viability as a construction medium. Proving that a building is healthy and free from moisture damage is one of the major concerns and will require the adoption of a robust, accurate, and appropriate moisture monitoring system capable of signalling potential future problems and plotting past histories.

Current monitoring methods are analysed and reviewed in the following section the benefits of each have inspired the development of two other methods which will also be discussed.

3 Research Methodology

3.1 Monitoring Methods

Straw bale walls must be monitored and must be able to provide historical records of the moisture levels in order that a critical evaluation of the method of construction may be addressed. The following methods can be undertaken to assess this:

3.1.1 Oven Drying

Samples of materials are weighed, placed into an oven at 105^{o}C and then re-weighed, once the weight stabilises the dry weight has been found. Using one of the following formulas will give an accurate moisture content reading:

$$MC_{(wet)} = \frac{100}{1} \times \frac{W_w - W_d}{W_w} \qquad MC_{(dry)} = \frac{100}{1} \times \frac{W_w - W_d}{W_d}$$

Where W_w is mass of a wet specimen and W_d is the mass of the dry specimen. It is important to note in which result the data is being presented.

This method is highly invasive and involves material extraction and is therefore not a suitable type to be used for regular monitoring.

3.1.2 Electronic Relative Humidity and Temperature Sensors

Placed within a bale and linked to a data logger these sensors can provide a detailed picture of the conditions within the bale. Straube and Schumacher installed some into a Californian winery but did not convert the data from relative humidity into an equivalent moisture content reading. (Straube, Schumacher 2003)

In the paper by Lawrence (Lawrence, Heath & Walker 2009) a formula was devised that could extrapolate the moisture content from the relative humidity:

$$C = \frac{C_S}{1 + n\left(\frac{K_m}{\varphi} - 1\right)^{\frac{i}{3}}}$$

φ = percentage relative humidity	
C = Moisture Content	
$K_m = 0.9773$	i = 1.6
n = 44	$C_s = 4$ 0%,

3.1.3 Existing Bespoke sensors

Protiometer produce the 'Balemaster' primarily for use in the agricultural industry, it is a hand-held device suitable for gauging the moisture content of a straw bale. It's accuracy is questionable as results vary according to the compaction of the bale and it must be used in conjunction with a temperature adjustment; they are expensive, invasive (a metal rod is inserted into the straw), and would not be suitable as a long term monitoring system but do provide a the ability to do a quick background check.

Protiometer also produce the ‘Timbermaster’ for checking the moisture content of timber. This may also be used in conjunction with the Balemaster’s probe but it is important to note that the Balemaster gives a reading in wet percentage and the Timbermaster in dry percentage terms.

3.1.4 Timber probes

There are various versions of the timber probe:

Figure 5. An Example of a Timber Probe & in Exploded View

Timber is used due to its close resemblance in reflecting the moisture content of straw and this design of probe (Figure 5) has an accuracy of ±1% moisture content (Goodhew, Griffiths & Woolley 2004). The probe is pushed into a bale and is allowed to equilibrate with the straw, readings are then taking with a hand-held wood moisture meter via contact with the metal rods providing a conductivity reading that is converted to a moisture reading.

The probes are cheap and easy to produce but require calibration and have been found to suffer from contact issues giving a lower than expected reading. The wood probe can also work free of the body as it expands and contracts with temperature and moisture. These observations have been recorded but are beyond the scope of this paper.

3.1.5 Straw Probe

A straw probe has been trialled with promising initial results. It consists of a measured amount of dry straw being compressed into a non hygroscopic perforated plastic cylinder and inserted into the straw wall as with the timber probe. A conductivity reading from a Timbermaster is then obtained by insertion of two metal rods into the straw.

There is no material assumption to be made as in the case of wood; the compaction is already established and will therefore not influence the results; and it can be withdrawn from the wall and weighed to verify the amount of moisture present. This provides an accurate way of monitoring a wall, but requires weighing scales with ability to read to two decimal places or more. It may not be suitable for intensive long-term studies and is invasive but requires very little calibration prior to use.

3.1.6 Wood disc

Common Oak discs are cut to 3 mm thick across the grain with a diameter of 15 mm. They react quickly to changes of relative humidity due to their reduced thickness and placed directly into a bale will expand in the presence of moisture.

Initial laboratory data shown in Figure 6 illustrates the initial findings of two wood disc's. Expansion relates to the moisture content obtained at differing relative humidities in an environmental chamber set at 22°C.

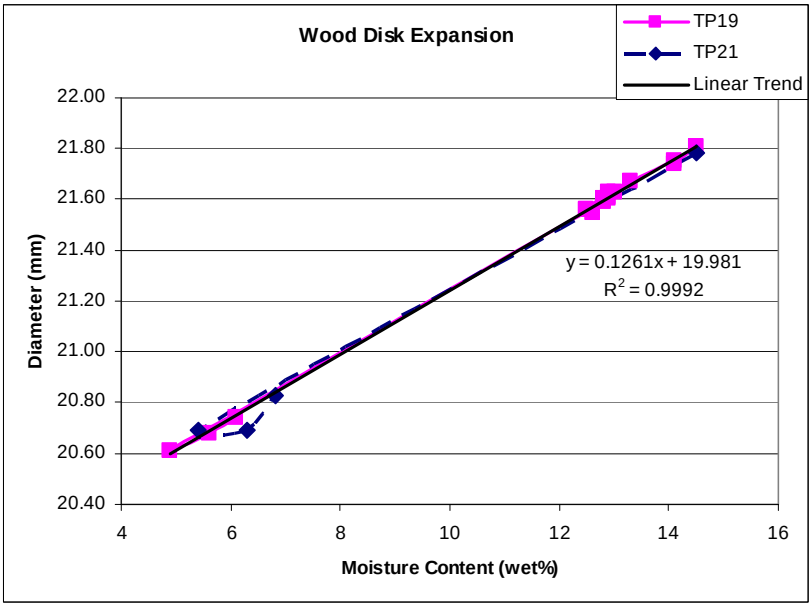

Figure 6. Graph of wood expansion over moisture content at 22°C

Figure 6 shows a close relationship between moisture content and diameter of the disc measured with a digital scale rule. This initial study requires further investigation, relating to adsorption and desorption with regard to temperature and adaptation to a robust monitoring system.

It is proposed that the wooden discs could be fitted with temperature compensating strain gauges to measure expansion with relation to moisture content of the straw.

Costing far less than relative humidity sensors they could still be connected to a data logger to record the moisture content, the disadvantages however may be that they require lengthy calibration tests and their fragility would be a concern.

1.2 The rig

To test these monitoring methods an outdoor test rig was constructed towards the end of 2010 and monitoring has been setup to record interstitial, internal, and external environments. The rig comprises of walls 225 mm thick and stands two meters tall with a roof footprint of 3000 by 3200 mm accommodating an overhang of 500 mm. The bales are raised 250 mm from ground level on rammed earth car tyres to prevent splash back of rainwater. There are 108 monitoring points within the rig walls which provides a wealth of information; this paper is concerned with only one of those points 'B5.7' as it had the highest overall moisture content prior to construction.

The Rig is not as it stands complete, it has been rendered with two applications of lime render externally to a depth of 20 mm; internally it has had one coat of lime and all 108 monitoring points remain open to the air due mainly to the nature of the experimentation being conducted. The internal environment is influenced directly by the external as there are major air leakage paths yet to be secured. It has no heat source and no roof or floor insulation. The completion of the rig is due to take place after this wave of experiments has ended.

1.3 Data collection

Point 'B5.7' in the rig stands 300mm above ground level, is monitored at a depth of 112 mm. Adopted monitoring techniques include a Maxim iButton sensor, a straw probe, a wood disc, and a Protimeter Timbermaster with Balemaster Probe and temperature probe attachment. It is worth noting at this point that all measurements in this paper will be presented in wet percentage terms.

A hole was drilled into the wall of the rig, the wood disc and iButton were located at the end and the straw probe was then inserted to plug the hole, measurements were taken once a week.

During measurements the straw probe is extracted and weighed in its entirety and the temperature compensated moisture content confirmed with a Timbermaster meter held across the metal rods. The diameter along the grain of the wood disc is then measured with a digital scale rule and the Timbermaster meter with temperature compensation is used to verify the moisture content of the wood. The moisture content of the straw in the wall is then checked with the Timbermaster, and Balemaster probe and temperature sensor attached. Finally the iButton data is downloaded.

Utilising these methods will help to verify the advantages and disadvantages of each method and produce results that can be reviewed and analysed.

4 Findings and Discussion

Figure 7 illustrates the findings from the rig study, the wood disc and iButton sensor have been monitored since the 27th of April 2011, the straw probe since the 5th April and

the Timbermaster with bale master probe attached has monitored the rig from the beginning of the construction.

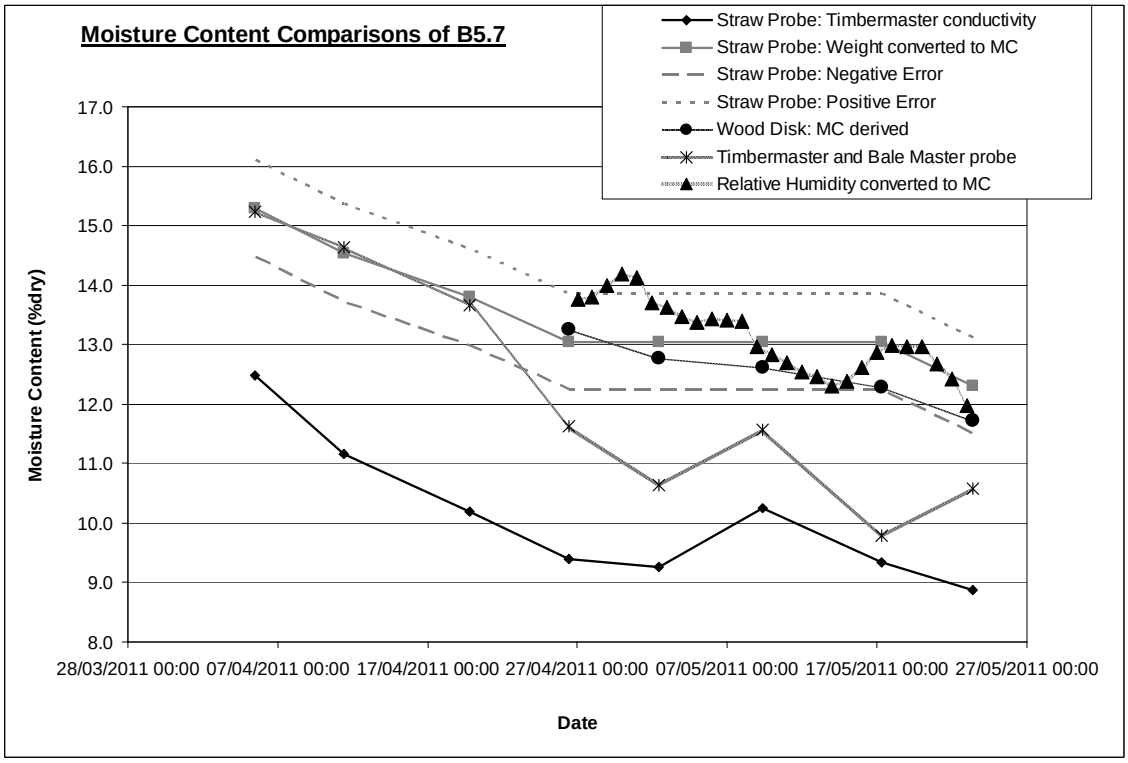

Figure 7. Moisture Content Comparisons

The 'weight converted to MC' (Moisture Content) refers directly to the mass of the straw probe converted using the formula laid out in section 3.1.1 with a negative and positive error obtained from the restrictions of the equipment used.

The 'Straw Probe: Timbermaster conductivity' shows a similar trend to the converted weight results but field observations have shown that results can be influenced by applying different pressures to the rods and by poor contact with the straw. The same conclusion can be drawn from the 'Timbermaster and Balemaster probe' at around 13.5% moisture there may be a lack of contact between the straw and the probe as it drops off from a steady decline that reflects the straw probe weight conversion data. The contact issues will not be investigated further in this paper.

The wood disc shows that the bale is drying out at a steady rate, it follows within the error boundaries of the 'weight conversion' method.

The relative humidity obtained from the iButton sensor converted with Lawrence's formula confirms that the moisture content is dropping and that it is similar to the results found in the error band of the mass of the straw and of the wood disc.

4.1.1 Rig study analysis

The benefits of the iButton together with the formula and the amount of data that can be collected would prove a tantalising option for a long-term study, but the overall cost and complication of maintaining it over the lifetime of a building may prove inhibitive.

The Balemaster probe has its limitations as is demonstrated by this example as contact is lost a lower reading is obtained reducing confidence in the method. It also requires a lot of effort to take multiple results and is not suitable for long-term studies.

A straw probe offers a very cheap way of manually taking moisture measurements through mass conversion, but conductivity cannot be relied upon as the connection between straw and metal rods cannot be verified and accuracy suffers. Mass conversion may not be a solution to a long term monitoring system over the entirety of a building but could provide a risk assessment tool for a few sample points without jeopardising efficiency of the building.

The expansion of the wood disc may hold a very cheap solution to monitoring at multiple points within a building. With the addition of a strain gauge it should be possible to record data via a network avoiding the sacrifice of an expensive relative humidity sensor every seven years.

5 Conclusion and Further Research

Human populations are set to increase putting greater pressure on the natural environment. Straw bale building may provide a way to alleviate the pressure slightly, utilising a locally produced, abundant, and natural by-product that can be grown to benefit a local ecosystem. Producing an organically farmed crop or employing methods such as field boundaries can help provide extra habitat and prevent pollution of watercourses and therefore encourage an ecosystem.

Straw bale building may be able to spearhead Biodiversity Conservation in the built environment by instilling the notion of Nature as a holistic intertwined and interconnected part of the build over the total life cycle of the material. However to make this possible the method will have to be proved viable. This will in turn requires a skill set to be developed amongst many professions including agricultural, planning and surveying, but above all one capable of proving the health of a build. Presently the lack of credible scientific research is restraining straw bale building from becoming more widely accepted.

The relationship of straw and moisture is of most concern, and in developing a monitoring method capable of demonstrating the history and potential risks in a build will help verify this method of construction. In conclusion, the straw probe and wood disc show encouraging initial results however the need for further study in both methods are required. Further research will be laboratory based to prove performance and reliability and will subject the two new methods to rigorous testing including environmental simulations and cycles of temperature and moisture.

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Building procurement

Operating the renewed school estate – an empirical insight into cost and PFI

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Abstract:

The use of the Private Finance Initiative (PFI) as a procurement method for capital schools projects over the past decade has been considerable, and a controversial issue. The relevance of procurement method on the operational performance of projects and facilities is an area cited as needing more research by amongst others the National Audit Office. Recently, the relative benefits of rebuilding verus refurbishment have also become an issue, especially in the context of cancelation of the Building Schools for the Future programme, and the James Review of how to get better value from likely decreasing total capital expenditure on schools. In attempting to fill this knowledge vacuum, this study presents comparative samples of normalised expenditures post-renewal on facility services costs in renewed English comprehensive secondary schools. Data is presented in elapsed time relative to year of school renewal, sampled to produce early facility life cost profiles up to a maximum of 9 elapsed years by both procurement method (PFI and Non-PFI), and type of capital works (refurbishment and new / re-build). The results include that total facility services costs in PFI schools are higher (though not significantly) in six of the nine elapsed years. Total facility services costs are broadly similar over the nine elapsed years following renewal in rebuilt and refurbished schools. The influence of procurement method on expenditure on certain facility services, coupled with high correlations between procurement method and type of capital works, prevents clear conclusions on the independent impact of type of capital works on operational expenditure. As expected, higher expenditures on building maintenance and improvement are witnessed in PFI samples in certain years, in line with life cycle financial modelling principles.

Keywords:

operational cost, PFI, renewal, schools, whole life cost.

1 Introduction

This paper is an empirical study of the on-going facility related operational expenditures of renewed secondary comprehensive schools within England. The analysis seeks to benchmark objectively the operational expenditures of such schools according to:

the procurement route that led to the school's renewal, i.e. via the Private Finance Initiative (PFI) route or not;

the form of renewal undergone, including 'new build', 're-build', 'refurbishment', 'partial refurbishment'[1].

The cancelation of Building Schools for the Future (BSF) capital investment programme leaves the issue of a deteriorating school estate unresolved. Lack of national school condition data[2] means we have no objective data with which to measure either:

change in the overall condition of the estate, on average or as a distribution;

or, specifically, to measure condition in the renewed schools examined here

'Performance' of renewed schools can in principle cover everything from educational outcomes to quality of current FM services and asset condition. This paper only looks at FM cost, but is an output from a research project looking at both cost and performance.

The ultimate funding of state provided comprehensive education is always by the taxpayer. However, over the past decade, the use of the PFI to finance upfront investment in schools has been considerable. According to the latest HM Treasury PFI signed project list of March 2011 (HM Treasury, 2011), the Department for Education (DfE) has 162 PFI projects (134 in operation, 28 in construction). The estimated capital value of these 162 projects is £7.76bn. The vast majority of these projects are in fact schools projects, but will include primary as well as secondary schools. In part due to the high transaction cost of arranging PFI projects, and the relatively low capital value of a single school, many PFI projects provide for the construction and maintenance of numerous separate schools within one bundled contract.

It is evident that a considerable amount of the recently renewed school estate is under the regime of PFI construction and operation. This paper seeks to benchmark the operational service expenditures of these schools with comparable recently renewed Non-PFI schools to shed light on relative cost attributable to procurement method.

The School Building Surveys (SBS) of 2007 and 2009 reveal fewer than 15% of comprehensive secondary schools have undergone capital works greater than 50% refurbishment during the period 1992 – 2008. There remains a vast estate in need of investment to reduce a considerable yet uncertain backlog maintenance.

1.1 Aims and objective of this research

The aim of this research is to contribute to a more solid evidence base for the on-going debate concerning the cost and performance of privately financed public infrastructure. The ability to compare the operational cost and performance of social and economic infrastructure by the procurement method applied is an area cited by the National Audit Office (NAO) as requiring work:

"We have yet to come across truly robust and systematic evaluation of the use of private finance built into PPPs at either a project or programme level. The systems are not in place to collect comparable data from similar projects using different procurement routes. Unless such systems are established, together with robust evaluation of the

[1] The form of renewal is as given in the School Building Surveys of 2007 and 2009.
[2] On this lack, refer to the James Review discussed later.

overall whole-life costs of alternative forms of procurement, Government cannot satisfy itself that private finance represents the best VFM option."

(Private Finance Projects – A Paper for the Lords Economic Affairs Committee, National Audit Office, 2009b, page 8.)

We sought to help remedy this through sourcing data that is both objective and appropriately comparable. It is expected the audiences that might benefit from this research include private contractors seeking to benchmark their contract performance, as well as public policy makers considering the future of PFI as a procurement method. Some findings of this research were included in evidence submitted by the authors to the Treasury Committee's 2011 inquiry on the Private Finance Initiative.

2 Theoretical framework and recent insight

The theoretical framework is in part based on the notion of incomplete contracts and private information (Hart et al. 1997; Hart, 2003). Under a PFI contract, specified standards of operational performance must be achieved for the Special Purpose Vehicle (SPV) providing the service to avoid financial penalties. A specified standard of output implies a certain level of expenditure on inputs. It is proposed that this expenditure can take one of three forms, the first being a form of capital expenditure (CAPEX), the later two being subsets of operational expenditure (OPEX):

Upfront CAPEX – leads to a better built or higher specification asset

Annual maintenance – frequent observation and non-capital upkeep expenditure

Life cycle replacement – infrequent renewal of elements of the asset

It has been proposed that combining the design, build and operation (DBO) of a facility into one contract, as in PFI, promotes the optimisation of a whole life cost (WLC) approach, potentially resulting in lower operational expenditures (Hart *et al*., 1997; Rintala, 2004). That is, there is an option of substitution between the three expenditures above with, in theory, an associated optimum lowest level of total expenditure (in present value terms) able to provide the contracted standards. This optimisation can be considered as the internalisation of a positive externality (Bennett and Iossa, 2006), the externality being the potential for WLC savings when there are separate contracts for D, B and O. This stands whether the investment in lower WLC is verifiable or not, and, as the incentive for this is internalised within the Special Purpose Vehicle (SPV) delivering the project, no bargaining with the public client for such investment is required.

In providing the SPV with a certain enough context in which to realise minimised WLC throughout a 25-year contract, there is a trade off in the flexibility of provision (HM Treasury, 2008; NAO, 2008).

Some question the ability of PFI to deliver efficiency gains in sectors where the quality of the infrastructure can not feasibly significantly reduce operational cost, as it can in transport and water (Iossa & Martimort, 2008).

Furthermore, it is not just the bundling of the contract that is relevant, but the ownership of the asset. This matters especially when investment cannot be verified (Hart et al.,

1997). Placing the asset's ownership within the SPV further incentivises optimal WLC investment to ensure the asset value (in terms of meeting contractual standards and the resulting revenue stream) is maintained.

In theoretical terms, the public sector client cannot observe the investment of effort expended by the SPV, which is therefore said to have private information. There are two types of investment a SPV can make, as discussed by Hart et al. (1997). These include effort spent on efficiency enhancing innovations as well as effort spent on ways to cut cost through shading quality. It is acknowledged that the freedom to innovate and realise WLC has a downside. In this regard, it is anticipated that a well enough specified contract would hinder the ability to shade on quality of operational performance.

To use this theoretical framework, we distinguish 'contractable build quality' from 'design quality' (Ive and Chang, 2007). The former is contractable because it impacts on measurable operational performance or asset durability, and these measures can in turn be linked to payment under the contract.

Given the PFI payment mechanism, we hypothesise that:

SPVs will trade-off capital expenditures on design quality for those on contractable build quality, resulting in higher levels of the latter (than in Non-PFI schools) per unit of CAPEX. This will tend to reduce required OPEX on maintenance and replacement.

The relatively high discount rate SPVs will use in investment decisions, taken together with their ability to commit to levels of maintenance and replacement expenditure, will lead them to spend more on operation relative to CAPEX.

Greater total budgets available for PFI projects than for Non-PFI would result in clients specifying higher standards of operational performance. This would induce SPVs to spend more on OPEX.

Whether OPEX will be higher or lower in PFI than in Non-PFI schools will therefore depend on: (i) their relative CAPEX budgets, and (ii) the relative strength of effect (A) versus (B) and (C).

The relevance of this theoretical framework in this study, driven by the principles of WLC, is limited by the completeness, scope and maturity of available data. We have not been able to control for CAPEX or asset condition of operational facility as yet.

2.1 Recent insight

Little work has been done that compares objective measures of operational cost and performance across methods of procurement. The NAO has made extensive studies of PFI procurement during the construction phase (NAO, 2009a; NAO, 2003), which find that PFI tends to perform better in terms of delivery time and being on budget. There has been one NAO study of the performance and management of PFI hospital contracts. This study found 'the cost and performance of PFI hotel services are similar to those in Non-PFI hospitals' (NAO, 2010, pg. 6).

A similar study to the present one, using central datasets, concerning the provision of soft FM cleaning and catering services found no significant difference in cost between new PFI and new Non-PFI hospitals (Ive et al., 2010). Of the 4 years observed, there

were however instances of statistically significant higher performance levels in terms of higher patient environment ratings, NHS cleanliness scores and food ratings. The data on aspects of hard FM was not of sufficient quality to draw conclusive insight.

The James Review of Education Capital (James, 2011) notes the potential for standard designs and specifications in reducing WLC, through common material specification and lower energy use. The review does not contain similar discussion of the potential for integrated and incentivised contracts. Perhaps an indication the government may not be planning to continue to advocate use of PFI for schools projects.

3 Research method

The aims and objectives of this research were achieved by accessing an official data source[1] of commonly specified public expenditures for all schools. Other reliable public data sources[2] were then used to develop the elapsed time profile from renewal, and to identify and extract comparable samples of PFI and Non-PFI schools.

3.1 Sampling schools

The sampling and analysis was performed during the summer of 2010 with the most recent available data as it was then. The core sample of renewed schools was created through the following process:

A complete list of over 65,000 educational establishments in England and Wales was obtained from the DfE[3]. The number of secondary schools within the dataset was 4,225. The dataset was filtered by admission type to include only comprehensives. That left 3,188 schools[4].

We then cross-matched the 3,188 schools with the SBSs of 2007 and 2009[5]. This identified which schools had received significant capital works amounting to 'renewal' between financial years 1992/93 and 2007/08. This included some 403 schools.

A very small number of schools had inconsistent data between the SBS of 2007 and 2009. The data was verified from external sources such as school websites and most such schools were retained in the core sample:

Five schools were removed from the sample as SBS of 2007 and 2009 contained conflicting information;

Two schools which appeared to have been renewed twice were removed from the sample;

One anomalous school was found to be an Academy and was removed.

[1] Consistent Financial Reporting dataset maintained by the Department for Education.
[2] SBSs 2007 & 2009 and the Edubase.gov educational establishment datasets.
[3] Refer to www.edubase.gov.uk
[4] Other admissions types excluded included 'selective', 'modern' and 'N/A'. This step also removed Academies as well as Welsh establishments from the sample, as they did not have sufficient admission type data.
[5] Survey undertaken by DfE, completed and by local authorities and provided to us by Partnerships for Schools.

The remaining 395 schools formed the core sample. 133 were identified as being PFI schools according to a field within the initial Edubase.gov dataset of educational establishments. The remaining 262 are considered Non-PFI.

9 samples were made, one for each elapsed year from each school's renewal.

3.2 Expenditure variables

These comparative samples were then used to retrieve the associated expenditure data for each school in accordance with the process below:

The Consistent Financial Reporting (CFR) dataset for financial years 2002/03 to 2008/09 was obtained from the DfE. There is thus a maximum of seven years cost data potentially available for a specific school, if it was renewed before 2002/03; reducing to a minimum of one year if it was renewed in 2007/08.

From the range of available expenditure lines, an operational cost basket was created. The basket is not exhaustive of all services provided within a school, but we believe it includes the core soft and hard FM[1] services typically included within the scope of a school PFI contract. The components of the basket, and corresponding CFR reference for clarity, include[2]:

Building maintenance (E 12);

Grounds maintenance (E13);

Cleaning and caretaking (E14);

Premises staff - in-house caretakers and other similar staff (E04);

Bought in professional services - inc. PFI management fee (E28);

Catering supplies - including contracted catering services (E25);

Catering staff - capturing in-house catering staff (E06);

ICT learning resources (E20).

Expenditures were converted to constant April 2010 prices using RPIX data from the Office of National Statistics. The expenditures for each school were divided by the school's pupil capacity[3] for normalisation.

Data for each school were rearranged into elapsed time from that school's renewal using the year of capital works from the SBS as a point of reference.

[1] Hard FM is typically understood to include the management and maintenance of the core fabric of the building. Soft FM services are those pertaining to the management and provision of services provided within the building, e.g. cleaning and catering.
[2] Detailed descriptions of what each expenditure line includes can be found on the School Financial Benchmarking website: https://sfb.teachernet.gov.uk/Assets/metrichelp.htm#I01
[3] Provided in the initial Edubase.gov dataset of educational establishments in England and Wales.

The cost data were sampled separately for each of the nine elapsed years after opening of a renewed school facility. A school was only included in the analysis if it had returns for all eight of the operational cost expenditure lines identified above. This was an attempt to minimise the possibility of bad reporting between expenditure lines and cleanse the sample of inaccurate observations.

The final combined actual sample sizes vary from 73 in Year 9 to 203 in year 2.

3.3 Procurement samples – PFI versus Non-PFI renewed schools

The core sample of 395 schools was divided into 133 PFI and 262 Non-PFI schools with reference to a field from the original list of all educational establishments, which indicated if a facility was under a PFI arrangement.

Works type samples – Rebuilt versus refurbished schools

To produce comparative samples for type of capital works, the core sample of 395 schools was divided into 193 rebuilt and 202 refurbished schools. Rebuilt refers to facilities listed in SBS's as either 'new build' or 're-build', and refurbished refers to schools listed as either '80% - 100% refurbishment' or '50% - 80% refurbishment'.

3.4 On statistical testing

Independent sample two-tailed t-tests at 95 percent confidence were used for annual comparisons of total basket expenditure. When interpreting the results, if Levene's test for equality of variance found significance, the *equal variance not assumed* p-value was used. If there is no correlation between the consistency of data reporting from the school and levels of expenditure, then the samples can be considered random samples and applicable to inferential statistical analysis. As we come to understand the data more, we will develop more descriptive statistical techniques.

3.5 Comment on accounting of expenditure

Looking at the definitions of the expenditure lines within the CFR data, the soft and hard FM expenditure lines for PFI schools refer to contract payments. The amounts allocated here will represent the amount paid by the public authority for the associated service as part of the larger Unitary Charge Payment (UCP) for the complete contract.

4 Findings and Discussion

The main findings from the analysis include:

Average total expenditures on the basket of FM related services are higher for PFI school samples in six of the nine elapsed years observed. Non-PFI expenditures are higher in three years. None of the differences of means are statistically significant[1].

As expected, we observe higher levels of *Building maintenance (E12)* expenditures in PFI schools from year 5 onwards, in line with planned life cycle expenditures.

[1] A significant result with assumed equal variance in year 7 is rejected because the Levene's test for equality of variance result is strongly significant.

The *Bought in professional services (E28)* expenditure line is consistently higher in PFI schools. This is as expected as this includes the PFI management fee. There is a considerable increase here going into year 7 of operation. We propose that this is the costing of the contractually obligatory benchmarking and market testing exercises being passed on to the public sector through the PFI management fee.

The level of variance differs significantly between samples. Further work is needed to apportion and explain much of this.

4.1 Procurement type data

Table 1: Operational cost breakdown by category for years following renewal (£s per pupil capacity) – Non-PFI schools

Years following renewal	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***9 year unweighted average***
Sample size	***112***	***135***	***119***	***124***	***109***	***98***	***89***	***65***	***60***	
Building maintenance	*97*	*96*	*82*	*85*	*77*	*73*	*81*	*80*	*85*	*84*
Grounds maintenance	*13*	*16*	*14*	*13*	*14*	*14*	*13*	*14*	*14*	*14*
Cleaning and caretaking	*53*	*55*	*54*	*56*	*56*	*54*	*54*	*55*	*55*	*55*
Premises staff	*107*	*112*	*112*	*116*	*116*	*120*	*118*	*122*	*119*	*116*
Bought in prof. services	*40*	*58*	*58*	*40*	*47*	*49*	*46*	*45*	*57*	*49*
ICT learning resources	*68*	*65*	*62*	*67*	*64*	*70*	*75*	*65*	*80*	*68*
Catering supplies	*65*	*73*	*76*	*75*	*82*	*80*	*77*	*78*	*74*	*76*
Catering staff	*16*	*17*	*18*	*17*	*17*	*23*	*21*	*29*	*29*	*21*
Total	***459***	***493***	***476***	***469***	***473***	***483***	***485***	***489***	***513***	***482***

Table 2: Operational cost breakdown by category for years following renewal (£s per pupil capacity) – PFI schools

Years following renewal	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***9 year unweighted average***
Sample size	***62***	***72***	***77***	***62***	***44***	***33***	***26***	***16***	***13***	
Building maintenance	*97*	*95*	*73*	*99*	*121*	*164*	*149*	*216*	*157*	*130*
Grounds maintenance	*18*	*17*	*12*	*12*	*11*	*15*	*10*	*9*	*9*	*13*
Cleaning and caretaking	*59*	*67*	*67*	*61*	*64*	*62*	*57*	*73*	*96*	*67*
Premises staff	*47*	*14*	*16*	*16*	*12*	*11*	*12*	*12*	*3*	*16*
Bought in prof. services	*121*	*173*	*152*	*138*	*132*	*153*	*238*	*110*	*80*	*144*
ICT learning resources	*110*	*91*	*69*	*79*	*91*	*103*	*62*	*75*	*58*	*82*
Catering supplies	*68*	*55*	*51*	*60*	*62*	*64*	*70*	*61*	*52*	*60*
Catering staff	*6*	*3*	*3*	*1*	*2*	*2*	*3*	*5*	*4*	*3*
Total	***525***	***516***	***445***	***465***	***494***	***573***	***600***	***561***	***459***	***515***

Combined sample size	*174*	*207*	*196*	*186*	*153*	*131*	*115*	*81*	*73*

4.2 Works type data

Table 3: Operational cost breakdown by category for years following renewal (£s per pupil capacity) – Refurbished schools

Years following renewal	1	2	3	4	5	6	7	8	9	9 year unweighted average
Sample size	101	117	98	100	85	75	62	41	38	
Building maintenance	115	120	89	99	95	87	96	78	86	96
Grounds maintenance	16	21	15	14	13	14	13	13	12	15
Cleaning and caretaking	55	58	62	58	59	57	56	63	63	59
Premises staff	98	102	102	110	104	108	116	116	111	108
Bought in prof. services	61	67	60	51	48	53	55	41	56	55
ICT learning resources	74	68	62	66	60	71	68	62	83	68
Catering supplies	72	80	76	78	79	80	77	76	77	77
Catering staff	13	14	13	15	12	21	22	30	26	18
Total	**504**	**530**	**480**	**491**	**469**	**492**	**504**	**477**	**514**	**496**

Table 4:Operational cost breakdown by category for years following renewal (£s per pupil capacity) – Rebuilt schools

Years following renewal	1	2	3	4	5	6	7	8	9	9 year unweighted average
Sample size	73	90	98	86	68	56	53	40	35	
Building maintenance	71	64	68	78	83	108	96	137	110	91
Grounds maintenance	13	11	11	11	12	15	12	13	14	12
Cleaning and caretaking	55	61	56	57	58	55	54	55	62	57
Premises staff	69	47	46	51	64	72	69	84	86	65
Bought in prof. services	81	138	130	98	101	103	129	76	67	103
ICT learning resources	96	82	68	77	87	88	76	72	69	79
Catering supplies	58	50	57	61	73	70	72	74	62	64
Catering staff	11	9	11	8	12	13	12	18	22	13
Total	**454**	**463**	**447**	**441**	**492**	**524**	**520**	**530**	**492**	**485**

Combined sample size	174	207	196	186	153	131	115	81	73

4.3 Discussion

It should be noted that there is considerable correlation between a school being rebuilt and a school being procured through PFI. Around 80% of the rebuilt sample, but approximately 33% of the total sample, comprises of PFI facilities. This provides further insight into the previous findings from procurement cost profiling. It is therefore reasonable to assume that the sample of PFI facilities may have incurred higher up front capital cost, not only because of the incentivisation for lower whole life cost encouraging high specification build, but merely because within these samples, PFI facilities comprise of more new builds and rebuilds, and less refurbishments.

The cancelation of the BSF programme along with notably minimal referencing to the terms ‘finance’ or ‘PFI’ within the James Review, suggests the future scope of PFI capital investment in the school building stock is limited. The current financial structures imposed by the UK government have clearly signalled the cessation of major renewal programmes for social infrastructure assets such as schools. Along with a

political desire to encourage more local decision-making, this financial challenge suggests schools will see smaller and more specific alterations and improvements.

5 Conclusion and Further Research

We believe this is the first study of it's kind for the UK. It uses officially collected data on cost and operation of a large portion of the school estate, to inform objectively the debate concerning the relative costs of alternative procurement methods. Using the best publicly accessible data, it has been shown that no years of operation witness statistically significant differences in average total FM basket expenditure between PFI and Non-PFI samples.

Furthermore:

In contrast to the near flat Hard FM expenditure observed in Non-PFI facilities over the first 9 years of operation, PFI facility operators are observed to sustain higher hard FM expenditure from years 5 to 9;

There is significant increase in the *Bought in professional services* expenditure line in PFI facilities from year 6 to 7. We propose that this is explained as the result of PFI operators passing on the cost of benchmarking and market testing activities within the PPP management fee.

In conducting this research, significant time was spent attempting to find data on the physical condition of the built infrastructure. Neither the SBS of 2007 or 2009 asked that an objective metric indicating the condition of the building be provided. Ofsted reports do not provide data on the condition of the physical building, though they do provide assessments of the 'learning environment'. We considered this as an inappropriate proxy for asset condition.

Recommendation 8 of the James review reads:

> "That the Department: gathers all local condition data that currently exists, and implements a central condition database to manage this information; Carries out independent building condition surveys on a rolling 20% sample of the estate each year to provide a credible picture of investment needs, repeating this to develop a full picture of the estate's condition in five years and thereafter."

(James Review of Education Capital, The Department of Education, April 2011, pg. 50)

The authors wholeheartedly support the establishment of common indicators of asset condition on the principle of 'what gets measured, gets managed'. Subject to this recommendation being enacted, we propose to revisit this analysis in future years. We are concerned that in an era of austerity and cost cutting, the collection and collation of the data necessary for such analysis will be reduced or even stopped. We urge policy makers to resist such temptations.

We have yet to develop a robust capability to control for capital expenditure. Some data is accessible but further work and consideration is required to establish a method.

Further planned research to build on this work includes:

Development of a parsimonious regression model to estimate significance and size of variable co-efficients in determining soft and hard FM expenditure

Development of a method to incorporate the relevance of initial capital expenditure

Identification of an indicator to control for school building condition

Incorporation of actual numbers of pupils on roll each year, as opposed to pupil capacity, to better normalise the figures

Testing additional variables as available to improve accuracy of comparisons.

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A Theoretical Framework to Understand the Relationship between Stakeholders in Malaysian Construction Industry

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Abstract:

A theoretical framework to understand the adversarial relationship between stakeholders in Malaysian construction industry is proposed. It applies the non-cooperative Game Theory (GT) and Transaction Cost Economic Theory (TCE) to traditional procurement. Both theories give insights into the heart of the industry's problem – opportunism in the nature of the relationship among stakeholders especially between client and contractor. There can be a Prisoner's Dilemma situation at the core of the client-contractor relationship, which may be the cause of project inefficiency. This is echoed by the assumption in TCE literature that there are limitations to stakeholder's rationality – bounded rationality, due to the incapacity to process information without error. Such a situation gives rise to opportunism as they need to protect themselves from possible loss. The attitudes of the contracting parties and the cooperative relationships among the project stakeholders are important to alleviate opportunism for successful project delivery. GT that emphasises the importance of future relationship as pre-condition for cooperative behaviours and Relational Contracting (RC) principles found in TCE may serve as a useful strategy towards fostering cooperative relationship and better teamwork within the construction industry. Therefore, a relationship-based procurement arrangement such as strategic partnering will improve project performance. Since the data collection is still ongoing, the discussion and analysis reported were based on the literature review and pilot survey carried out. The findings should provide a strong foundation for further research towards the development of an effective relationship-based procurement model in Malaysia.

Keywords:

adversarial relationship, game theory, Malaysian construction industry, opportunism, transaction cost economics

1 Introduction

Since construction is inherently a project-based activity, in which time, quality and budget are associated with one-time individual project (Dubois and Gadde, 2002), relationships were often built upon on a short-term basis with construction stakeholders attempting to take advantage from one another from an existing project; such

phenomenon often leads to opportunism (Cox and Thompson, 1997; Axelrod, 1984). Conflicts, lack of trust, ineffective communication, uneven bargaining power, and lack of end-user involvement are among the significant shortcomings in a construction project owing to its adversarial relationship (Latham, 1994; Egan, 1998; Chan *et al.*, 2003; Harmon, 2003; Eriksson, 2006).

The Malaysian construction industry has traditionally a lot in common with the construction industry in United Kingdom, Australia and Hong Kong in its industry structure, system, practices and procedures. Therefore, the key problem areas experienced in the Malaysian construction industry are much similar compared to those countries mentioned (CIDB, 2009). The traditional competitive approached to procurement which relied on independent firms bought together by competitive bidding has caused adversarial attitude and fragmentation in the construction industry (CIDB, 2009)

As construction relationships are argued to be adversarial, it is timely to propose a theoretical framework to investigate the nature of such relationship between stakeholders in the Malaysian construction industry. The framework applies non-cooperative Game Theory (GT) and Transaction Cost Economic (TCE) to the widely used traditional procurement in the construction industry. Both theories give insights into the heart of the industry's problem – opportunistic behaviour among stakeholders, especially between clients and contractors.

Understanding the characteristics of this behaviour will enable the researcher to formulate appropriate strategies to alleviate the problem. In this connection, GT that emphasises the importance of future relationship as the precondition of cooperative behaviours and Relational Contracting (RC) principles found in TCE may hold the key towards a more cooperative construction industry. The findings of this study thus provide a strong foundation for further route of the current research on the development of an effective relationship-based procurement model in Malaysia.

2 Literature Review

2.1 Game Theory

Game theory provides some appropriate and useful insights as to what constitutes opportunistic and cooperative behaviours in the construction industry. It is a study of rational behaviour in situations where stakeholders with various objectives participate and where interdependence between outcomes is involved (McMillan, 1992).

Cooperative behaviours describe a series of strategies that generally leads to a win/win conditions. It is characterised by mutual respond. For example, if player A makes a collaborative move, a strategy of cooperative behaviour would require player B to make its next move collaborative in response. On the other hand, opportunistic behaviour describes a series of moves that are adversarial, that the moves are planned to maximise the player's own gain at the other player's expenses, whether or not a collaborative strategy could have yield higher total benefits for both.

The theory is based on three assumptions: individualism, rationality and mutual interdependence. Individualism means that players are individual decision makers with personal and opposite interests. Rationality means that the players will aim to pursue

the best they can for themselves given the resources they have and strategies being played by other players. They can calculate the consequences of their actions and choose the best strategy to maximise profits. Mutual interdependence means that a player's benefits are depended on both his or her own strategy and other player's strategy.

Game theory is predicated on the assumption that the stakeholders are rational. They will aim to do the best they can for themselves given the resources they have and the strategies being played by the other players. Although the interdependencies often generate competition among the players, but games in business such as construction are not purely competitive; the players often have some common interests (Saxby, 2004).

Saxby (2004) further described that playing a game in business is analogous to baking a pie, whose size can increase or decrease as a result of the players' actions. Construction procurement is a particularly complicated "pie" to bake where it involves different stakeholders. The client creates the opportunity and looks to make a profit (usually monetary) and so do the various stakeholders in the project. Challenges lies on whether the players are looking to take advantages at the expenses of everyone else, or they are collaborating to increase the size of the pie.

2.1.1 The Prisoner's Dilemma Game

Game theory and the game - prisoners' dilemma (PD) are useful for analysing client-contractor relationships in construction projects, as they are very similar to such games (Lazar, 2000). In a construction project, there are economic gains at stake, and there can be winners and losers. It involved multiple stakeholders such as clients, consultants, contractors, sub contractors and so on. Different strategies are undertaken by different parties and the outcome usually depends largely on the appropriate choice of strategies and how well each strategy is executed. The PD game is one of the games that fit the situation of a construction project well.

Prisoner's Dilemma is a 2-person nonzero-sum game that can be applied to describe the conflict between individual and collective interests in many different political and economic situations, such as inter-organisational relationships (Zagare, 1984). Strategies available to the players are competitive, collaborative, or a mixture of both. Each player can choose to cooperate or to defect, resulting in one of four pay-offs as below:-

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	**R, R**	**S, T**
	Defect	**T, S**	**P,P**

Figure 1. Symbolic pay-off structure of Prisoner's Dilemma (Source: Zagare, 1984)

A PD requires T>R>P>S and R+R > T+S. T is temptation to defect, R is reward for mutual cooperation, P is punishment for mutual defection, and S is sucker's pay-off (worst outcome). It is predicted that each player in rational will pursue his own selfish ends. They will choose to defect from cooperation even though they are both better off to cooperate (Romp, 1997). A hypothetical example of PD in the construction industry will help to explain the overall idea.

3.1.1 Hypothetical Example

Two parties, (the client and the contractor), have engage one another in a construction project, both seek to obtain profits from it. After the initial project briefing, both parties are being advised by their independent advisor with the following offer:-

i. If you take advantage and the other party does not, you will gain the maximum 30% profits, but the other party will experience a 20% loss.
ii. If you did not take advantage and the other party does, you will experience 20% loss and the other party will gain the maximum 30% profits.
iii. If you both of you take advantages on one another, you will both experience a 10% loss.
iv. If neither of you take advantages, both of you will share the profits.

*take advantage = contractors search for extra work (variation) and clients' rejection of contractors' suggestions regarding alternative solutions.

It is helpful to reformulate the numbers given above into a simple hierarchy of preference as follows:

Preference Rank	Outcome	Label
4 = Best Outcome	30 %profits	"Temptation" (T)
3 = Next Best	15% profits	"Reward" (R)
2 = Next Worst	10% loss	"Punishment" (P)
1 = Worst	20% loss	"Sucker's Payoff" (S)

Axelrod (1984) labels the various pay-offs as "temptations" (T), "rewards" (R), "punishment" (P) and "sucker's pay-off" (S). Assuming the client and contractor are rational, what will be their best response? The choices available to them can be presented in the following pay-off table:

Table 1. Pay-off structure of Prisoner's Dilemma in hypothetical example.

	Contractor		
Client		Cooperate	Defect
	Cooperate	3 3	1 4
	Defect	4 1	2 2

The number on the left of each column represents the payoff for client and those on the right for contractors. The "dominant strategy" in this game is to take advantage from one another as it is better in some instances and not worst at any. Due to rational calculations, both players are caught in a loss/loss situation. Each player, in pursuing his own selfish ends, defects from cooperation even though there was a better outcome, if they had been able to cooperate (Romp, 1997). The result of a Prisoner's Dilemma is therefore an "*inefficient equilibrium*". As a conclusion, the dilemma exists where there is a short term, higher payoff for defection compared to cooperation.

However, if the players have opportunities to cooperate in future projects, cooperative behaviour can emerge. For example, if you are a client who can offer long term, profitable work to a contractor, strategic partnering is then a viable solution. The payoff structures change dependent upon how valuable the future is. Hence, it is no longer rational to defect on the first move. On the other hand, empirical researches have shown that the amount of trust between players will also affect cooperation in PD (Morgan and Hunt, 1994; Lazar, 2000). While trust and future relationship discouraged opportunistic behaviour, the strategy becomes more focused on cooperation than defection. When relationships improved, there are fewer needs for costly monitoring and control, which in turn decrease transaction costs. This will increase the profits of the current and future transaction while strengthening the cooperative spirit of the team.

2.2 Transaction Cost Economics

Another framework that has gained much interest in construction management research is transaction cost economics (TCE). TCE is a theory that indicates strategies to organise different projects (transactions) from an efficiency point of view (Williamson 1996). Efficient governance is achieved by the minimisation of transaction cost, which are those incurred for searching and gathering information on buyer and seller, writing and negotiating contractual agreements and administering their execution.

TCE is based on assumption of bounded rationality and opportunism. Bounded rationality means that there are limitations to the stakeholders' rationality, due to the incapacity to process information without error. Opportunism implies that stakeholders are self-interest seeking, they will deviate from the agreement whenever its suits their purpose and agenda (Williamson, 1985). Even though all stakeholders are not assumed

to be opportunistic, but it is difficult to identify opportunistic stakeholders *ex ante* (Rindfleisch and Heide, 1997).

According to TCE theory, there are three principal transactions characteristic: asset specificity, frequency/duration as well as uncertainty. Asset specificity refers to the dependence created through transaction-specific investments and the switching cost incurred by terminating the relationships and choosing another party. It mainly depends on the level of complexity, uniqueness and adaptability of the assets required for the exchange (Hakansson and Snehota, 1995). Frequency/ durations refer to the times the transaction is repeated. The time horizon may affect the relationship between stakeholders as recurring transaction may be governed within long-term relationships, an expectation of continuity may arise and thus cooperative behaviour may be fostered (Noordewier *et al.*, 1990). Uncertainty may arise due to unanticipated changes in circumstances surrounding the transaction leading to adaption and performance problem. (Noordewier *et al.*, 1990). In short, the greater the transaction uncertainty and asset specificity and the lower the transaction frequency, the higher is the transaction costs.

2.2.1 Governance structure

Construction contracts are seen as 'governance structure', that is, as frameworks for conducting transaction (project). Transaction can be governed within three main structures which are market, hierarchy and the intermediate *hybrid* structure, which map into price, authority and trust respectively. Williamson (1985) presents a model for the choice of an optimal governance structure for six different type of transaction, depending on their asset specificity and frequency.

Table 2. Model for the choice of governance structure
(Source: Williamson, 1985)

		Asset specificity		
		Low	Medium	High
Frequency	Occasional	**Market** Purchasing standard equipment	**Trilateral hybrid** Purchasing customised equipment	**Trilateral hybrid or Hierarchy** Constructing a plant
	Recurrent	**Market** Purchasing standard material	**Bilateral hybrid** Purchasing customised material	**Hierarchy** Site-specific transfer of intermediate product

According to the TCE framework, most of the construction projects are governed within the hierarchy structure where the transaction is usually given by the authority (client) to the agents executing them (consultant and contractors) (Larsson, 1993). It goes through

a process of constant coordination and monitoring in order to achieve the required organisational goals. Even though it ensures certain level of stability, however, it decreases mutual participation and effective communication which in turn reduce commitment and motivation from the involved parties (Das and Teng, 2001). In addition to that, the uncertainties about future prospect and contingency factors (economic and weather conditions, availability of resources) and the high asset specificity often lead to opportunistic behaviour.

2.2.2 Relational Contracting

TCE considers that the underlying behaviour of a particular transaction is always expected to be opportunistic and therefore 'negative'. Nevertheless, this problem can be mitigated by the suitable choice of contractual form (or overall governance structure), which depends on the characteristic of each transaction. Apart from market and hierarchy structure, the third type of governance structure – *hybrid* structure in TCE framework may provide an answer to the industry's opportunistic behaviour. Williamson (1996) referred to such governance structures as 'relational contracting'.

Relational contracting is based on the recognition of mutual benefits and win-win situations through cooperative behaviours and trust between the contracting parties. It represents a wide range of cooperative arrangement, such as long term contracts, partnering, alliancing, joint venture as well as better risk sharing mechanism (Blois, 2002) that are governed by trust. The formation of trust within the construction stakeholders can decrease the need for formalisation of contract as well as stringent monitoring procedure, leading to lower transaction cost and facilitate incentives for the party to cooperate. This can be done by lengthening relations through future projects, sharing risks in alliance agreement, or increasing the importance of reputation and co-operative skills in relation to price in traditional procurement. Characteristics of relational contracts and construction contracts adapted from Rowlinson and Cheung (2004a) may give a better idea on relational contracting.

Table 3. Characteristic of relational contracts and construction contracts
(Source: Rowlinson and Cheung, 2004a)

	Relational Contracts	**Construction Contracts**
Contracting Environment	• Cooperative instead of defensive. • Proactive instead of reactive.	• Cooperative, mutual trust is the desired static of contracting
Effectuation	• Flexibility and Adjustments provisions to cater for unanticipated contingencies.	• Power to issue variations with associated time and cost adjustments
Dispute Resolution	• Relational Dispute Resolution.	• Alternative Dispute Resolution

Many studies have been conducted to look into the possible ways of improving project performance in Malaysia (Al-Tmeemy *et al.*, 2011; Takim and Adnan, 2008; Sambasivan and Yau, 2007; Abdul-Rahman *et al.*, 2006). However, there has yet been any widely published research that has described construction stakeholders' attitudes and behaviours in relation to project success. Most of them have failed to look into the heart of the industry's problem – opportunism in the nature of the relationship among stakeholders especially between client and contractor. Even though various dimensions

of project success have been discussed, but the researchers have remained relatively silent on the matters relating to opportunistic behaviour and the lack of trust among construction stakeholders in Malaysia.

Understanding these two important variables will enable the researcher to address the core problem in the industry and to further develop an effective procurement model that promotes the formation of trust and instil greater level of confidence among stakeholders. Without addressing the opportunistic behaviour and the lack of trust at first, other strategies and efforts on project success would be futile.

3 Research Methodology

As the study is at the early stage of the research, it is beyond the scope of this paper to discuss any concrete research methodology. However, potential research methodologies have been reviewed and adapted for this research. As part of the wider on-going research, this study would satisfy the qualitative nature / "interpretivist" philosophical stance of the research, in order to gain a deeper and specific understanding of the construction industry in Malaysia.

Apart from the theoretical framework discussed, semi-structured interviews with clients and contractors in the Malaysia construction industry will be carried out to obtain empirical data concerning especially the bidding process, the contractual relationship and the level of trust between both parties in order to corroborate with the assumptions made in the framework. It shall provide vigorous findings for the further research towards a development of an effective relationship-based procurement in Malaysia.

Samples for the semi-structured interview would adopt a purposive sampling approach. For this study, the samples will be selected based on the size of their company as well as nature of participation in different project type such as residential projects, commercial projects, mixed development and infrastructure work.

4 Findings and Discussion

Table 4. Overall ranking of top fifteen critical success factors contributing to the success of construction projects in Malaysia.

Factors	Mean	Std. Dev.	Ranking	Categories
Financial Capability	4.818	0.386	1	Client
Control of subcontractor works	4.818	0.386	2	Contractor
Competence	4.727	0.445	3	Consultant
Cooperation in solving problems	4.636	0.481	4	Consultant
Competence	4.545	0.656	5	Team Leader
Commitment	4.545	0.498	6	Consultant
Skilful worker	4.545	0.656	7	Contractor
Adequacy of design details & specification	4.545	0.498	8	Contractor
Industry related issues (availability of resources)	4.545	0.498	9	External
Commitment	4.455	0.656	10	Contractor
Communication among project stakeholders	4.455	0.656	11	Consultant
Involvement to monitor the project progress	4.455	0.656	12	Contractor
Effective allocation of man power	4.364	0.481	13	Project
Shared authority and responsibility among clients, consultants and contractors.	4.364	0.643	14	Procurement
Nature	4.364	0.643	15	External

A recent pilot survey was conducted to assess the critical success factors for the construction project in Malaysia. The questionnaire was distributed to three target

groups: private developers, consultants and contractors. The respondents were required to identify, from the list of factors, which they agreed to be critical to the success of construction project in Malaysia.

Based on the findings tabulated in table 4, a total of fifteen top critical success factors were consolidated from the thirty-seven factors being examined. The study recommends that more emphasis should be given on improving the human relationship factors such as competence, commitment and communication in order to ensure the successful implementation of construction project in future.

The findings are in line with the assumption of the theoretical framework proposed in this paper. As demonstrated by GT and TCE approaches, the traditional procurement is seen as an inefficient process as it promotes delayed payment progress, excessive demand and variation as well as unrealistic competitive bidding. This is due to the nature of the procurement procedure which encourages opportunistic behaviour to emerge since decisions were made based on human rationality.

On the other hand, the findings are also coherent with the growing trend in recognising the importance of human relationship factors towards project success (Toor and Ogunlana, 2009; Andersen, 2006; Dainty *et al.*, 2005; Chan, 2004; Walker and Hampson, 2003; Nicolini, 2002). Fellows (2010) emphasised that in order to 'inflict' a paradigm shift in the construction industry, it is crucial for the researcher to recognise the significance of human factors – the soft elements that are 'critical' to the success of the industry alongside with thorough cultural assimilation, understanding and support from top management.

Therefore, in order to improve on project performance, the industry needs to look into strategies that alleviate opportunistic behaviours and promote better working relationship among project stakeholders. This can be achieved through the development of mutual trust within the industry by adopting a relationship-based approach in procurement. Mutual objectives, structured problem resolution mechanism, teamwork initiatives, top management advisory, incentives programme and continuous improvement strategies from relationship-based procurement (Walker and Hampson, 2003) may enhance the mutual level of trust within the industry.

Nevertheless, it should also be noted that based on PD assumption, a change of adversarial attitude alone does not guaranteed the success of the construction project but rather it is the prospect of future projects that is critical to the development of cooperative behaviour in the industry. Hence, the relational contracting principles found in TCE that encourage the formation of long term relationships may serve as a useful strategy towards fostering co-operative relationship and teamwork within the industry (Rowlinson and Cheung, 2004a)

5 Conclusion and Further Research

It is insightful to apply non-cooperative game theory and transaction cost economics to traditional procurement. Both GT and TCE were studied in detail to form a theoretical framework that gives a clearer understanding towards the nature of the opportunistic behaviour among construction stakeholders in Malaysia especially between the clients and contractors.

Based on the current findings, it is made known that the nature of adversarial relationship within the construction industry is originated from the opportunistic behaviour caused by human rationality/ weaknesses. It is evident that the industry itself recognised the existence of adversarial relationship and opportunistic behaviour in the industry's practise, and they are now demanding a change from the current situation.

The prospect of future work played a critical role in escaping from such situation. Industry at large should look at contractual arrangement that can offer a future such as strategic partnering and alliancing. Apart from that, the construction industry development board should encourage and educate the stakeholders on the benefits of cooperative approaches. Government agencies should be the pioneers and projects champions that start to adopt cooperative measure in their project management.

As this is an on-going study, the next stage of the research would be to carry out the interview process for obtaining empirical data for further analysis.

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A temporal view of partnering within Scottish Housing Associations

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Abstract:

Housing Associations have a responsibility to provide well maintained and functional properties, therefore, must continually upgrade or build new properties to accommodate tenants. A recent report published by by Gibb and Leishman (2011) highlighted that Housing Association grants from the government for new build properties were likely to be drastically cut, with new funding methods, including private sector participation being explored. Value for money achieved by Scottish Housing Associations has remained a constant driver throughout the recession. The challenging economic times have placed significant importance on social housing providers achieving value for money from all construction and maintenance projects. The economic climate may tempt construction clients to revert to lowest price, traditional procurement, as contractors cut margins to survive the business environment. A reversion in procurement method is a divergence away from the advocated use of collaborative partnering arrangements. UK central government has advocated the use of partnering, by public sector or quasi-public sector organisations to achieve best value. There is however, criticism, not only associated with the concept of partnering, but specifically partnering within the public sector. This paper assesses the historical benefits and limitations associated with partnering arrangements and the concept of value for money. Understanding the principals of partnering and value for money enables assessment of the validity associated with Scottish Housing Associations utilising a partnering procurement arrangement when striving to achieve value for money. The findings show that Scottish Housing Associations may achieve value for money, through the implementation of a partnering procurement arrangement, which significantly eases the cuts in spending and optimise the investment of capital for necessary projects.

Keywords:

partnering, procurement, Scottish housing associations, value for money

1 Introduction

The current requirement for Housing Associations (HAs) to achieve value for money (VFM) during the difficult economic climate has never been as crucial. With substantial spending cuts being introduced, Scottish Housing Associations (SHAs) have been

instructed to maximise the level of value achieved. SHAs have embraced the partnering procurement method, however the current economic climate has dictated that construction clients may be tempted to revert to traditional procurement. The low price tenders submitted by contractors attempting to survive the business environment, appear to being capatilised upon by clients to drive down costs. Strongly opposing this strategy, Sir Michael Latham (2008) emphasised that if clients abandon best practice, close down frameworks, stop partnering, and return to lump-sum, single-tender contracts, based solely on lowest price, the industry will go back to its undesirable practices. Within the context of SHAs, the Scottish Housing Regulator (2011) commented that as the quality of the housing stock has improved at a steady pace it was believed that some landlords may have been able to take advantage of falling tender prices during the current climate. Despite this, publications have identified that lowest price tenders do not represent VFM (OGC 2003; OGC 2007). There is therefore a risk that SHAs reverting to lowest price tenders, will not achieve VFM, thus limit the level of investment to develop new properties and maintain existing dwellings.

Partnering has been endorsed through Government publication as an effective procurement method, which should provide cost, time and quality benefits (Latham, 1994; Egan; 1998; OGC, 2003). HAs have been encouraged to use partnering, when possible to achieve positive results. There may be an argument however that the differing characteristics of HA clients could prevent partnering from effectively functioning. There is a requirement to ensure demonstration of competitiveness within public sector and quasi-public sector procurement to protect the taxpayer against anti-competitive behaviour that can result from partnering agreements (Fisher and Green, 2001). Another characteristic is that procedures implemented by the Public Sector can often work against the mutual trust and open relationship, which forms the prerequisite of partnering (Woodrich, 1993). HAs may also be prevented to applying an agreed share of savings with the contractor. The Housing Forum (2000) highlighted that this may be due to individual financial standing orders or the perceived need to have a fiduciary duty to tenants and the taxpayer.

HAs are not-for-profit bodies, who are committed to providing low cost social housing to society, as opposed to private sector organisations that focus on profit. Excess income is re invested into maintenance and development of properties. The differing characteristics may prevent the historical and generic benefits of partnering being achieved, therefore historic limitations of partnering may manifest into SHA projects. The necessity for SHAs to achieve VFM was highlighted by the Housing Minister in the Scottish Parliament, Alex Neil Scottish Government (2010), emphasising that achieving VFM was an essential element to underpin the Scottish Government`s future investment programme in housing. The requirement to identify the applicability of the reviewed benefits and limitations of partnering within the context SHAs is necessary when considering that approximately £326m was spent by SHAs in 2009/2010 for planned and reactive maintenance alone and the number of new build properties constructed in 2009-2010 was 8,092 (Scottish Housing Regulator, 2011). The motivation for this paper is to therefore identify the historic benefits and limitations of partnering. The validity of the reviewed benefits and limitations will be tested within the specific context of SHA clients in the near future. Understanding the benefits contributing to VFM or the limitations failing to achieve VFM, will provide much needed clarity to identify if partnering will facilitate the achievement of VFM.

2 Literature Review

2.1 Housing Associations and Partnering

HAs and Cooperatives have functioned in Scotland since the mid-1970s in response to the continual failures of both private and public sectors to deliver high quality, affordable rented housing. Scottish Federation of Housing Associations (2011) highlighted that SHAs have been at the forefront of developing, building and managing high quality homes for the past 35 years. HAs have continually contributed to public housing policy, providing a range of housing solutions at both local and national levels. The importance of SHAs is emphasised through evaluating the proportion of housing they manage. A recently published report from the Scottish Federation of Housing (2011) highlighted that currently, HAs and Co-operatives own and manage approximately 47% of Scotland`s affordable social housing stock. The percentage translates into 279,144 dwellings, equating to approximately 11% of all Scottish homes, resulting in an indicative value of SHA assets of approximately £7.6 billion.

The report published by the Scottish Housing Regulator (2011) highlighted that the sector medians for direct maintenance costs in 2009/2010 were £574 per house for planned maintenance, compared with £505 in 2008/2009, and £402 per house for reactive maintenance, compared with £416 in 2008/2009. The Scottish Housing Regulator (2011) further noted that although £192.1m, total planned maintenance across the sector has increased by approximately 3.0% from the 2008/09 level (£186.6m), the per house increase is minimal at 0.88% from 2008/09 when adjusted for inflation. The figures do however highlight that reactive maintenance costs have decreased. This is demonstrated in total across the sector where a drop of around 3.6% took spend in 2009/10 down to £133.9m from £138.9m in 2008/09, and also per unit house where a slightly bigger drop of 5.2% took the spend down to £477 from £503 in 2008/09.

The recent budget proposed by the Scottish Government (2010) reduces the total amount of funding to support provision of new build by HAs. It is now apparent that new build programmes will rely on a greater level of funding from HAs own reserves or borrowing capacity or some combination of both. The Scottish Housing Regulator (2011) emphasised that this has the potential to increase the financial risk attaching to the sector as a whole as well as to individual RSLs, should they continue to build in this necessary method. An essential factor associated with private funding and increase risk allocation is the achievement of VFM for both new build and maintenance by SHAs. Adopting the most effective procurement method to achieve this is now of vital importance to increase the level of VFM attained. Failure to achieve this will only exacerbate the limited funding available.

HAs have been encouraged for some time to utilise partnering agreements as the preferred procurement method for delivering construction and maintenance projects. Partnering was described by the OGC (2003) as the integrated project team working together to improve performance through agreeing mutual objectives, dispute resolution methods and committing to continuous improvement, measuring progress and sharing the gains. SHAs invest significant capital in maintenance, refurbishment and new build projects annually. Loraine and Williams (2000) stated that partnering for HAs is based on a number of key objectives, which include: cutting out waste; increased predictability of out-turn cost and time; reduce the impact of traditional client/contractor procedures, resulting in increased costs; the need to improve the experience of the

user/tenant in terms of communications and quality; the need to secure life-cycle cost benefits; the desire to utilise innovation and technology to maximise resource potential. Identifying the actual benefits or limitations received by SHAs through the utilisation of partnering will uncover the legitimacy of use and endorsement within a SHA context.

2.2 Value for Money (VFM)

VFM is a term utilised not only in construction but all procurement processes, especially within the public or quasi-public sector. The fundamental ethos of VFM can be characterised through three principles, namely: Economy, Efficiency and Effectiveness. Economy encapsulates the price paid for the service, efficiency is the measure of productivity and effectiveness is the measure of impact achieved. The Audit Commission (2005) believed VFM is achieved when there is an optimum balance between the three factors. The Audit Commission however fails to discuss the relationship between the factors on a quantitative basis, suggesting that value assessment should be formed through an overall judgment of quality in relation to cost.

The OGC (2007) advocated that the primary consideration in defining a procurement strategy is the need to obtain overall VFM in the whole life of the service or facility. In agreement and within a HA context, the Chartered Institute of Housing (2007) emphasised that VFM is a fundamental business driver both from within HAs and in terms of regulatory expectations. The potential resurgence in traditional procurement due to the economic climate contradicts the policy identified by the OGC (2007), highlighting that traditional procurement should only be used where it can be clearly demonstrated that this approach will provide better VFM than preferred integrated procurement routes, including partnering. On this basis, construction clients may consider the notion of lowest price tenders as superseding the overall benefits of achieving VFM. HAs must be made aware of the validity of the historic benefits associated with partnering to discover if VFM will be achieved. Should the limitations of partnering be more relevant to HAs, the reversion to traditional for lowest price tenders may actually be beneficial to the HAs during this economic climate.

2.3 Partnering Benefits

The following benefits and limitations in Section 2.4 have been identified through a literature review, applying generally, without specific focus on client group. Understanding the applicability of the theoretical benefits or limitations of partnering to SHAs is important during the economic climate.

2.3.1 Reduced Litigation

Litigation can be a significant issue in many construction projects, but is more prevalent in traditional contracting arrangements. Chan *et al.*, (2003) believed that partnering arrangements greatly reduces issues of disputes, claims or litigations through open communication and improved working relationship. This could be beneficial to SHAs during an economic climate conducive to arising disputes and claims.

2.3.2 Effective Cost Control

Partnering can result in effective cost control, which can result in a reduction of overall project costs. Pheng (1999) highlighted that one of the benefits for both the client and contractor that can be achieved from partnering is the reduction in risk of cost over runs, due to more effective cost control. Should partnering enable more effective cost control,

SHAs could ensure that spending budgets are not exceeded, and continually strive for potential savings through setting mutual objectives between the partners.

2.3.3 Effective Time Control

More effective control of time could significantly facilitate SHAs, as mitigating tenant disruption during maintenance or refurbishment works could increase tenant satisfaction. Black *et al*., (2000) emphasised that partnering can reduce delay as a result of better schedule performance. There is however a large input of time and resources needed to effectively set up a partnering project. SHAs must consider the resources available and the time needed to implement the partnering arrangement.

2.3.4 Improve Quality

Pheng (1999) identified that partnering arrangements facilitate communication of quality issues and enables earlier recognition of potential problematic issues, through focussing energies on the ultimate mutual goal therefore facilitates the development of quality consciousness. The literature consensus advocates a higher degree of quality available to the client through adopting a partnering arrangement. The nature of HAs providing accommodation for tenants dictates that quality is an important priority, therefore the validity of this perceived benefit must be confirmed for SHAs.

2.3.5 Increased Overall Satisfaction

When considering satisfaction for SHAs, the actual satisfaction of the tenant is vital. The HA must also be satisfied from the outcome of a project, however this is intrinsically related to the satisfaction of their tenants. If this can be achieved by the SHA being closer to the construction process and better informed through utilising partnering, this will contribute to the overall VFM.

2.3.6 Improved Health and Safety Performance

Chan *et al*., (2003), suggested that partnering organisations taking collective responsibility can reduce the risk of hazardous working conditions and avoids workplace accidents. The substantiation of the belief that health and safety performance will improve through partnering remains elusive. A procurement method should not have any implications on the health and safety performance.

2.3.7 Reduced Administrative Costs

Chan *et al*., (2003), identified that costs associated with negotiating and administering contracts is lowered as partnering organisations become knowledgeable of the counterpart's legal and litigation concerns. The current economic climate could justify SHAs deciding not to invest these initial resources as funding is reduced. A detailed evaluation should be undertaken by the HA to assess the feasibility of expended resources on this start-up period.

2.3.8 Increased Innovation

Increasing innovation through the high degree of open and trustworthy communication may improve the design and construction phases of a project. Jones and O'Brien (2003) believed that partnering can enable more innovation for products and processes related to delivering greater end user value and enhanced whole life performance. Innovation

could be jeopardised if complacency enters the arrangement through time as partners may become too comfortable and not strive to continually innovate.

2.3.9 Sharing Risks and Resources

A pre-requisite of partnering is sharing risks and resources. Chan *et al*., (2003) believed that partnering can also produce the tools for both measurement and sharing of gains and risks. This could be more difficult within the public sector as sharing savings made with a private sector organisation, could be perceived by taxpayers as wasteful.

2.3.10 Efficient Problem Solving

Jones and O'Brien (2003) noted the increased collective learning arising from joint problem solving contributing to more effective decision making, more understanding of the process, increased trust and greater commitment. SHAs could work closely with partners to anticipate problems and formulate action plans to address problematic issues.

2.4 Partnering Limitations

2.4.1 Decentralised Decision Making

Decentralised Decision Making could hinder the success of the project. Bennett and Peace (2006) suggested that modern forms of decentralized decision-making can potentially undermine partnering as decisions by one department are contradicted elsewhere. A SHA decision making process could hinder the flow of decision making within the arrangement and therefore oppose the ethos of the partnering arrangement.

2.4.2 Increased Interdependency

Partnering can inadvertently promote a degree of increased dependency, which could negatively affect the quality of output. Cartlidge (2002) highlighted that there is a potential risk of increasing the level of interdependency amongst partnering organisations within strategic relationships, with possible ideas becoming stale due to lack of new players. SHAs and their partners must ensure that interdependency does not manifest into the arrangement, which would negatively affect the outcome.

2.4.3 Early Commitment of Resources

Partnering arrangements normally involve the commitment of resources early, which, may result in not realising rewards for a prolonged and considerable period of time. Jones and O'Brien (2003) noted that a considerable investment in time and resources is required to build closer and more open relationships. An indication of the expendable level of resources should be provided to SHAs for them to assess the feasibility of implementing partnering for specific projects.

2.4.4 High Professional Fees

Cartlidge (2002) suggested that consultants are involved in extra work due to the increase in alternative solutions arising and require consideration. This importantly highlights that SHAs must consider the cost for consultancy fees when assessing the feasibility of implementing a partnering arrangement. An estimate should be incorporated within the assessment of likely resources to be committed to the process.

2.4.5 Increased Complacency

Partnering provides continuity for parties over a period of time. There is a risk that this could lead to complacency within a project. Cartlidge (2002) noted a risk that partners may become complacent and relationships become too familiar and cosy. Human nature dictates that this limitation could easily manifest within a SHA partnering arrangement. This could result in SHAs becoming unfamiliar with the market, and the benefits of downward trends may not be passed on to clients tied into long-term agreements.

2.4.6 Inequitable Distribution of Risk

The allocation of risk should be governed by the partner more able to cope with the risk. Roe and Jenkins (2003) emphasised that risk apportionment should reflect the appropriate level to each partner, encouraging firms to place the necessary commitment into the relationship. If SHAs do not ensure an equitable and sensible distribution of the risks, there is a high probability that the theoretical benefits will not be achieved.

2.4.7 Loss of Confidentiality

The possible loss of confidentiality associated with proprietary information could result in the competitive edge being compromised. Ashworth and Hogg (2007) highlighted that confidentiality could also be compromised in the event of an arising dispute. SHAs would have to ensure clear communication with their partners that sensitive information remains confidential at all times and is not disclosed within the public domain.

2.4.8 Lack of Competition

European Procurement Law requires a degree of competition to ensure competitive prices and the opportunity for parties to tender. For public sector projects, a partnering arrangement could place non-partnered contractors at a disadvantage during tendering as Olsen and Espling (2004) suggested that the partnering contractor could possess restricted information on the public sector body, thus reduce competitiveness. SHAs must ensure a rigorous competitive tendering process is undertaken at the beginning of a long term partnering arrangement, adhering to current procurement legislation.

2.4.9 Corruption

One of the perceived limitations of partnering is the potential for corruption to enter through time. Hibberd and Newman (1999) noted the increase risk of unethical practice associated with partnering. Any allegation of corruption within a SHA procurement process would have serious detrimental effects on the HA. Caution and transparency is required to ensure corruption does not enter the partnering arrangements.

2.4.10 Over powerful Partners

Bennett and Peace (2006) emphasised that powerful partners dictate terms and conditions of the partnering arrangement to marginalise partnering organisations which are dependent on future continuity of work. SHAs must lead by example, demonstrating fairness and trustworthiness, effectively communicating and ensuring initial performance targets for continual improvement are not adjusted.

3 Research Methodology

This conference paper has been assembled on the basis of an extensive review of the existing literature. The publications include academic journals, government reports and books. Naoum (2007) identified that a literature review attempts to integrate what others have done and said, and criticise previously scholarly works, to build bridges between related topic areas, and/or identify the central issues in a field. In agreement, Fink (2010) suggested that a literature review enabled a systematic, explicit and reproducible methodology for identifying and synthesising the existing research conducted. The review of literature focuses on the necessity for Scottish Housing Associations to achieve VFM. The paper considers partnering as an appropriate procurement method to facilitate the VFM objective, through considering historic benefits and limitations. This paper will enable the conduction of further research to test the validity of the historic benefits and limitations, within the specific context of SHA clients. Understanding if partnering will increase the likelihood of achieving VFM through identifying the historic benefits applicable to SHA, could prevent a tempting reversion to traditional procurement during the difficult economic climate.

4 Findings and Discussion

This paper was solely based on a review of literature associated with SHAs and the utilisation of partnering to achieve VFM. The literature primarily highlighted the necessity for SHAs to achieve VFM for both new build and maintenance construction projects. The Housing Minister in the Scottish Parliament, Alex Neil Scottish Government (2010), emphasised the necessity for SHA`s to achieve VFM to underpin the future investment in housing development. The Scottish Housing Regulator (2011) reported that in 2004/05 the proportion of HAs housing assets that was funded from Housing Association Grant (HAG) and other capital grants was 73.1%. At the end of 2009/10 the HAG had fallen to 68.0% (2008/09, 69.4%). The reduction in funding illustrates the increasing requirement to which HAs have utilised private borrowings, as well as their own internally generated reserves, to continue to grow their asset base. These circumstances clearly highlight the need for SHAs to procure projects as effectively as possible to achieve VFM. The paper attempts to identify if SHAs should persevere with partnering to achieve VFM, through assessing the validity of the generic and historic benefits and limitations within the specific context of SHAs. The potential resurgence in use of traditional procurement, to receive the lowest price tender, exacerbated by the economic conditions could be justified, should the limitations be more prevalent in HAs partnering arrangements than the benefits.

Upon reviewing the literature, extremely attractive historic benefits for the client through implementing partnering were identified. The three significant benefits were directly related to outcomes of VFM, namely effective cost control, effective time control and improved quality. There was a general consensus within the literature that all three of these benefits can be achieved by the client through utilising a partnering agreement. Two generic benefits that could significantly facilitate the VFM remit for SHAs were reduced administration costs and improved overall satisfaction. According to The Scottish Housing Regulator (2011) lettings costs (costs of owning and managing houses) for Housing Associations was £771.9m with approximately 82% of the lettings costs attributable to management and maintenance activities. This substantial sum

highlights that SHAs could seriously benefit from receiving reduced administration costs. Improving the overall satisfaction of tenants would add to VFM and also adhere to SHAs dedication to supplying quality and affordable accommodation to tenants. The findings emphasise important benefits for the client, which if applicable to SHAs would increase the level of VFM and optimise the investment for capital for necessary projects.

The historic limitations of partnering were also identified. Increased interdependency and increased complacency were commonly viewed as serious limitations associated with partnering. Other important limitations were the inequitable distribution of risks, early commitment of resources and loss of competition. These limitations could be particularly applicable to HAs as risks are inherently passed from the public sector to the private sector, HAs resources are scarce due to cut backs, and HAs must be seen by the tax payer as receiving competitive prices. Should a significant number of the historic limitations of partnering be applicable to SHAs, then serious consideration must be given to the most effective procurement method to achieve VFM.

The findings within the literature review indicate the potential benefits associated with partnering significantly outweigh the potential limitations. However, the literature highlighted various barriers associated with the characteristics of public or quasi-public sector that could be argued will prevent the historic benefits being achieved. This included: protecting the taxpayer against anti-competitive behaviour (Fisher and Green, 2001); procedures implemented by the Public Sector can often work against the mutual trust and open relationship (Woodrich, 1993); HAs may also be prevented to applying an agreed share of savings with the contractor (Housing Forum, 2000); lack of experience associated with both the purchaser and provider of long term partnership arrangements (Burnes and Coram, 1999); and the risk-aversive nature of Public Sector organisations, which is embedded within the ethos (Burnes and Coram, 1999). The barriers highlight that some of the limitations could transpire in HA partnering agreements, namely: corruption, decentralised decision making, inequitable distribution of risks, early commitment of resources and loss of competition. Should the research identify that HAs are faced with these limitations, then perhaps the current economic climate would dictate the opportune moment to revert back to traditional procurement. The reviewed conceptual benefits and limitations that may manifest in Housing Association partnering agreements are illustrated in Figure 1.

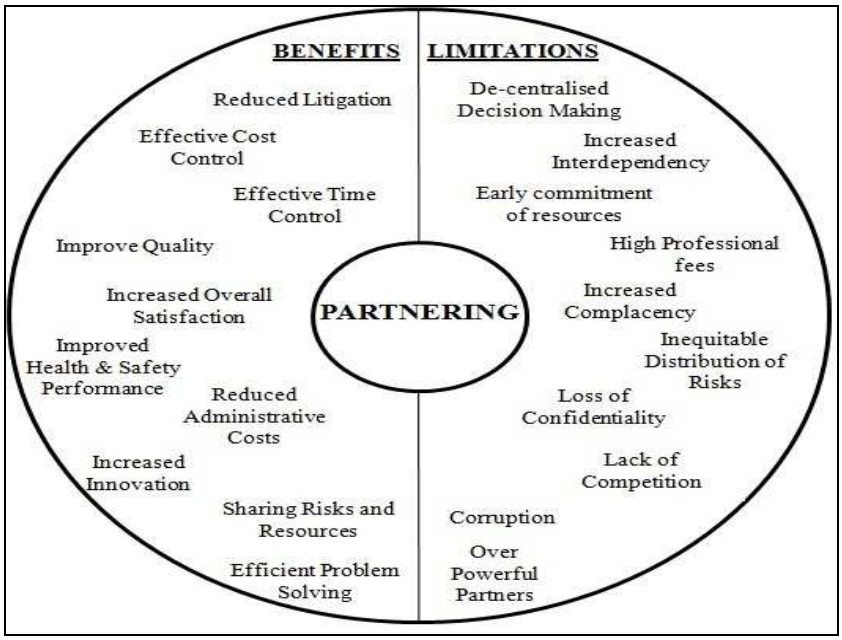

Figure 1. Conceptual Benefits and Limitations of Partnering

Despite the aforementioned barriers and potential limitations of partnering, the reviewed benefits that can be achieved by the client, highlight that partnering could significantly enhance VFM. The benefits of partnering concur with the SHA need to demonstrate VFM. It is therefore considered that should the future research highlight that the historic benefits of partnering are received by HAs, facilitating the achievement of VFM, partnering must be implemented. The identified barriers would therefore be overcome, ensuring a successful partnering agreement. The emphasis from the Audit Commission (2008) that savings per house can range from £1.66 to £220.00 through more effective procurement, highlight the need to clarify the benefits of partnering for SHAs. If the potential benefits are achieved by SHAs, any reversion to traditional procurement would be unjustified. To assist SHAs achieve the theoretical benefits of partnering, there are change management initiatives that can be introduced. SHAs should ensure pre-requisites for partnering arrangements such as mutual trust, effective communication, and commitment between partners are all present within the arrangement. Management must also introduce continual evaluation and improvement processes, through benchmarking, to monitor performance of projects and identify areas for improvement. SHAs should also utilise partnering workshops to ensure all parties fully understand the requirements of the partnering arrangement and also encourage effective communication throughout all stages of the project. SHAs that embrace the culture of partnering, implement the necessary pre-requisites and processes will increase the probability of achieving the conceptual benefits of partnering, therefore could ease the effects of reduced investment and better utilise the resources available.

5 Conclusion and Further Research

The economic climate has reinforced the need for SHAs to achieve VFM for both new build and maintenance projects. Delivering socially owned rented housing or maintaining existing stock is an important and necessary function within society. With reduced funding from the Scottish Government and the necessity to provide affordable

housing, SHAs must utilise the most effective procurement method to deliver VFM. For a long time, partnering has been advocated, with the historic benefits being widely publicised. This paper therefore attempts to summarise the generic and historic benefits and limitations of partnering, to enable the validity to be tested through further research within the specific context of SHAs.

At this stage of the research, it would appear that should SHAs receive the historic benefits of partnering, then a reversion to traditional procurement and lowest price tenders is unjustified. Confirming the benefits of partnering for specifically SHAs, in future research will provide more confidence to SHAs that they are utilising the correct procurement route. The perceived barriers associated with public sector or quasi public-sector partnering could also be disproved, should the data support the legitimacy of the historic benefits of partnering. The current economic climate emphasises the importance of understanding if partnering is effective, as the low tender prices submitted may tempt SHAs. The findings of the paper highlight that clarifying the benefits or limitations applicable to SHAs that utilise partnering is required due to the necessity for SHAs to achieve VFM and the reduced funding. The current economic climate reinforces the need to confirm if SHAs should continue or discontinue utilising partnering agreements.

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Frameworks Scotland – Making NHSScotland a Best Practice Client?

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Abstract:

The UK construction industry has been the subject of many key industry reviews, audit reports, and recommendations as to how it should improve. Many clients have embraced the recommendations, developing innovative partnering approaches to deliver their capital investment programmes. The NHS, particularly in Scotland, has often been considered to be lagging behind in the development of modern and innovative procurement routes for publically financed capital healthcare projects. In November 2008, NHSScotland launched Frameworks Scotland as a response to the key industry recommendations and various criticisms over traditional procurement arrangements. NHSScotland has developed Frameworks Scotland as a strategic, flexible and collaborative procurement route for the design and construction of capital projects. This paper sought to identify whether NHSScotland is likely to improve towards becoming a best practice client through the implementation of Frameworks Scotland. A thorough literature review of the subject was conducted. Furthermore, sections of key Scottish industry stakeholders in construction procurement were interviewed. The findings in this research in this paper are that in order for NHSscotland to improve towards becoming a best practice client through the implementation of Frameworks Scotland, the framework arrangements must be effectively managed and nurtured. Furthermore, framework arrangements must be evaluated constantly to ensure value for money and must retain a strong focus on performance management and continuous improvement.

Keywords:

NHSScotland, Frameworks Scotland, innovative procurement, best practice

1 Introduction

The launch of Frameworks Scotland on behalf of NHSScotland followed a lengthy implementation process, of over one year, involving setting up and implementing the framework arrangements, guidance and processes, as well as the OJEU procurement process for appointing the various delivery partners (Health Facilities Scotland, 2008). NHSScotland and the Scottish Government Health Directorates had been considering a national construction framework for some time. The establishment of such a framework had been the subject of an Efficient Government Fund bid to the Scottish Executive in January 2005, which although not taken forward at the time, was the original inception

of developing the framework (NHSScotland Property and Environment Forum, 2005). Subsequent to this bid, the Scottish Executive decided to use an NHSScotland scheme to pilot the principles of the NEC contract, supply chain management and collaborative partnership working and open book arrangements. A £50m refurbishment scheme in NHS Fife was selected and delivered on this basis. This was subsequently reported on, and its success paved the way for the commencement of a national construction framework in NHSScotland (O' Keefe, 2007; Health Facilities Scotland, 2007).

A substantial review of NHSScotland procurement took place, which considered heavily the framework approaches already developed by the NHS in England and Wales. This included a series of partnering workshops, which resulted in the production of a discussion paper on NHSScotland construction procurement. This paper recommended the establishment of national frameworks as the best way forward. The differences in the construction market in Scotland meant that it was deemed more appropriate to develop a bespoke solution for Scotland however using the knowledge, experiences and lessons learned from the other United Kingdom health organisations (Health Facilities Scotland, 2007). Health Facilities Scotland (2008) states that Frameworks Scotland is intended to be a long term, strategic and flexible framework procurement approach which relies heavily on the principles of partnering and collaborative working for the delivery of both new build and refurbishment healthcare facilities in Scotland. Frameworks Scotland uses the NEC Engineering and Construction Contract 3rd edition for construction projects. When implemented, it was anticipated that Frameworks Scotland could be used for an estimated annual NHSScotland capital expenditure of £100 - 150 million (Health Facilities Scotland, 2008). However it is now believed that this range could be significantly exceeded due to the initial uptake of the framework from the health boards.

Scottish Government (2009) states that although not considered mandatory, Frameworks Scotland has been established as the preferred approach to the procurement of publicly funded construction work within NHSScotland and must be considered in the formulation of any business case. Frameworks Scotland is expected to complement other procurement initiatives for the delivery of health facilities in Scotland such as the HUB initiative for procurement of primary and community care facilities (Scottish Government, 2009). Health Facilities Scotland (2007) states that Frameworks Scotland is designed to improve programme and process efficiency. Under traditional arrangements, NHS Boards will assemble a bespoke design team (following OJEU) to progress through Initial Agreement (IA), Outline Business case (OBC) and then Full Business case (FBC) before advancing to design and then tender stage, before a contractor can be appointed to mobilise and start on site. On some projects this full process may take years. Under Frameworks Scotland, NHSScotland clients can dispense with the consultant procurement stage, the design stage and the tender stage. In addition, 70 -80% of the design is done at FBC stage and construction can start on site shortly after approval of the FBC. The early appointment of a delivery partner, and overlap of design and construction activity is therefore expected to save significant amounts of time on each project.

Frameworks Scotland was intended to improve project management of NHSScotland capital projects through a more standardised approach, better clarity of roles and responsibilities, training and skills development, and introduction of a collaborative contract mechanism, which encourages, rather than restricts, good project management

(Health Facilities Scotland, 2008). Frameworks Scotland places a significant focus on value management and risk management within the construction project environment and these are considered integral to the overall process (Health Facilities Scotland, 2008). The ability to appoint a Principal Supply Chain Partner much earlier in the process than under traditional procurement, is considered highly beneficial in relation to joint and collaborative risk management, as well as in maximising value for money within the required budget (Mosey, 2009). In addition, it is felt that working repeatedly with the various health boards will allow the supply chains to gain a better understanding of the clients requirements and build stronger working relationships which will ultimately improve the design and construction quality of NHSScotland healthcare facilities (Architecture and Design Scotland, 2009). The ultimate aim of Frameworks Scotland is to embrace the principles of partnership and collaborative working and ensure that teams within and between the public and private sectors work together efficiently and effectively. This approach is intended to deliver ongoing tangible performance improvements due to repeat work being undertaken by the supply chains and ultimately make NHSScotland a best practice construction client (Health Facilities Scotland, 2008). This aim in the research in this paper was to seek to identify whether NHSScotland is likely to improve towards becoming a best practice client through the implementation of Frameworks Scotland.

2 Research Methodology

The key purpose of this methodology was to set down the principles and procedures of the logical research process that has been undertaken to analyse whether the Frameworks Scotland initiative is likely to make NHSScotland a best practice client. Based on the literature review a number of key themes were developed as follows:

Obtaining better value for money through improving time, cost and quality on NHSScotland construction projects through long term strategic partnering with consultants and contractors.

Improving relationships and reducing adversarial cultures through partnering.

Improving the results of scrutiny and audit into NHSScotland capital projects.

Standardisation of contracts and appointment terms.

Improving design of healthcare facilities and briefing within NHSScotland capital projects.

Management of the framework and partnering arrangements being key to their success.

Improving structures and communication processes throughout NHSScotland capital projects.

Improving project management through guidance and use of the NEC form of contract as a project management tool.

It was recognised that there is a degree of overlap in relation to some of these themes, however this was expected due to the nature of the subject and the linkage and

convergence of the key issues. A series of interview questions was developed, totalling 17 questions, each of which addressed an aspect of one or more of the identified themes.

2.1 Research Interview Participants

The primary source of information relates to the views and opinions of a selection of key industry personnel associated with, or with knowledge of, the Frameworks Scotland initiative. Five interviewees were selected based on their knowledge and experience of the research subject area. A brief professional profile of each interviewee is listed in the table below.

Participant	Role and Experience
Interviewee A	an Assistant Director with responsibility for Property and Capital Planning within NHSScotland Health Facilities Scotland. He is responsible for providing support and guidance and also for development of best practice initiatives relating to property, capital planning, construction procurement and estates management.
Interviewee B	an Operations Director (Technical Advisor and Project Management services) within a national multi-disciplinary construction consultancy. He has almost 20 years experience in Quantity Surveying, Project Management, PFI Technical Adviser, and Fund Monitoring of construction projects working primarily in the health and education sectors.
Interviewee C	Principal Estates Advisor within NHSScotland Health Facilities Scotland. He has over 30 years experience working in Quantity Surveying, Facilities Management, and Estates and Construction Consultancy.
Interviewee D	a Senior Project Manager within a national multi-disciplinary construction consultancy. He has 15 years experience working in Project Management, Quantity Surveying, Risk and Value Management, Property Strategy and in the provision of technical and strategic advice to clients including NHSScotland.
Interviewee E	a Principal Architect within NHSScotland. He has over 40 years experience mainly in the private sector as an Architect, Project Manager, Employers Agent, and Director responsible for Independent Certifier services within a national construction consultancy.

3 Findings

In order to achieve the aim of the research in this paper, the analysis was focused on the key improvement areas that the literature review demonstrated were expected from the implementation of a strategic partnering or framework procurement initiative and included some of the following:

3.1 Improving Relationships and Reducing Adversarial Cultures

Throughout the literature review, partnering and framework arrangements were identified as being based on reducing conflict, adversarial working, and contractual or commercial approaches to delivering projects. ProCure 21 was shown as an example of how this had been achieved in practice with many clients using the same delivery partner for their entire project portfolio. The literature review also identified that the NEC3 form of contract is based on parties working in a spirit of mutual trust and cooperation, sharing problems and risks, and working together to achieve the optimum benefits and objectives of the project.

The interviews identified that working relationships should improve due to client and delivery partner working together over a longer term, as they will each develop an understanding of the other organisations approach, culture and method of operating. The NHSScotland clients would be likely to gain efficiencies from working with the same partner as the partner would take less time and resource to gain an understanding of the clients organisation and priorities, resulting in reduced costs. With regard to the delivery partners, the incentive of repeat business and security of work over a long term period was considered to be a major contributor to ensuring good relationships are built and maintained. A key point emerging from the interviews was that delivery partners will gain an understanding of their client's way of working and be able to contribute to their business planning and overall strategy. This is considered to be a major advantage and a key element of best practice. In addition, it was noted that while improved relationships are a positive development, relationships should not develop into 'cosy' arrangements where the business relationship is less influential and the client eventually begins to take ownership of risks that they are not best placed to manage.

A further point in relation to reducing the adversarial nature of the construction industry and improving relationships, is that within Frameworks Scotland, competitors, on the main Principal Supply Chain Partner frameworks as well as the Professional Services Contract frameworks, are encouraged to participate in information sharing forums and network groups, which are set up and administered by Health Facilities Scotland. Each organisation is expected to share experiences, lessons learned, and examples of best practice. Under traditional procurement arrangements this would not be possible as organisations would wish to maintain corporate confidentiality, however they participate in the Frameworks Scotland forums on the basis that they will, or should, be awarded a fair share of the available workload and do not need to maintain the same level of competitive edge. This ultimately results in experiences gained from each individual project, being shared among all organisations, which allows continuous improvement to be exponentially increased.

3.2 Standardisation of Contracts and Appointment Terms

The literature identified that Frameworks Scotland will utilise a standardised contract form and consultancy appointment terms for all projects. This is considered to be advantageous due to the known division and allocation of risk. The interviews identified that this element of standardisation would provide a better understanding for all parties of roles, responsibilities, and liabilities on NHSScotland construction projects. In addition, it was noted that the standardised contract forms and appointment terms would greatly assist less experienced clients and smaller health boards who are less familiar with major capital projects. The interviews also noted that there was significantly less scope for misunderstandings between the contract parties, if the same terms and conditions are being used on a repeat basis. This ultimately reduces commercial risk for delivery partners and should therefore improve value for money and openness in relation to contractual issues.

There was one issue raised within the interviews in relation to the fact that Frameworks Scotland uses only one NEC3 procurement option, Option C (target cost with activity schedule). It was felt that this could be regarded as inflexible and perhaps overly prescriptive, and may not always be the best procurement option for the particular project. A further doubt was expressed during the interviews about whether standardisation will actually be maintained for the duration of the framework

agreement, as individual NHSScotland clients may begin to make amendments on a single project basis. However the literature review had earlier identified that amendments will require permission of the Frameworks Scotland management team, again stressing the importance of a nationally managed and coordinated approach to the implementation of the frameworks.

3.3 Improving Design and Briefing

The literature identified that it was expected that design of NHSScotland construction projects procured through Frameworks Scotland would be improved through earlier contractor involvement and the overlap between design and construction. The interviews generally concurred with this however there were doubts expressed by one of the interviewees, that the design team being employed by the contractor was not necessarily likely to promote the design elements, in fact it may have the opposite effect due to the delivery partner wishing to minimise costs and also develop a design which is as simple and straightforward to construct as possible. Generally, the interviewees believed that the early engagement of the contractor delivery partner would encourage more innovative design solutions, improved design quality, and better construction techniques on site. There was one particular exception to this trend with one interviewee believing that contractors did not generally provide innovation or different solutions to problems, and it was usually the designers who were most active in those aspects. Both the literature and interviewees agreed that under the Frameworks Scotland arrangements, briefing would be significantly improved and delivery partners and their supply chains would be able to develop a better understanding of client requirements through working closer together.

3.4 Management of Framework and Partnering Arrangements

The literature review identified that a key aspect of developing and maintaining a successful partnering or framework relationship is the management of the arrangements. In the case of Frameworks Scotland, the literature identified that NHSScotland had established a central framework management team following the model used by the NHS in England and Wales. Throughout the interviews there was a broad consensus from all interviewees that the management of Frameworks Scotland was a critical element of ensuring standardisation is maintained, ensuring continuous improvement is possible, and ensuring a nationally coordinated approach is fully maximised, exploited, and the benefits of that approach optimised. In addition, the central management function is also necessary to allow performance measurement comparisons and benchmarking. It also provides an element of consistency across all projects and ensures delivery partner performance and behaviour is being closely monitored, for example ensuring delivery partners are not ‘picking and choosing’ work within the central belt only and not servicing the needs of NHSScotland in more remote areas such as the highlands and islands. Overall, in general terms, the interviewees felt that effective resourced management of the framework was critical to its ongoing success.

4 Discussion

The aim in the research in this paper was keenly pursued in an attempt to fully understand whether the Frameworks Scotland initiative is likely to improve NHSScotland towards being a best practice construction client. In general, the interviewees considered the development and implementation of Frameworks Scotland

to be a positive development within NHSScotland construction procurement. Improvements in programme timescales and certainty as well as better management of costs and improved value for money were key aspects of this. In addition, from the general perspective of the interviewees, it was expected that the Frameworks Scotland initiative would improve project management, project structures, definition of roles and responsibilities, and standardisation of contracts and appointment terms. The Frameworks Scotland initiative is also expected to significantly improve a number of key issues affecting the design of healthcare facilities including briefing, design quality and functionality, and sustainability. It was generally felt that the effective management of the Frameworks Scotland initiative was a key feature of their ongoing success and contribution to the development of NHSScotland as a best practice client.

A key finding of the research is that over and above the direct benefits of the implementation of a national strategic framework procurement arrangement, there are many indirect benefits related to corresponding NHSScotland initiatives in relation to design quality, sustainability, patient focused briefing, and ward bedspacing and single room initiatives. These significant developments are not directly related to Frameworks Scotland, however are being influenced and driven by the fact that NHSScotland, for the first time, has a nationally coordinated portfolio of construction projects and extensive capital programme which is visible to all NHSScotland clients, delivery partners and consultants. The research has demonstrated with considerable certainty that procurement lead in times will be improved under Frameworks Scotland. The ability to appoint the Principal Supply Chain Partner and Professional Services Contract consultants significantly more rapidly than under traditional procurement or OJEU arrangements, combined with the overlap between design and construction will provide significant overall programme savings. It is also expected that the involvement of the contractor at an earlier stage will improve buildability and subsequently reduce construction programmes, improve programme certainty, and reduce the risk of delays, which is a highly common risk on construction projects. The involvement of a contractor delivery partner from a much earlier stage in the process, as part of an integrated project team, is also expected to significantly improve decision making through availability of expert construction advice to the NHSScotland client.

The research has also indicated that Frameworks Scotland will provide benefits in relation to project costs. While the literature review identified that partnering and framework arrangements are often quoted as providing significant cost reductions, it became clear from the subsequent interview that this was not the primary objective of NHSScotland. The real objective is to improve value for money within defined capital allocations and improved cost reporting and cost certainty through better visibility of risks and improved financial management through open book cost reporting. A key feature of the Frameworks Scotland initiative is the use of the NEC3 form of contract. Generally this is considered a flexible form of contract however Frameworks Scotland is restricting the NHSScotland clients to one particular procurement option, target cost with activity schedule (Option C), which was considered to be one possible criticism. Although this perhaps could be considered restrictive, the research demonstrated that this single procurement route was considered a success on the ProCure 21 initiative, and would also ensure that both NHSScotland and delivery partners were constantly working with the same procurement option, providing a further element of standardisation and also removing any possibility of prolonged discussion or disagreement in relation to choice of contract procurement route. In terms of the NEC3

contract generally, it is widely considered to be a better, more proactive form of contract, expressed in clear understandable language, which encourages more disciplined project management through definitive response times and encouragement of early warning of issues and risks.

In addition it is expected that the introduction of an online collaborative project extranet tool, which provides a storage repository and document management system for all project documentation, and also facilitates the management of the NEC3 procedures, across all Frameworks Scotland projects, will be a significantly positive development and is a modern innovative client led approach to best practice management of projects. The research has shown that there are significant precedents in relation to the framework and partnering approach being successfully utilised as a best practice model by other client organisations including the NHS in England and Wales. It was however noted that one of the pioneers of the framework approach, British Airports Authority (BAA) had recently announced that their frameworks were to be discontinued and replaced by other procurement options. The research demonstrated that many private sector clients may follow this example and take the view that they can secure better value for money using lowest price tendering or alternative procurement routes during this current recession and financial climate. The research did however demonstrate that best value for money is not always achieved through obtaining the project for the lowest cost.

The construction industry has been significantly affected by the current recession and many clients are being forced to cancel projects or put projects on hold due to the uncertainty or unavailability of previously secure funding streams. NHSScotland has the considerable advantage of being able to guarantee a steady flow of construction workload with a reasonable degree of certainty and is not subject to the same issues affecting their funding streams due to the known availability in advance of public capital and highly politically driven spending on healthcare. Emerging from this was the issue of the improved understanding of roles and responsibilities on NHSScotland projects. The research demonstrated that the Frameworks Scotland initiative would provide much more clarity in relation to the roles and responsibilities procured through the standardised framework contracts. The research also identified that it was expected that NHSScotland would become a more informed client, with a significant ‘corporate memory’ and an improved contractual knowledge and understanding. It was therefore expected that NHSScotland would become a more informed and better construction client, and this would improve relationships with private sector partners.

5 Conclusion and Further Research

Overall this research concludes that the Frameworks Scotland initiative is a major step by NHSScotland in improving as a construction client. NHSScotland is rapidly improving in terms of project management skills, contractual awareness, and understanding of risk within the construction project environment. At the same time, NHSScotland is becoming more design focused comprising functionality, aesthetics, sustainability and patient environment focused design. In addition, NHSScotland is becoming more performance focused and accountable in terms of value for money, which requires a greater degree of cost certainty and transparency that Frameworks Scotland will provide. Frameworks Scotland is a major development for NHSScotland in striving to become a best practice client, however it is essential to realise that this

initiative is only one aspect of the clients wider procurement strategy. The consideration of the strategic fit of Frameworks Scotland with wider NHSScotland and public sector procurement initiatives will therefore be an important factor in maintaining a holistic best practice approach. Frameworks Scotland will only be effective as a best practice model if it is effectively managed, continuously improved, embraced by the construction industry, and shown through robust and accurate performance measurement to provide real tangible improvements in time, cost and quality. The initiative certainly represents an adoption of best practice for NHSScotland based on the various criticisms, recommendations and findings of key industry reports, however in order to maintain a measure of best practice it will be vital to continue to improve value for money on construction projects through an increased focus on delivery partner innovation, risk allocation and management throughout the integrated project teams, and better design quality and functionality of healthcare facilities, ultimately improving patient care.

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Climate Adaptation and Resilience on Construction Sites

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Abstract:

Predicting the possible effect of climate change on the climate of any given country is a complex and uncertain science. The construction industry in the UK historically has used programme planning and risk analysis methods to absorb the effects of variable and adverse weather on building contracts and depended upon and experience of construction professionals to assess health and safety risks posed by weather events on construction sites to prevent the occurrence of injury, damage to property or deaths. The evidence from climate change models suggest that in the short term variability and extremes will being more common whilst in the longer term, cold weather impacts may reduce as the climate gradually warms. This paper seeks to understand the impact this may have on construction programmes and project management and understand how the UK construction industry may prepare for and overcome changing climate in managing construction programmes and contracts.

Key Words:

climate change adaptation, resilience, construction industry, risk management

1 Introduction

Belief and understanding in the issues and science of climate change and warming patterns within the construction industry at consultant level is generally thought to be high. However lack of trust in long term weather forecasting and imperceptible or gradual change in UK climate may prevent a full recognition of the need for climate change adaptation and resilience. Add to this the dependence on past experience of individuals and teams in planning and site management tasks and management and there is significant potential be at the mercy of the weather with associated risks under-anticipated. The definition of adverse weather use in the construction industry is: *weather in which operations are generally restricted or impeded*.

Using a study by Ipsos-MORI, Pidgeon (2011) claims that extreme weather influences behavior more than climatic change due to the more apparent social and economic impact felt by communities and businesses affected and having felt such impacts changes perception of climate change. Recent cold weather events in the winters of 2010 and 11 in the UK and possibility of reversed weather systems over the UK causing colder winters and drought summers may be changing perceptions of weather related risks and impacts on site and to construction programmes. Whether the projections of

scientific modelling of climate change or the experience of extreme weather disruption on sites is more likely to be utilized to plan and prepare for construction works is not clear and may rely on individual judgment. Both may be needed to influence the industry for social and economic resilience in the future and contractors need to be able to reduce health and safety, business and performance failure risks posed by future weather and climate.

1.1 Aims and objectives

The aim of the paper is to identify how contractors will need to adapt to future climate change impacts in site operations and supply chains and what impact this may have on ability of the main contractor to deliver projects safely, on time and budget.

To understand the impact of weather experienced during construction on health and safety, programme and building performance.

To understand how the supply chain will be impacted by less obvious and longer term climate change and how this could change the design and procurement of buildings in the future.

To develop recommendations for resilience planning in the supply chain of buildings, and means to advise customers of the construction industry on what to expect and how best to procure buildings in the future.

The paper intends to conclude on how best practice in project management should anticipate and respond to weather pattern and climatic changes predicted in the UK towards minimizing the impacts for the construction industry, its supply chain and clients.

2 Literature Review

Research published by the UK Climate Impacts Programme (UKCIP) is readily presented through maps depicting probability of increased temperature and rainfall until 2080. These include an expectation of milder winters, wetter summers, prolonged heat waves and increased wind loading. Changes are perhaps more pronounced in the south east and may affect cities differently than rural areas. Together these changes would impact on the performance of building services energy demand, structural stability from storm damage, ground stability and the risk of inundation from flooding. This science is generally accepted in that UK government recommends that climate will now change regardless of whether emissions rates can be capped or reduced (DTI, 2010). This acknowledgement may need to prompt changes to building performance standards to respond to how weather and climate might change over the lifetime of buildings to be constructed in the near future. It is not clear from the climate research if the UK climate will modify over time to be more like that of another more southerly maritime country or region and whether experience and building typology materials, construction methods and building services technology from these places can be drawn on effectively or not.

Government recommendations provide a view towards opportunities for businesses to exploit by embracing the challenges and seeking out market gaps in this predicted future (DEFRA 2010). Other recommendations identified by the UK Climate Impacts

Programme (BACLAIT, 2010) have provide an overview of risks and opportunities from the vulnerability of the supply chain and logistics, impacts on customers and clients, changing behavioural patterns, risks of building performance failure and also the risks of management either under-preparing for change or overreacting to a perceived threat which may remain statistically unlikely.

Advice for design of buildings for changing climate is well served by the literature at community level and at individual building level (Shaw, Colley and Connell, 2007; Gething, 2010). Many of the technologies offered centre around well known technologies such as rainwater harvesting, Sustainable Urban Drainage (SUDS), passive solar design and use of the thermal and evapo-transpiration and microclimate modifying features of materials and landscaping. These design modifications are often compatible with reduced resource availability. Refurbishing existing buildings is another important area. Advice centres round using scenarios, developing resilience and flexibility from the scenario findings and regularly reviewing mitigation plans at all levels from household to governmental.

The Confederation of British Industry(CBI) have published a very informative guide (CBI, 2010) for businesses and claim that while 87% of FTSE 100 businesses accepted that they were at risk from climate change, only 35% had responded with a strategy or taken action. This research raises cost and availability of insurance, damage to reputation and ability to achieve compliance as additional risks for businesses too consider. An approach similar to strengths, weakness, opportunities and threats analysis ("SWOT") is proposed of assessing businesses' Supply chains, Markets, Assets, Compliance, Operations and Reputation (SMACOP) to scope issues followed by a risk management exercise to develop resilience. Key conclusions are that businesses may be under-informed of the likelihood and risks posed and tend towards a reactive rather than proactive approach to planning for more difficult conditions.

The need for reliable data is clear, and whilst an excellent resource at national level UKCIP (2010) does not help in the planning of individual projects in specific locations. Nor does it help to predict the changing markets for materials and labour in the construction industry which may be directly affected by climate change (such as closure of untenable quarries or factories in coastal/fluvial regions due to flooding) but also indirectly such as the possibility pricing branches of multinational companies out of the UK as a result of the Carbon Reduction Commitment or CRC Energy Efficiency Scheme in the UK (DECC, 2011).

Research by Frith and Colley (2006) suggests a fear of limiting economic potential being used as a reason by many businesses for inaction. A lack of data which can be applied effectively also limits the ability of businesses to make reasoned judgements. They identify that the impact of a sudden financial shock caused by a weather event can be extreme and that adaptation planning is critical for business continuity. Whilst each industry is singled out for specific risks and expectations of impacts, it is clear that all sectors are interrelated with each other; infrastructure networks, transport and utilities being fundamental to the ability of all sectors to be successful, retail sales affecting industrial and agricultural demand for products, the construction industry being depending on these sectors to generate workload too. Dlugolecki (2009) notes that smaller businesses are more at risk from sudden weather impacts, furthermore some sectors are very sensitive to prolonged and unseasonal weather variability such as

tourism and farming. These sectors need to be seen holistically to accept the interrelation that exists.

3 Research Methodology

The aim of this paper was to understand the situation for a main contractor as the first point of view of the risks, threats and opportunities posed by climate change. From a position within a main contractor organization a number of means noted in the literature have been applied as follows to understand the aspects relevant to office locations in the UK;

Cause based impact analysis of individual issues

Business vulnerability and opportunities approach using the CBI method (SMACOP)

Scenario Planning; establishing what could or should happen if an event occurred to protect people and property

Catastrophe modelling (Dlugolecki 2009) which takes up a sequence of events in succession or together to identify costs or impacts in quantifiable terms.

Typically the business of a main contractor comprises utilizing a supply chain to deliver multiple buildings for a number of clients in a wide variety of geographical locations. The risks are therefore balanced between the demands and expectations of the client organization and their economic drivers and the delivery limitations and vulnerability of the subcontractors and materials manufacturers which form the supply chain working at a specific site.

A workshop was set up with a selection of invited subcontractors to draw on their experience and view point regarding the type of work they typically encountered. The participants were asked to consider what happens on site when certain extremes of weather occurred such as performance failures of materials, how programme might be affected and health and safety issues which would need to be considered. They were asked to use experience they had on large new build projects in the UK (between £1m and £50 million). They were also asked to consider the likelihood of defects and performance failure in the longer term due to conditions encountered during construction which might occur. The subcontractors included specialists for earthworks, groundworks, steel and timber structure, roofing, flooring, electrical, mechanical, internal fitout and decoration. The causes were identified as;

Higher summer temperatures (hot and dry)

Higher summer rainfall (humidity and flash flooding)

Cool humid conditions

High wind speeds and storms/tornadoes

The subcontractors also considered catastrophic events with compounded causes such as forest fires/fire risk and water shortages in hot dry conditions. Exceptionally cold weather and snow loading was not asked to be considered as part of the exercise due to

the recommendation of the research presented from UKCIP. The group was split into groups and asked to review causes based impact analysis consequences and offer possible adaptation and mitigation measures in groups covering their own specialism (structural systems, groundwork, flooring, envelope and retail interiors and refurbishment). The groups came together to review their findings, spent some time considering their own business using the SMACOP approach and then discussed the use of scenario and catastrophe modeling methods.

4 Findings and Discussion

Many of the participants had experienced of some of the causes and impacts raised either in the UK or in other climatic regions and found it easier to express their understanding or concerns using anecdotes than to envisage future projects of which they had no experience. Scenario planning was easier to perform for an identified site (with apparent constraints and hazards) than in abstract discussions. During the workshop it was noted that participants did not attempt to document the CBI SMACOP method in any detail and may have preferred taking this approach back to discuss internally rather than discuss in an exposed environment with competitors. Feedback received by the researcher following the workshop would suggest this was the case. In the workshop it was difficult to maintain focus on methodological approaches outlined as each participant responded differently to the realization of likelihood and notes have been taken by the researcher of general discussions instead as listed in Table 1.

The primary concern was that the main contractor must not allow activity to continue at risk of injury or death to operatives and members of the public. Consequences of safety risks were generally well understood and the group felt that they had benefitted from gaining some understanding about risks in specialist trades that they weren't normally interacting with on site. Both main and subcontractors need to keep good records of site and weather conditions in site diaries, site management have a duty to display weather forecast notices. Subscription to a weather service, and use of locally fixed electronic monitoring devices and anemometers would assist with this.

Subcontractors must understand how weather may affect all risks in any activity and ensure these are included in both subcontractors and general written risk assessments, especially limits and thresholds at which any particular activity must cease and who makes the decision to cease work. Site management need to have a full understanding of possible weather issues involved in risk assessments of each activity. The wind speed at which safe lifting is limited varies for different cranes and products, and is outlined in guidance BS 7121-3:2000 and in individual manuals for lifting equipment. Hand held and crane mounted anemometers must be used to gauge wind speed frequently both prior to and during lifting works. The crane operator usually makes the final decision based on his experience but advance notice of windy weather could stop the crane operator from being put at risk too (BS EN 14502-1:2010).

Table 1. Findings of participant discussions (cause based impact analysis)

Cause	Performance issue	Consequence	Possible mitigation or adaptation
Too wet	Inability to excavate effectively	H&S risk of subsidence and slumping of trenches	Avoid low lying sites with unstable soils
			Avoid deep trenches in the design
			Sheet piling design and retaining structures
		Programme is effected	Timing of work to avoid rainy season
			Allowing sufficient programme float when rainy seasons are unavoidable
		Additional materials required to fill less effective cuts	Cost of materials/over-design
	Inability to apply walling materials such as render in falling rain	Programme and critical path for enclosure of the building	Allowing sufficient programme float when rainy seasons are unavoidable
	Flooding on site	H&S site closure	Cost of programme delay
		Mess and spoiling from flood water	Additional works for repair/replace damaged, stained and spoilt works and cleaning
		Latent defects	Cost of correction
	Flooding of site access or near to site affecting staff travel	Site closure	Consideration of plan to ensure workforce can evacuate safely
		Inability to complete specialist tasks	Ensure alternative team members have adequate skills and experience to cover absence
	Flooding of main logistics routes or loss of infrastructure (i.e. bridges) for deliveries	Delay to works awaiting materials or equipment	Programme delay (using example of loss of bridge in Cumbria in November 2009 could have been a prolonged delay)
	Humidity affecting application and drying time of finishes Cool humid prevents curing and bonding of adhesives. Hot and humid prevents drying generally	Delay to programme and risk of defective work.	Programming works to allow sufficient time to dry
		Severe performance failure (for example intumescing paint, adhesives, mastics)	Eliminating dependence on seals and paints for integral performance through design
Too Hot	Solar radiation falling on roof	Albedo effect on reflective roof materials causing heat traps, and fire risk	Consider reflectance and absorption of under layers as well as final build up of roof in the design
		Heat build up on black and dark absorptive finishes (melting of products or failure to seal joints)	Alternative materials in design
	General site exposure (glare, sunburn,	Conditions can be fatal and temporary effects could	Salt tablets, sun cream, and availability of water, enforced

	dehydration and sunstroke in workforce)	lead to a serious accident, error of judgment	shade breaks. Putting on more clothes as protection against hot air reaching the body.
	Overheating inside a fully airtight building where other cooling/ventilation controls and systems are yet to be installed	Heat exhaustion	Anecdotal evidence of all works stopping on site at 43^{o}C in the Middle East and holiday period (such as in European Summer) avoids worst extremes.
		Overheating due to exothermic action and inability to cure concrete slabs properly	Planning for controlled ventilation to enable drying
	Differential solar gain through windows and roof lights	Patchy and poor curing of screed, slabs and bonding, fading of floor finishes, especially in large floor plate buildings	Change roof light orientation, material or design.
	Concrete cures too quickly	Cracking and possible latent defects	Anecdotal evidence of use of ice in middle east to slow down concrete curing
			Use of PFA and GGBS and other retardants to slow curing
Too Dry	Dust creation from dry exposed ground	Nuisance caused may result in compulsory site closure	Damping down adequate water supply required
	Concrete supplier difficulties due to water pressure or shortages to non essential services	Impact on programme	Theoretical risk - This had never been heard of by the group as such water shortages had not yet occurred in the UK
	Risk of fire on site or from adjacent sources of fire such as buildings, trees and hedges	Safety risk	Fire plan to assess nearby risks and ensure location of source of water identified and available if fire service have to pump in more remote sites
		Damage to building works - Cost and programme affected	Insurance protection against fire from outside
			Damping down of desiccated vegetation
Too Windy	Inability to lift materials by crane beyond safety thresholds	Programme delayed	Unit sizes of pre-fabricated items and crane sizes planned to minimize risk
	Working at height and exposed sites with sheet materials	Risk of wind destabilizing workers and hand/arm injuries	Avoid manual lifting of sheet materials through design and method statements
	Working at height generally	Unsafe for workers, risk of injury. Delay to programme	Monitoring of weather forecast by site management to prevent works starting or exposing fabric at high level
	Instability of hoardings, scaffolding, fixed platforms in high winds	Loosened boards and poles cause hazard workers and public and damage to	Ensure design will withstand windspeeds and checking demountable hoardings and

		property	scaffold regularly
	Partial and exposed works	Vulnerable to wind damage	Protection and programme planning to limit exposure
	Roof damaged by exceptionally high winds during programme	Consequential loss to internal works already completed	Suitable safety factors designed into roof design and detail of flashings etc
		Disproportionate collapse in partially constructed buildings	Protection against consequential loss
	Commissioning of roof level plant delayed	Programme delay if critical to opening etc	Better planning of specialists visit
Combination events and storms	Wind driven rain egress into building and partial completed envelope	Damage to internal finishes	Protection and programme planning to avoid exposed fabric
		Undetected interstitial damp causing latent defects	
	Deliveries affected by shipping delays and port closures	Programme delay, possible loss of special materials by sinking of a vessel	Protect against risk through insurance
	Staff turnout late/no-show for work	Team of specialists installers/engineers are delayed in the same vehicle	Lodge staff locally to site or employ regionally scattered workforce, ensure adequate training is given to spread specialist skills throughout workforce
	Fires from offsite driven by wind	Loss of materials, damage to building and safety risk	Assess local surroundings and have plan in place
	Weather forecasting (week ahead) becomes erratic and inconstant	Inability to plan in the short term for thresholds being breeched for lifting etc	Utilise links to weather websites and weather warning alerts
			Put back up plans in place for special tasks such as lifting operations
	Dust blown onto site from elsewhere	Damage to quality of finishes	Assess local surroundings and have plan in place
	Erratic weather across UK/Europe	Far reaching supply chain affected by event far away from actual site	Take account of weather variation in differing locations in the UK and Europe

The UK construction industry has seen very difficult economic conditions in since 2008 and resulting in a wider use of competitive tendering by clients. Contractors may respond to this by eliminating any perceived wastage in programmes and preliminaries (the cost associated with running the site; staff, welfare facilities, hoardings, temporary elements of the building site). Competitively shortening programmes to enable the customer earlier access is common consequently demanding more competitive behaviors from suppliers of materials, subcontractors and specialist installers. These subcontractors in turn will eliminate any spare time in their own programmes to remain competitive, time which in the past would have allowed a buffer against bad weather

and missed deliveries at any time of year. This contingency to allow for adverse weather has become virtually non-existent.

The Main contractor has to make contractual claim for delay due to exceptional weather or suffer Liquidated and Ascertained damages as set out in the contract. The Subcontractor generally has not priced for weather contingency in programme to reduce tender price or has only assumed for typical conditions as averaged over the last 30 years or used more recent experience. If the claim relates to exceptional weather conditions it would be allowable, if the weather was to be expected at that time of year then it is not and the contractor will seek to redress the loss against subcontractors. JCT 2005 suite of contracts points towards mediation or arbitration if the contact administrators' decision is contested in this definition. This is an interesting point as with climate change predictions of increased exceptional weather conditions and unseasonal weather patterns this definition becomes harder to define and will changeover time. Contract administrators may need training or a resource (Meteorological Office or similar) to define this issue. Where the claim is not deemed to be exceptional weather, the Subcontractor bears cost of delay and impact on turnover and may become at risk of insolvency. Subcontractors on the whole felt that weather was a chance thing; three mild and dry weeks in February just as likely as three weeks of solid rain in July, their attitude is to cope and aim to recover quickly. Loss of power and other utilities is much less of a risk than in permanent buildings as sites were used to being self sufficient.

Contractual practice is driving main contractors to continue to test the market and not commit to subcontractors until the very last minute – this was generally viewed as detrimental to building quality and forces subcontractors to cut down prices to a point where adversarial behaviour once delay is experienced is inevitable . This is seen as a vicious cycle. There is lost opportunity from lack of early involvement of specialist contractors to solve problems of conflicting specification and make buildings more resource and energy efficient, and ensure programmes are risk free. Customers need to consider other forms of contract to enable better design stage planning and preparation and anticipate increased cost of building procurement. Increased risk left with the supply chain needed to be balanced with increased customer responsibility.

Main contractors need to be assured that insurable risks are covered; this may have an uplift effect on preliminaries. Subcontractors need to ensure that unexpected costs associated with weather events have been included in their contract with the main contractor to avoid being left undefended against a claim. The Customer needs to be made aware of risks taken on and cost impact in prelims of both main contractors and subcontractors. The client is interested in long term performance for their own gains, but may not be so accepting of increasing costs and programmes, and although UK Construction Design Management regulations expect the customer to take their share of responsibility for health and safety and to provide adequate time and resource for work to be undertaken safely, on a day to day level, this area is much more site focused. Insurers and lawyers have a role to play in advising customers towards better practice.

The Design Team (Architects, Quantity Surveyors, M&E Consultants and Structural Engineers etc) have an interest in performance requirements being met, but may be much less involved in programme planning or sourcing all materials in supply chains. Although safety is paramount in their designs, involvement in day to day site

management is rare. Construction Professionals would be well advised to keep informed of technologies and materials which help to mitigate climate change and be prepared for new design standards in the future too.

Clients and their property advisors must also consider risks in selecting sites for new development and continued occupation of existing buildings. Lease length and mechanical and electrical system design life drives the time frame to 25 years ahead to avoid catastrophic failures which effect inability to trade or loss of stock. Developers and design teams are looking 1- 5 years ahead for designs and responding to site constraints and anticipated legislation changes, whilst the contractor looks only to the duration of weather risk on each individual project until handover.

4.1 Risks and Responsibilities

The workshop concluded that these good practice recommendations should be adopted without delay to limit risks;

Health and Safety – which commenced with discomfort caused by weather conditions and extended to parameters defining when certain works on site must be stopped or the site closed entirely in order to maintain safety of workers and the public.

Additional PPE for heat and solar radiation have an additional cost which is generally borne by the subcontractor. The equipment is however mostly suitable to be re-used for a number of projects and already in general use for roofing trades exposed to high levels of solar radiation.

Consumables (water, salt tables and availability of quality sun cream); contractors could consider could bulk buying and requesting sponsorship by food retail and pharmaceutical customers of these products.

Main contractors should introduce opportunities for site operatives to have any moles or skin conditions checked by a visiting health care practitioner to raise awareness and identify any skin cancer incidence early.

Additional breaks and “siesta hours” may have a detrimental impact on programme, but workers do tend to take an enforced lunch break of an hour inside a well ventilated cabin already, this could be shifted to a later hour if very hot conditions prevailed.

Daily briefing and reminders by site managers/health and safety representatives to prompt weather report checking and seasonal issues by site teams.

Checking regimes for loose and weather sensitive materials and hoarding which could be a danger in high winds.

Contractual and Commercial – relating to delay and financial impact in the first instance, the complexity of global supply chains and delivery of materials to sites being hindered by weather events as well as longer term changes in where materials were supplied from and what impact that might have on cost.

Being realistic about programme and weather; use longer term predictions of weather but with anticipation of the unexpected patterns and out of season events.

Reviewing sensitive supply chains and lengthy delivery routes for problems and build in contingency.

When severe weather occurs, follow on learning is advisable to build good practice into subsequent projects and avoid repetition of difficulties experienced.

All buildings, construction sites and places of employment would benefit from having a disaster recovery plan (or a less dramatically named incident management plan) which outlines who is responsible and what should be done in the event of receipt of threatening weather reports related events to protect individuals and property alongside fire plans. These should take into account flood risks and impact on access and utilities as well as evacuation triggers.

Disaster recovery planning for electronic information and paper documents helps with compliance and insurance. Protecting stock and fabrication work in progress for off-site manufacture was similarly important to be protected.

Establishing a climate adaptation and resilience planning review process as part of either strategic planning, commercial and insurance viewpoints with senior management level responsibility and commitment to maintain.

All businesses should review the opportunities and threats posed by changing climate and adverse weather events. National investment in rail deliveries, ports, flood alleviation schemes, coastal defenses are needed and these are clearly an area of huge opportunity for the construction industry to secure future workload.

Design and performance – relating to performance of the building at completion and over the longer term to meet the needs of adaptation to anticipated changing climate over 25 to 60 years building design life.

It is important in the short term not to become complacent about cold weather impacts (including snow loading and ice build up) even though some predictions claim that cold snaps will be much reduced in the longer term, they are not impossible.

Anticipate the predicted level of degree days within the lifespan of cooling and refrigeration equipment and future proof the performance specification.

Review the impact of loss of stock, trade or production in buildings which fail to provide the internal conditions needed, this might help to justify additional costs when refurbishing or developing new build projects.

Modification of building fabric design for changing climate may lag behind services design, meaning that the shell is built to building regulations and standards which are out of date already by the time the fitout is completed. Developer's teams may be forced to predict these design parameters to future proof shell building against risk of failure to secure tenants.

4.2 Longer term climate change and catastrophe modelling

The entire group discussed what they thought might be longer term implications for the construction industry, their own supply chains and customers expectations and needs.

Table 2 Longer term issues which could be considered in catastrophe modelling

Issue	Change anticipated	Impact
M&E equipment currently manufactured in China	Economic bubble expected to burst	Manufacture may become more local to the UK
Steel production moving towards location of ore and low carbon/cheap fuel/cheap labour	Recycling drive may lead to more UK localized production	Increased recycled content of steel and reduced carbon footprint but would costs be counter balanced by cost of shipping increasing?
Cost of shipping from overseas	Might get more expensive if storms and hurricanes make port business more erratic and insurance more expensive.	Tendency to source more locally and change design to use locally available products
Peak oil/ failure to deliver oil forcing up oil prices	Increasing all transport costs significantly	Tendency to source more locally
Higher cost of materials due to manufacturing costs increasing	Lifecycles of buildings need to be extended	Could mean less new build work, but more refurbishment
	Attempts to rationalize quantities of materials and reuse more	Less waste and materials to landfill
Current design standards no longer relevant	Wide scale changes to Building regulations and design standards to accommodate higher peak rainfall, wind speeds etc.	Training for building inspectors and structural engineers etc
Infrastructure reinforcement	Large contracts for new flood defenses for roads and rail, national grid, District energy schemes etc	Depends on timing and budget for government led works to be secured
Some raw materials may be in more demand such as renewable and low carbon, special metals for M&E equipment	Costs go up, longer lead-in times	Changes may be needed to decision making process of clients/funds/developers to enable alternatives to be used
Buildings and services integration, pre-fabrication of elements etc	Specialist design needs to be incorporated earlier to avoid added cost and abortive design work etc	May require changes to current contractual and customer procurement programmes to enable design stages to be frontloaded with specialist contractor involvement or design.
Servicing strategies are more complex to manage; renewable energy, BMS, more automation, actuation etc	Breakdowns and seasonal commissioning call backs more frequent	Post occupancy evaluation and remote management becomes a growth area. Quasi-PFI type of management and maintenance contacts with carbon performance targets may become more common

Developing cost projections for these changes was very difficult to consider as so many variables were at play and a team would be needed in each case to agree the timeframe and consider the commercial impact on the client, main contractor, subcontractors and supply chain. It was apparent in most scenarios that cost impact could be beneficial or

detrimental depending on the viewpoint of the organization doing the modeling and consequently the gains could neutralize the losses if enough foresight and planning were in place. The use of other ways to measure impact was also discussed such as carbon emissions, and less tangible sustainability indicators to determine the winners and losers in any given situation.

4.3 Limitations of the workshop approach

It was not intended that this paper considered sustainable design or principles of design for climate change adaptation in detail but it became apparent that the construction processes and supply chain of buildings was so very much interrelated with the design of the building that it could not be ignored. Design and materials selection has such an influence on the risks present in the construction stage and the potential for failure in the building life that any further study must consider these together.

The workshop and survey techniques used took in a small and self selecting sample of the subcontractors involved in the industry and the range of construction areas covered by the attendees was difficult to control to ensure all issues were considered in every aspect of the construction process.

The depth of experience of and response to extreme weather events may be dependant on the age and experience of the individuals involved. Surveying views and opinions of construction work programmers was not undertaken as part of the methodology of this paper, it could have helped to verify the expectation that statistical data and past experience of weather event repetition is used more than forward projection of climate change and learning taken from extreme scenarios. However, this does not change the need for a the adoption of a considered risk approach to respond to likely and foreseeable risks to prevent human and property harm and not over-respond to perceived or over stated risks resulting in commercial harm.

Reviewing the clients approach to the recommendations made has been undertaken with selected customers but for reasons of confidentiality has not been reflected in this paper. It would be fair to say that changing designs and procurement approach to reflect the UKCIP predictions is yet to be adopted. Furthermore it will take many years before actions could be proven to have been beneficial.

5 Conclusion and Further Research

The whole procurement philosophy in the UK must change to a more collaborative approach ensuring the design of buildings is right for the future climate, with a committed subcontractor design team involved earlier and better management of the programme to eliminate risk. Trust between parties, behavioural change and ***responsible customership*** is needed to ensure that the construction industry would be able to deliver buildings safely and efficiently in the future. The wider implications of the changes needed to how buildings are procured could be considerable, particularly in the approach to contractual terms with regard to delay.

Further research is needed in a number of areas to prepare the construction sector and reduce risks. Tools for project planners and programmers based on statistical projections in the longer term are needed to help to determine what is considered exceptional and adverse weather and how often to expect it. Similar tools for degree days, wind speed

and rainfall intensity frequency and peak conditions are needed to support development of design standards, and review of structural and building design regulations. This will help to make building and services design more appropriate for future climate.

More analysis of the trends towards use of renewable and lower carbon materials such structural timber and annual field crops such as hemp and straw and how sensitive these products might be to climatic change and weather events in their production yield, cost volatility and competing demand from other sectors. The same products are increasingly used as fuel sources and the longer term impact of this may be significant to the ability of buildings to perform in the longer term.

Off-site manufacture can dramatically reduce environmental impact on construction sites by reducing programme and waste, and it is expected that it may also help to reduce weather and climate risks on site such as water scarcity, working in hot or windy conditions. Understanding how vulnerability can be mitigated in delivering, lifting and positioning large prefabricated units and protecting stocks off site should be more fully investigated.

For Contractors, reaction to climate adaptation, resilience and risk management must be appropriate, and finding the correct balance is a sustainability issue in itself to ensure safe, responsible and economically viable construction processes are maintained for the benefit of clients and occupiers throughout the course of this century. There will be a point when adaptation and resilience is not just a good idea to protect business from risk, to being an absolute necessity to remain in business.

6 Acknowledgments

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Achieving compliance with level 3 of the Code for Sustainable Homes for speculative housing developers in Wales

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Abstract:

The aim of this research was to investigate the cost of achieving compliance with the requirements of the Welsh Assembly Government's Planning Policy Wales framework in relation to achieving specified levels of the Code for Sustainable Homes to gain planning permission for new housing developments in Wales. The UK Government and the Welsh Assembly Government have recognised the urgent need to reduce carbon emissions, a significant proportion of which are produced from the construction and occupation of new homes. Governmental aspirations are to achieve zero carbon homes by 2016, which if achieved will herald a revolutionary change to the methods of building and powering British homes. The Welsh Assembly Government has passionately adopted these aspirations and enshrined them in new regulations for building sustainably in their Planning Policy Wales framework. These new requirements are articulated to achievement of levels of performance standards enumerated in the Code for Sustainable Homes. The research involved the analysis of both qualitative and quantitative data which identified potential methods of achieving cost effective compliance with the Code for volume house builders in the Welsh market. This involved the analysis on a cost per percentage point basis of the credits required to achieve different levels on the Code. Variables that will affect these computations were also examined. Data was gathered from an analytical case study involving an existing house design template used to compare existing specifications with the extra over costs involved in achieving levels on the Code and from interviews with relevant stakeholders in this process. The authors finally drew conclusions on the significant consequences of the new requirements of the Welsh Assembly Government's planning framework and made recommendations for a volume house builder to implement in their operations in Wales to promote achievement of the relevant standards currently and in the future.

Keywords:

building procurement, Code for Sustainable Homes, house building in Wales, sustainable building.

1 Introduction

The introduction of The Code for Sustainable Homes (the Code) originated from a statement in 2007 by Yvette Cooper MP, former Minister for Housing and Planning (Video: 2007):

"We have to cut carbon emissions from homes. We know that about a third of the homes we will be living in by 2050 have not yet been built and that is why it is so important that we improve the technology, cut the carbon emissions from the new homes. And we want a star rating, a code for sustainable homes to tell people just how well the new homes are doing."

This statement was further expanded upon by the Minister(2007, Pg.6) pledging that by 2016 all new homes should be zero carbon and that to achieve this nothing less than a revolution in the way we heat, light and power our homes is required as it is estimated that a quarter of all CO^2 emissions come from our homes.

This need for a reduction in CO^2 emissions has been recognised and an attempt made to address it by the Welsh Assembly Government through its Ministerial Interim Planning Policy Statement (MIPPS): Planning for Sustainable Buildings (01/09) (2009b, Pg.3):

"To move towards more sustainable and zero carbon buildings in Wales, the Assembly

Government expects that the following standards will be met:-

Applications for 5 or more dwellings received on or after 1st September 2009 to meet

Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1 - Dwelling

Emission Rate"

Applications for 1 or more dwellings received on or after 1 September 2010 to meet Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1 - Dwelling Emission Rate**.**

The authors' aim in the research was to establish the cost of achieving compliance with Level 3 of the Code for Persimmon Homes East Wales (PHEW). Persimmon Homes East Wales is a subsidiary company of Persimmon Plc and builds approximately 450 homes per annum in South East Wales.

To achieve the aim and to enable recommendations to be put forward to PHEW on how they were to approach their first planning application under the MIPPS (01/09) regime the research was concentrated on the following aspects:

An examination of the Code for Sustainable Homes

Requirements in Wales in regard to compliance with the Code

A Case Study which examined the extra over cost of achieving level 3 of the Code on the PHEW Cothi 3 Bedroom 814 Ft^2 House Type:

Identification of the most cost effective method to achieve level 3 and 31% Improvement on current building regulations for Ene1

This research was conducted and in part written prior to the commencement of the Consultation on the Code for Sustainable Homes and the Energy Efficiency standard for Zero Carbon Homes. It therefore does not take into considerations any of the issues raised as part of the consultation and issue of the latest version of the Code. These issues have been considered and incorporated into further research on this topic and will be the subject of another paper.

2 Literature Review –The Code for Sustainable Homes

The Code for Sustainable Homes (the Code) forms part of the Government's aim to improve the sustainability and environmental/energy efficiency of new homes, in particular concentrating on reducing carbon dioxide (CO^2) emissions and achieving its overall target for all new homes to be zero carbon by 2016.

2.1 Categories

The Code comprises of nine categories of environmental sustainability, each category has a varying number of credits available, each credit has a percentage weighting resulting in a total percentage for each category. Table 1 below extracted from The Code for Sustainable Homes Simply Explained (Gaze et al, 2009, p.7) illustrates this.

Table 1 – Categories of The Code

Category		Issue	Number of Credits	Weighting Factor (%)
1	Energy & CO^2 Emissions	ENE1: DER (m)	29	36.4
		ENE2: Building Fabric		
		ENE3: Internal Lighting		
		ENE4: Drying Space		
		ENE5: Energy-labelled white goods		
		ENE6: External Lighting		
		ENE7: LZC Technologies		
		ENE8: Cycle Storage		
		ENE9: Home Office		
2	Water	WAT1: Indoor Water Use (m)	6	9.0
		WAT2: External Water Use		
3	Materials	MAT1: Environmental impact of materials (m)	24	7.2
		MAT2: Responsible souring of materials-basic building elements		
		MAT3: Responsible souring of materials-finishing elements		
4	Surface Water Run-Off	SUR1: Management of surface water runoff from developments (m)	4	2.2
		SUR2: Flood Risk		
5	Waste	WAS1: Storage of non-recyclable waste and recyclable household waste (m)	7	6.4
		WAS2: Construction site waste management (m)		
		WAS3: Composting		
6	Pollution	POL1: Global warning potential of insulants	4	2.8
		POL2: No_x emissions		
7	Health & Well Being	HEA1: Daylighting	12	14.0
		HEA2: Sound Insulation		
		HEA3: Private Space		
		HEA4: Lifetime Homes (Level 6 Only)		
8	Management	MAN1: Home User Guide	9	10.0
		MAN2: Considerate Constructors Scheme		
		MAN3: Construction Site Impacts		
		MAN4: Security		
9	Ecology	ECO1: Ecological Value of Site	9	12.0
		ECO2: Ecological enhancement		
		ECO3: Protection of ecological features		

		ECO4: Change in ecological value of site		
		ECO5: Building Footprint		

(m) - Mandatory Element

2.2 Levels of the Code

The Code has six levels each with a required amount of percentage points, from level one at 36 points through to level six at 90 points. This is demonstrated in Table 2.

Table 2 – Code Levels

Total percentage points score (equal to or greater than)	Code Levels
36 Points	Level 1 (*)
48 Points	Level 2 (**)
57 Points	Level 3 (***)
68 Points	Level 4 (****)
84 Points	Level 5 (*****)
90 Points	Level 6 (******)

(Source : The Code for Sustainable Homes, Gaze et al .,2009, p17)

Within each code level there are a number of mandatory minimum requirements: ENE1, WAT1, MAT1, SUR1, WAS1, WAS2 and HEA4 which becomes mandatory in 2013 for Code level 3 and above.

2.3 Assessment under the Code

The assessment is a two stage process: design stage assessment and post construction review. The design stage assessment is based on drawings, specifications and design commitments, the results of which are shown in an interim certificate of compliance. The post construction review is to prove that the design assessment goals have been met. If any changes in the design have been made they should be identified and re-assessed accordingly. Eagles et al, (2008, p.13), emphasize that all evidence of compliance should be recorded during the construction process to save both time and money later.

An appropriately qualified Code Assessor will carry out both the design stage assessment and post construction review and should ideally be appointed at the planning stage of the development. Eagles et al (2008, p.12) argue that the Code Assessor is a valuable member of the construction team who is not only responsible for completing the Code assessment, but can also assist on which credits should be aimed for and how they can be best achieved. To confirm compliance two certificates are issued by the

Code Assessor: an interim certificate at the design stage and a final certificate at the post construction stage. Flow charts explaining both the scoring and assessment system are demonstrated fully in The Code for Sustainable Homes (Anon, 2008b, p.18)

2.4 Mandatory Requirements

The Code focuses on saving energy and water and therefore categories ENE1 and WAT1 are considered the most critical to sustainability and have mandatory requirements across all Code levels. There are currently four additional areas of mandatory requirement: MAT1, SUR1, WAS1 and WAS2.

2.4.1 ENE1 – Dwelling Emission Rate

This category relates to the Dwelling Emission Rate (DER) measured as a percentage improvement in CO^2 emissions compared to current building regulations and Target Emission Rate (TER).

To meet Code level three the mandatory requirement is set at 25% improvement in DER over TER which would earn five credits, however in Wales the requirement is set at 31% improvement which would earn 6 credits.

2.4.2 WAT1 – Indoor Water Use

The focus of this section is on reducing internal water use which is measured through a maximum usage in litres per person per day. For Code level three the maximum consumption is 105 litres per person per day, earning 4.5 credits.

2.4.3 MAT1 – Environment Impact of Materials

This element encourages the use of materials with lower environmental impact over their lifecycle. There are five constructional components examined: roof, external walls, internal walls, floor and windows. To meet the mandatory requirement for all Code levels three of the five elements must be BRE Green Guide rated D or above. Credits are awarded from 0.25 – 3 per component depending on its rating: 3 credits are awarded for an A+ rating down to 0.25 of a credit for a D rating. A maximum of 15 credits can be achieved.

2.4.4 SUR1 – Management of Surface Water Run Off

Probably the most challenging section of the Code, at one of the conference proceedings attended by the authors the Sustainable Construction Manager for BRE (King, 2009) stated that he firmly believed it is actually impossible to achieve compliance on some developments. In essence the peak run off rate into water courses for the developed site must not exceed the pre-developed site. No credits are awarded for achieving the mandatory requirement however 2 credits can be achieved for improvements through the use of Sustainable Drainage Systems (SUDS). For the purpose of this research it has been assumed that the mandatory requirement will be achieved.

2.4.5 WAS1 – Storage of Waste

Adequate internal and external space should be provided for waste. This mandatory requirement can be met either through local authority provisions or calculated using BS5906: 2005. It should be noted that the area provided should be accessible to all

including wheelchair users. No credits are awarded for meeting the mandatory requirements.

A total of 4 credits can be achieved through the provision of the following facilities:

Three internal storage bins located in an adequate storage space each of 7 litres minimum capacity

All internal storage must be a minimum of 30 litres combined capacity.

At least three external bins again located in an adequate storage area.

No bin is to be smaller than 40 litres with a total storage capacity of 180 litres.

2.4.6 WAS2 – Site Waste Management

For developments over £200,000 it is a mandatory requirement for waste on site to be managed effectively through a site waste management plan. No credits are awarded for meeting mandatory requirements. However, if the site waste management plan details information regarding procedures and best practice for waste minimisation and diverting waste from landfill through recycling, 2 credits can be achieved.

2.5 Stand Alone Credits

Although building to level three of the Code is more technically demanding there are some simple, relatively low cost changes that can be implemented to achieve credits which have little or no impact on the other areas and can provide 8% of the total points available (Gaze et al, 2009, p.14).

2.5.1 ENE4 – Drying Space

The provision of an internal or external drying space for clothes provides 1 credit or 1.25% points.

2.5.2 ENE5 – Energy Labelled White Goods

The developer can either install energy efficient white goods as follows to obtain the full 2 credits or 2.51% points:

Fridge Freezer – A+

Washing Machine – A

Dishwasher – A

Tumble Dryer – B

Gaze et al (2009, p.15) found that if a developer chooses to install appliances in a property the premium for the installation of energy efficient appliances is small. However, if the developer does not offer appliances, by providing information on the EU energy efficiency labelling scheme they will gain 1 credit or 1.255% points.

2.5.3 WAS3 - Composting

For houses a simple composting bin provided in the rear garden gains the full credit. For apartments it is not as simple; however with more and more local authorities providing composting services the single credit or 0.91% points can be obtained through this.

2.5.4 MAN1 – Home User Guide

Most of the information required for a Home User Guide will have to be made available to the Assessor so collating it into a single document for the end user is straight forward. The other information required such as that relating to the local area is readily available and providing this information to the end user will result in three credits or 3.33% points awarded.

2.6 Code Level 3 Requirements in Wales

Planning policy of the Welsh Assembly Government is encapsulated in the strategic document Planning Policy Wales, which comprises sections titled Ministerial Interim Planning Policy Statements (MIPPS), each of which deal with different aspects of policy. MIPPS 01/09 articulates the Assembly's requirements for sustainable building within the Principality. Technical Advice Notes (TAN) provide guidance on how to achieve the requirements of the MIPPS.

MIPPS (01/09) dictates that compliance with level three of the Code only applies to outline and full planning applications submitted after 1st September 2009. As part of the MIPPS (01/09) (2009b, p.3) a 31% improvement in DER on TER is required as opposed to a 25% improvement for properties built in England.

In an interview with the Managing Director of PHEW, the authors confirmed that the company are in a strong position in terms of their land bank, with planning permission for the properties required to fulfil over 18 months budget already secured prior to the September 2009 deadline imposed by the Welsh Assembly Government (WAG). The company chose to obtain outline planning permission on as many strategic parcels of land as possible prior to September 2009 in an attempt to mitigate the extra costs of the Code's requirements and also to allow as long as possible to get compliance 'right' both in terms of sustainability and cost.

2.6.1 Zero Carbon

Consideration needs also to be given to the desire of the Welsh Assembly Government (WAG) to achieve 'zero carbon' emissions from new buildings by 2011 (WAG, 2010). Although at a conference Francois Samuel of WAG (2009) pointed out that 2011 is prior to the devolution of the Building Regulations which is set to be completed by 31st December 2011, therefore it was felt that the reality would be that the maximum stepped changes practical would take place in the immediate future and post 2013 would be the earliest opportunity to achieve 'zero carbon' in Wales.

This was confirmed at a House Builders Federation(HBF) forum by Jane Davidson (2010), WAG Minister for Environment, Sustainability and Housing, that 'zero carbon' for all new buildings in 2011 was merely an aspiration for WAG and this target is now being revised and is likely to be 2013 before this is achieved

It should be noted that prior to working towards achieving zero carbon a firm definition is required for the industry. At the Wales Low/Zero Carbon Hub Workshop the Minister discussed the definition comprising of a 70% reduction in DER over TER with 30% allowable solutions being the way forward for 'zero carbon' (Davidson, 2009). At the same conference the Head of Housing for the HBF confirmed the need for a clear definition for the allowable solutions in order for 'zero carbon' to be achieved (Pannell, 2009).

An example to illustrate the confusion surrounding allowable solutions is that of The Miller Zero Project by Miller Homes. In Basingstoke properties have been built to each level of the Code and to achieve Code level 6 a wood chip biomass boiler was used to provide under floor space heating and hot water. The allowable solution used was that the carbon omitted from the wood chips when burnt had previously been absorbed (Mann, 2009). It can be legitimately argued as to whether this is really achieving zero carbon and begs the question as to whether this is truly a sustainable approach as the analogy could be drawn for hydrocarbon fossil fuels albeit that the carbon dioxide absorption occurred in a different epoch.

2.6.2 Energy Hierarchy

The energy hierarchy, illustrated in Section 3.2 of the Technical Advice Note (Tan) 22(Anon,2009a, p.12), states that the use of renewable energy sources should be avoided until all the other principles of the energy hierarchy

The Sustainable Construction Manager for BRE (King, 2009) confirmed in a conversation with the authors that the key to achieving compliance with level three of the Code was to concentrate on improving the fabric of the building; this will result in a decrease in energy demand and an increase in energy efficiency.

King (2009) substantiated his claim in his presentation to the Wales Low/Zero Carbon Hub Workshop by stating that from the pilot schemes run to date in Wales by Registered Social Landlords (RSL) it has been proven that the u-values of the fabric should be taken to:

0.21 - walls

0.13 - floors and roof

1.2 0- windows

Air tightness of 3

Attempting improvements beyond these values provides only a small reduction in CO^2 compared to the uplift in costs.

3 Research Methodology

The methodology involved an initial literature review and attendance at two specialist conferences which allowed individual discussions with one of the seminal authorities on

the Code and subsequent interviews with senior professionals involved in housing procurement Wales. This initial investigation identified the importance of design and compliance requirements and the principles necessary to satisfy these. This then facilitated the case study cost analysis performed on a existing PHEW house template and which compared the existing specification with amendments to this to achieve compliance with level 3 of the Code in the most cost effective manner. This allowed the articulation of a specification to achieve level 3 and conclusions to be drawn and recommendations for PHEW, and more broadly for the sector in Wales, to be made in regard to future planning and design processes to satisfy the requirements of MIPPS 01/09. The research also identified potential effects on land values and consequently corporate profitability for developers operating in Wales.

4 Findings and discussion

4.1 The case study

Using the PHEW Cothi 814 Ft^2 house type, a typical 3 bedroom end terrace home as a case study, an analysis of the current specification against the Code has been undertaken. The Cothi type is a traditional 3 bedroom 2 storey home, either terraced or semi-detached comprising of an entrance hall with downstairs cloakroom. The kitchen is to the front of the property with a spacious lounge /dining room to the rear with French doors leading to the rear garden. The first floor hosts the master bedroom with en-suite, two additional bedrooms and family bathroom.

4.2 Assumptions

The baseline specification for a Cothi to meet current building regulations is shown in Table 3.

PHEW stipulated that for the purposes of this research traditional external elevations should be maintained where possible and that traditional masonry construction to be preferred over timber frame.

SAP calculations were carried out using BRE Approved 2005 SAP software meeting Part L 1A, 2006 requirements.

4.3 Assessment of existing house type

Initially an appraisal was made of the current specification of the Cothi house type, breaking it down into the various Code requirements; this demonstrated that the current specification only achieved 18.38% against a requirement of 57% to achieve compliance with level three of the Code. This assessment is shown in Table 3.

4.4 Level Three Analysis

In order to achieve the remaining 38.62% the following steps were taken:

Firstly the mandatory elements of the Code, as examined previously, were considered. These credits, plus the additional credits obtained as a by product of these mandatory requirements, namely ENE2 and POL1, resulted in an additional 15 credits being obtained and an additional 16.13% overall. These were achieved at an extra over cost of £3,855.

The total percentage points were then 34.52%, leaving a further 22.48% required to achieve level three.

To achieve the remaining 22.48% an analysis on a cost per percentage point basis was undertaken, whilst considering the perceived value of the eco friendly options.

O'Donnell (2010) confirmed in a conversation with the authors that it is deemed essential as part of the planning process to carefully consider the management and ecology categories of the Code. These categories amount to a total of 18 credits or 22%. With current house type designs 14 credits or 16.65% are achievable at a cost of circa £398.00, argued by O'Donnell (2010) as a very cost effective way of obtaining 16.65%. Compared to an extra over cost of £3,855 for the 16.13% for the mandatory element £398.00 does appear a cost effective way of obtaining a significant number of credits.

At this point the total credits totalled 48.96%, leaving only 8.04% to achieve compliance.

This phase of the assessment required further careful deliberation and was found to involve a degree of subjectivity. The aim of this research however, was to find the most cost effective way of achieving compliance therefore the elements included in the assessment shown in Table 4 utilise the lowest cost per credit items.

For example, previously it was illustrated that a composting bin was a easy way of obtaining 0.91%, however at a cost of £85.00 per bin (Sugar, 2010) this option was dismissed. Instead an external water butt was chosen at a cost of £95.00 (Sugar, 2010) achieving 1.50%.

Similarly superficially a cycle store (in ENE8) would appear to be an 'easy' method of obtaining 2.52%, however, at a cost of circa £420.00 (Sugar, 2010) for the provision of a shed and base this option was also rejected. Instead a combination of 75% low energy lighting, external lighting, a drying space for clothes and information conforming to EU guidelines relating to appliances was chosen at a cost of £317.00 (Sugar, 2010) and 7.53%.

It should also be noted that several categories were simply unobtainable due to the current design of the Cothi and many of the other PHEW house types. These are ENE9, HEA1, HEA4 and ECO5.

The full evaluation is shown in Table 4.

4.5 Published Cost Analyses comparison

Various figures have been published regarding the cost of achieving level three of the Code:

Official reports from the government suggest figures between £4,947 and £5,801 (Anon, 2008a, p.32).

In a more recent report by Gentoo figures between £3,945 and £3,978 are suggested (Thompson & Morrison, 2009, p.45).

Taylor Wimpey (2008, p.2) believe that their costs will be 10%-20% higher than the official government figure and are suggesting an extra over cost of £6,246 for a typical three bedroom mid terraced home.

A more rounded figure of £5,000 per plot has been given as a guide in conference proceedings by the Wales Low/Zero Carbon Hub (Pannell, 2009)

This research has enumerated an extra over cost of £4,985, based on prices of materials available to PHEW. This figure is in line with the other published costs, however it should be noted that this figure achieves 31% improvement in DER on TER whereas the other reports are based on a 25% improvement to comply with English legislation. This may then suggest that industry estimates of the extra over cost of achieving level 3 maybe pessimistically high given the cost significance of ENE1 illustrated in Table 4.

Table 3 – Current Specification

Code for Sustainable Homes			Current Specification	
Code	Section	Max Credits	Credits	Comments
Category 1 - Energy & CO_2 Emmissions				
ENE1	Dwelling Emission Rate	15	0	Only 2.4% over DER
ENE2	Building Fabric	2	0	1.34 Heat Loss Parameter
ENE3	Internal Lighting	2	0	Only 4 from 11 fittings are low energy = 36% Min 40% Req.
ENE4	Drying Space	1	0	None Provided
ENE5	Energy Labelled White Goods	2	0	No Information Provided
ENE6	External Lighting	2	0	No External Lighting Provided
ENE7	LZC Technologies	2	0	Not used
ENE8	Cycle Storage	2	0	Not Provided
ENE9	Home Office	1	0	Not adequate provision of telephone points etc.
Total Credits		29	0	
% Points (Weighting of 1.26)		36.40%	0.00%	
Category 2 - Water				
WAT1	Indoor Water Use	5	1	Only low flush WC currently used
WAT2	External Water Use	1	0	Not Provided
Total Credits		6	1	
% Points (Weighting of 1.50)		9.00%	1.50%	
Category 3 - Materials				
MAT1	Envirnonmental Impact	15	10	Compliance as MAT1 Calculation
MAT2	Responsible Sourcing - Basic	6	3	Compliance as MAT2 Calculation
MAT3	Responsible Sourcing - Finishing	3	2	Compliance as MAT3 Calculation
Total Credits		24	15	
% Points (Weighting of 0.30)		7.20%	4.50%	
Category 4 - Surface Water Run Off				
SUR1	Management of Run Off	2	0	Variable for each development assume compliance
SUR2	Flood Risk	2	2	Part of standard site assessment
Total Credits		4	2	
% Points (Weighting of 0.55)		2.20%	1.10%	
Category 5 - Waste				
WAS1	Storage of Household Waste	4	0	No facilities provided at present
WAS2	Construction Site Waste	2	2	Currently using Site Waste Management Plans as standard
WAS3	Composting	1	0	No facilities provided at present
Total Credits		7	2	
% Points (Weighting of 0.91)		6.40%	1.83%	
Category 6 - Pollution				
POL1	GWP Of Insulants	1	1	All insulatants used are rated <5
POL2	Nox Emmissions	3	1	Boiler Class 4
Total Credits		4	2	
% Points (Weighting of 0.70)		2.80%	1.40%	
Category 7 - Health & Wellbeing				
	Daylighting - Kitchen	1	1	Occurs by default
HEA1	Daylighting - Other Rooms	1	0	Not achievable with current house design
	View of Sky	1	0	Not achievable with current house design
HEA2	Sound Insulation	4	3	Use of robust detail as standard
HEA3	Private Space	1	1	Provision of an outside space as standard
HEA4	Lifetime Homes	4	0	Not achievable with current house design
Total Credits		12	5	
% Points (Weighting of 1.17)		14.00%	5.83%	
Category 8 - Management				
MAN1	Home User Guide	3	0	Not Provided
MAN2	Considerate Contractors Scheme	2	0	Not a member
MAN3	Construction Site Impact	2	2	Four procedures carried out as standard
MAN4	Security	2	0	Secure by design not currently complied with
Total Credits		9	2	
% Points (Weighting of 1.11)		10.00%	2.22%	
Category 9 - Ecology				
ECO1	Ecological Value	1	0	Report not commissioned at present
ECO2	Ecological Enhancement	1	0	ECO1 not compiled with
ECO3	Protection of Ecological Features	1	0	ECO1 not compiled with
ECO4	Change in Ecological Value	4	0	ECO1 not compiled with
ECO5	Building Foot Print	2	0	By product of design and non compliance at present
Total Credits		9	0	
% Points (Weighting of 1.33)		12.00%	0.00%	
TOTAL CREDITS			**18.38%**	
REQUIREMENTS FOR LEVEL 3		**57.00%**		
DEFICET			**-38.62%**	

Table 4- Level Three Compliance

Code for Sustainable Homes			Meeting Level 3 Requirements		
Code	Section	Max Credits	Credits	Comments	E/O Cost
Category 1 - Energy & CO_2 Emmissions					
ENE1	Dwelling Emission Rate	15	6	See Specification in Appendix C	£3,375.00
ENE2	Building Fabric	2	1	Based on HLP from SAP Calculation <1.3	£0.00
ENE3	Internal Lighting	2	2	Install 75% Internal Energy Efficient Lighting	£132.00
ENE4	Drying Space	1	1	Install External Clothes Line	£40.00
ENE5	Energy Labelled White Goods	2	1	Provision of Information only as EU Guidelines	£25.00
ENE6	External Lighting	2	2	Install Appropriate External Lights to front & rear	£120.00
ENE7	LZC Technologies	2	0	Not required to meet level 3	£0.00
ENE8	Cycle Storage	2	0	Not used as an option	£0.00
ENE9	Home Office	1	0	Not required to meet level 3	£0.00
Total Credits		29	13	Total E/O Cost for Cat 1	£3,692.00
% Points (Weighting of 1.26)		36.40%	16.32%		
Category 2 - Water					
WAT1	Indoor Water Use	5	3	Intall flow limiters to taps	£210.00
WAT2	External Water Use	1	1	Install external rainwater collector	£95.00
Total Credits		6	4	Total E/O Cost for Cat 2	£305.00
% Points (Weighting of 1.50)		9.00%	6.00%		
Category 3 - Materials					
MAT1	Envirnonmental Impact	15	10	Provision of Information only	£0.00
MAT2	Responsible Sourcing - Basic	6	3	Provision of Information only	£0.00
MAT3	Responsible Sourcing - Finishing	3	2	Provision of Information only	£0.00
Total Credits		24	15	Total E/O Cost for Cat 3	£0.00
% Points (Weighting of 0.30)		7.20%	4.50%		
Category 4 - Surface Water Run Off					
SUR1	Management of Run Off	2	0	Variable for each development assume compliance	£0.00
SUR2	Flood Risk	2	2	Part of standard site assessment	£0.00
Total Credits		4	2	Total E/O Cost for Cat 4	£0.00
% Points (Weighting of 0.55)		2.20%	1.10%		
Category 5 - Waste					
WAS1	Storage of Household Waste	4	4	Internal & External Recycling Facilities	£270.00
WAS2	Construction Site Waste	2	2	Site Waste Management Plan - Provide Info	£0.00
WAS3	Composting	1	0	Not required to meet level 3	£0.00
Total Credits		7	6	Total E/O Cost for Cat 5	£270.00
% Points (Weighting of 0.91)		6.40%	5.49%		
Category 6 - Pollution					
POL1	GWP Of Insulants	1	1	Current specification is sufficient	£0.00
POL2	Nox Emmissions	3	2	Alpha Boiler Class 5	£0.00
Total Credits		4	3	Total E/O Cost for Cat 6	£0.00
% Points (Weighting of 0.70)		2.80%	2.10%		
Category 7 - Health & Wellbeing					
	Daylighting - Kitchen	1	1	Occurs by default	£0.00
HEA1	Daylighting - Other Rooms	1	0	Not achievable with current house design	£0.00
	View of Sky	1	0	Not achievable with current house design	£0.00
HEA2	Sound Insulation	4	3	Use of robust detail as standard - SDB	£0.00
HEA3	Private Space	1	1	Provision of an outside space	£0.00
HEA4	Lifetime Homes	4	0	Not required to meet level 3	£0.00
Total Credits		12	5	Total E/O Cost for Cat 7	£0.00
% Points (Weighting of 1.17)		14.00%	5.83%		
Category 8 - Management					
MAN1	Home User Guide	3	3	Provide information only	£15.00
MAN2	Considerate Contractors Scheme	2	2	Join Scheme (Avg per plot)	£23.00
MAN3	Construction Site Impact	2	2	Four procedures carried out	£0.00
MAN4	Security	2	2	Meeting Secure by Design Standards	£285.00
Total Credits		9	9	Total E/O Cost for Cat 8	£323.00
% Points (Weighting of 1.11)		10.00%	10.00%		
Category 9 - Ecology					
ECO1	Ecological Value	1	1	Employing ecologist to commisison report	£50.00
ECO2	Ecological Enhancement	1	1	Fulfill recommendations of report	£25.00
ECO3	Protection of Ecological Features	1	1	Default as per ECO1	£0.00
ECO4	Change in Ecological Value	4	2	Assume change is neutral	£0.00
ECO5	Building Foot Print	2	0	By product of design and therefore non compliance	£0.00
Total Credits		9	5	Total E/O Cost for Cat 9	£75.00
% Points (Weighting of 1.33)		12.00%	6.67%		
TOTAL CREDITS		**100.00%**	**58.00%**	TOTAL E/O COST FROM STD SPEC	£4,665.00
REQUIREMENTS FOR LEVEL 3		**57.00%**	**57.00%**		

5 Conclusions and Further Research

To conclude the Code has significant consequences for the speculative house builder in Wales and the authors believe the following:

Cost effective proposals to achieve level 3 compliance for an existing house template has been presented in Table 4.

The extra over cost of achieving level 3 of the Code may have been over-estimated if the authors' case study analysis is compared with other studies published in the literature.

At the time of the research build cost above ground for the Cothi type house was approximately £52 per square foot (no garage included in this figure) with a total cost of approximately £43,000. Therefore the £4,600 extra over cost to achieve level 3 of the Code is circa 11% of above ground build cost.

In practical terms, it is evident from the research undertaken that a solid understanding of the Code and its requirements are essential to any developer and appointing a code assessor at the earliest possible stage is important in the process to achieve success.

The WAG requirement under MIPPS (01/09) for a 31% improvement in DER on TER requires significant improvements to be made in the fabric of the building and this is inevitably where the majority of the extra over cost lies. In the case study used, approximately 80% of the total extra over cost was to achieve compliance with ENE1 for only 6 credits or 8.79%. It is therefore essential that during the initial design stage of a development the energy hierarchy is exhausted and anyone working on the project should be mindful of the required u-values and the diminishing returns that apply.

It was found that the most debatable and arduous element of achieving cost effective compliance with the Code arises after fulfilling the mandatory elements, and it was established that a comparative analysis on a cost per percentage point basis was the best way forward. It is important to note that what may appear superficially as an easy option to gain credits may not necessarily be the most cost effective approach.

The published estimates of extra over costs for building to level 3 of the Code are wide ranging. The authors believe that this can be significantly affected by material costs and buying power which would indeed vary from business to business. Thus it can be seen that the supply chain and future technological developments will play a critical role especially when legislative performance levels are raised.

6 Recommendations

In order for Persimmon Homes East Wales, and other developers, to cost effectively meet level three of the Code the following recommendations are made in addition to the proposals outlined in Table 4 above:

Organise appropriate training courses for key members of staff – internal staff need parity of knowledge with externally appointed Code assessors.

Share knowledge. Stakeholders should continue working with the HBF on workshops such as the Wales Low/Zero Carbon Hub Workshop to discuss the issues surrounding the Code in an open forum.

Secure best value from the supply chain. New technology will be critical to success in the future and companies should invest time on securing group deals for these new products to ensure the best price possible is negotiated which will result in lower extra over costs than illustrated in the case study. This will become ever more crucial as higher levels on the Code become the legislative requirement in Wales as the country moves closer towards the aspiration of zero carbon development.

Follow the steps taken by the authors and carry out a cost per percentage point analysis once the best possible prices for new technologies have been agreed with potential suppliers and try to improve on the £4,665 extra over cost obtained from the case study.

Recognise and remember that the obvious choices for 'easy' credits are not necessarily the cheapest and possibly environmentally most effective. A small amount of time spent on cost analysis at the outset may result in savings in the long run.

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A Project Alliance Approach for the Procurement of Indigenous Social Housing in Australia

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Abstract:

The standard of living conditions for indigenous Australians in remote areas of the Northern Territory (NT) is widely acknowledged as being below standards the remainder of the population is accustomed to. Project delivery programs have failed to address issues of overcrowding, poor living conditions and insufficient infrastructure that have proved to be a primary contributor to indigenous disadvantage leading to poor helath, reduced life expectancy, and social, economic and cultural. Delivery methods for indigeonous social housing and infrastructure is in need of reform to overcome the mounting problems and to address continuing disadvantage of indigenous communities. A current Government initiative is the Strategic Indigenous Housing and Infrastucture Program (SIHIP) which is using an Alliance approach to deliver the planning, design and construction stages for social housing. Project Alliancing is a form of relational contracting that provides value for money, fosters trust, manages team goals, attracts multi-disciplinary expertise and encourages innovation in order to develop the best possible solutions for project delivery. Alliancing is characterised by project arrangements which ensure that risk is shared across all participants under a pain/gain-share system to overcome previous problems with traditional contractual approaches which have have been adversarial and inefficent. Through a case study approach, this paper analyses the SIHIP Project Alliance framework and focuses on specific outcomes of the Alliance partners. The SIHIP was particularly successful in terms of redefining program management principles, integrating community consultation and cultural considerations and devlivering sustainable housing projects for indigenous Australians.

Keywords:

Australia, Government projects, indigenous social housing, project alliancing, sustainable procurement

1 Introduction

The management of construction projects and associated research is grounded in achieving successful production of a project throughout the entire life cycle of the construction process. Effective management and use of resources throughout this entire holistic process is the key to successfully producing a product in the built environment (Harris et al, 2006). It is the procurement approach that provides a framework for all the aspects of construction to be holistically brought together to produce a successful

product Walker (2008). Development of procurement strategies can effectively govern the success, efficiency and sustainability of a construction project. It is this that governs the aim of this paper, which sets out to identify issues with the problem of providing adequate and appropriate housing for remote indigenous communities. This has been identified as a serious problem throughout Australian history by the likes of Read (2000), who covers a history of the research into the social, political and cultural problem; and both Pholeros (1993) and Memmott (1989), who further describe problems with Indigenous Housing (IH), particularly those with the construction and provision of houses in the remote Northern Territory (NT) of Australia.

Recent innovations in procurement have led to the development of contracting frameworks that aim to address the increasing nature of change and complexity of the construction industry. Formed around the characteristics of developing relationships, sharing risk and collaborative and innovative development of solutions, Project Alliancing is a contracting system which embraces change, adapts to obstacles and enables participants to work together to achieve increased project performance and improve the key outcomes of time cost and quality. It is the choice of implementing the Project Alliancing framework for the delivery of remote IH in the Strategic Indigenous Housing and Infrastucture Program (SIHIP) that forms the basis of this paper.

Subsequently, the aim of this paper is to:

"Evaluate the SIHIP Project Alliancing procurement model in delivering culturally, economically and socially successful Indigenous Housing outcomes."

The significance of the problems associated with indigenous housing is pronounced and evidence is wide spread. With grossly overcrowded houses, poor performance of utilities, no maintenance and deteriorated, unsafe buildings (Pholeros 1993), (ABS 2006), (FaHCSIA, Australian Dept. of Families 2007), Indigenous Australians in the remote areas of NT have the lowest socio-economic profile of all Australians. Procurement in construction is an evolving process that provides a framework for the successful and effective delivery of a construction project over its lifecycle (Walker, 2008). Long and Memmott (2007) identify Indigenous housing as having to incorporate all aspects of production, management, maintenance and occupation of indigenous living environments. In addition the NT governments' Department of Local Government and Housing has identified problems with current IH and their solution involves the provision of adequate housing and services to remote indigenous communities.

The development of the SIHIP saw the choice of Project Alliancing as the most effective contracting method for successful delivery of IH (FaHCSIA, Australian Dept. of Families 2009). Therefore, drawing on issues of remote IH and the successful attributes of Project Alliancing procurement strategies, this paper will evaluate the success of the SIHIP in solving problems that plague the NT indigenous communities.

2 Literature Review

2.1 History of Indigenous Housing

The management and quality of housing and the built environment have always been a primary determinate of indigenous disadvantage, especially in remote communities. The

1970s saw the first official definition and identification of issues revolving around housing and infrastructure and how it served as a major element of concern for the living conditions, health and overall social wellbeing of the Australian indigenous people. Rowley (1971) described housing or the level of dwellings during that era, as an issue decaying the standard of living of many remote aboriginal communities. The poor standards of living including poverty, lack of education, violence and health issues became attributed to the primary issue of insufficient and inappropriate housing. Heppell (1979) drew these conclusions along with the need for improved government policy aiming at the immediate need and the development of long term solutions to problems with Indigenous housing in remote Australia.

Memmott (1990), Saunders (1990) both gave developed insight into housing policy for indigenous Australians and identified areas of concern. They covered the need for both state and federal policies to understand the specific need for positive development of housing. This related not only to provision, but the specific design, construction and delivery of the projects that would be appropriate to the needs of remote Indigenous communities, especially in regard to culture, living standards and remote sustainability. The situation in recent years has continued to be problematic with issues of overcrowding, low quality construction, inefficient planning, poor community infrastructure and lack of basic services and utilities (ABS 2002). Reviews of government programs also confirmed some problems not only with the housing itself but also the method of delivery and focused more specifically on poor construction, maintenance and management of housing, fragmented and failing housing organisations and ill allocation of funding (FaHCSIA, Australian Dept of Families 2007).

The current SIHIP is utilising almost A$700M funding and is the largest IH program undertaken by the Australian and NT governments (FaHCSIA, Australian Dept. of Families 2009). The primary aims reflect those of similar policies and past programs, with additional objectives to improve remote indigenous built environments through the construction, rebuild and refurbishment of houses

2.2 Procurement of Indigenous Housing

Pholeros (1993) identified the need for a system of procurement involving industry, government and community partnership. In his contribution to the benchmarking framework in service delivery (Council for Aboriginal Reconciliation: Benchmarking Workshop, 1997) he stated that the need has been defined and it is time to develop solutions and begin work to improve the day to day living environment. There was also definition that the policies must match the practical work, which is difficult with the complexity and layers on many of the current and previous policy. From his work in the communities he identified the problems attributed to poor design, construction standards and overall management of the construction process. There was even reference to developing a specific section of the Building Code of Australia (BCA) for indigenous and remote housing and infrastructure (AIHW, 2005). It was also identified that for Government programs to achieve their objectives the process of implementation and construction must be managed and organised better (Barker, 2003).

2.3 Project Alliancing

Construction projects are by nature dynamic, ever changing and inherent with risks. These levels of risk and the growing size and complexity of projects has attributed to

the adversarial and fragmented nature of the construction industry (Noble, 2007). Project Alliancing aims at effectively managing risks and encouraging more collaborative, relational and contractual partnerships between stakeholders to better achieve the objectives and improve overall project performance. Project Alliancing utilises the principles of sharing risks and benefits in to develop relationships and integrate the project team to maximise project performance (Walker, 2008).

According to the Victoria Governments 'Project Alliancing Practitioners Guide' (Dept. of Treasury and Finance, 2006), an Alliance is "a commercial/legal framework between a department, agency or government-business enterprise as 'owner-participant' and one or more private sector parties as 'service provider' or 'non-owner participants' for delivering one or more capital works projects. The system demonstrates characteristics of a partnership in that there is a collective sharing of almost all project risks and benefits, a no blame/no disputes agreement, with an integrated project team selected on best placed entities and a principle based strategic management process. In partnership, each entity provides their services on a net cost basis, and upon completion of the project the parties share in the profits and or losses respectively.

Traditional forms of contract such as construct only or combined design and construct systems consist of project risks being allocated to the party believed best placed to mitigate and manage the risk. The terms and conditions of traditional contracts aim at predicting all possible outcomes and assign liability and when changes and alterations occur, the result often ending in dispute. Project Alliancing is built on partnering to embrace collaboration, change and innovation in project delivery (Sakal 2005). Another prime characteristic of an Alliance is the early involvement of contractors and other stakeholders to encourage innovation, collaboration and allowing the design, construction and use of the occupation of the project to be integrated (Scheublin, 2001).

Alliance systems have been used on numerous capital works and infrastructure projects in the Australian public sector. To take advantage of Alliancing in the public sector, some Australian State Governments have developed a set of guidelines detailing the processes and framework for using Alliances to deliver major capital works. Australian projects utilising Alliances include Sydney water infrastructure works, Dept of Defence projects, and major road and civil works from both local and state governments (Dept of Treasury & Finance, 2006). However, the use of Project Alliances to deliver building projects across the public and private sector has been limited, the SIHIP is another of the first major building projects to utilise this system, and the project offers its own unique risks and challenges. The following table lists the benefits and risks associated with using an Alliance based contracting system such as Project Alliancing.

Table 2: Benefits and risks of project alliancing (Adapted from Sakal, 2005; Victorian Government, 2006; and Walker 2008)

BENEFITS	RISKS
'Best for Project' not 'Best for Individual' commercial focus	Participants are responsible for larger range of risks & liable for the performance of other participants
Improved ability to manage risk, uncertainty and change through shared responsibility and resources	The absence of competitive tendering and pricing may lead to questioning the value for money
Early involvement of contractors and consultants	Larger levels of involvement by senior participants
Reduced need for contractual administration, reduced disputes, claims and litigation	Resource intensive
Encourages innovation and high standard of work	No maximum or capped pricing for clients/owners
Collaboration provides development opportunities for client and alliance teams	Risking profit an overheads for non owner participants
Increased accountability and transparency in costs. More robust budgeting and value for money	High costs of tendering
Project objectives aligned and achieved efficiently through incentives for Non owner participants	Requires full commitment and may reduce the ability to perform normal business activity.
Costs and budgets are developed over the course of the project to reduce overall prices and get vfm	Legal recourse against participants is limited to wilful default or acts of insolvency

3 Research Methodology

The data collected for this paper involved a number of levels of inquiry. Primarily, the research focused on published literature and secondary data. This allowed the researchers to understand the themes based entirely on the information at hand without opinion or subjectivity (Knight 2008). The preliminary stages of research analysed current and historical literature to gain an understanding of the issue of remote indigenous housing, and identified the need for a procurement approach specific to this problem. The issues or principles of IH established via a review of literature were identified as both problems and contributors to successful outcomes. Subsequently developed into criteria, the principles were used to evaluate a case study of the Project Alliancing procurement system developed for the SIHIP in the Northern Territory of Australia. The evaluation was be based on the performance review documentation and published statistical data representing the outcomes of the SIHIP.

4 Findings and Discussion: The Strategic Indigenous Housing and Infrastructure Program (SIHIP)

The Strategic Indigenous Housing and Infrastructure Program (SIHIP) is a current initiative of the Australian and NT governments aimed at improving housing outcomes for indigenous Australians in rural, remote and very remote areas of the NT. The program is the largest of its kind and SIHIP will construct new houses, rebuild and refurbish existing houses in over 70 remote regions in the NT. Delivered using Alliance contracting the SIHIP was developed to achieve the objectives of national IH policy and address the issues of previous projects through timely and cost-efficient delivery.

4.1 Development of SIHIP

The program, as a part of the reform agenda depicted in the National Partnership Agreement on Remote Indigenous Housing (NPA RIH), was announced in April 2008. The SIHIP replaced the previous arrangements of the Aboriginal Rental Housing and Community Housing and Infrastructure Programs, following the trend of federal and state funding and state controlled delivery of the program. It was the agreement between the federal and NT governments which initiated the establishment of the SIHIP in response to the recognition that previous housing programs had been unable to achieve the desired outcomes (COAG 2008). The project aimed to address the large shortfall in housing stock, overcrowding, poor living conditions and overall community, social and economical disadvantage to the Indigenous population in remote NT (ABS 2006).

Recognition of the multitude of problems combined with the understanding that previous programs were failing to achieve the desired outcomes prompted a change in program structure and project delivery. As the general delivery method was previously standard one-off, lump-sum contract agreements, the programs failed to achieve value-for-money and the economies of scale that are needed for successful outcomes in a unique project such as this. Presented with a range of business and policy challenges unique to the remote Indigenous regions of the NT, such as cultural and social considerations, history and heritage, environmental and climate restrictions, limited resources and a significant potential scope of works, the government agreed that a alternative procurement approach may be able to achieve the required outcomes (FaHCSIA, Australian Dept. of Families, 2009). A system which provided incentive for quality outcomes, sharing of risk, responsibility and benefits, and greater elements of indigenous employment, training and overall community development would be a significant driver for change to achieve more sustainable improvement.

The SIHIP was initiated in September 2007 (DHLGRS, Dept. of Housing 2010) and aimed to deliver the construction of new housing, refurbishment and upgrading of existing housing, including servicing of sites, improvement of living conditions and communities in the remote areas of the NT, in addition to infrastructure and capital works. Announced in late 2008 the program was initially provided with $538 million worth of funding from the Australian Government an additional $100 Million from the NT Administration. The NT Government delivered the program through the Project Alliancing procurement system and would also be responsible for property management, collection of rent and routine maintenance though the public housing framework. The Australian government would provide support throughout the program, oversee the delivery and provide governance and guidance of key decisions and the strategic direction of the program.

4.2 The Project Alliance Approach for SIHIP

It was decided that a Strategic Alliance procurement system would be the most effective approach to achieving the objectives of the program through best practice procurement. The system had the potential to achieve greater economies of scale, better value for money, and grab the attention of innovative and successful international companies with the capacity to partner with smaller local firms capable of integrating and engaging the local community (FaHCSIA, Australian Dept. of Families 2009). Initiated in 2007 the system was based around the Victorian Governments ‘Project Alliancing Practitioners Guide’. The procurement approach is based around the following characteristics:

Collective sharing of project risks;

No, fault, no blame and no dispute between alliance participants;

Payment of NOPs for their services under a ‘3 limb’ compensation model:

Reimbursement of NOPs project costs on a 100 percent open book basis;

A fee to cover corporate overheads and normal profit; and

A gainshare/painshare regime where the rewards for good performance and the penalties for poor performance are shared equitably.

Unanimous principle based decision making on all key project issues; and

An integrated project team selection based on best person for each position.

Early involvement of contractors

Specific details of the SIHIP Project Alliance are summarised in Table 2.

Table 3: SIHIP Project Alliance Details

PROCUREMENT SYSTEM	Alliance Contract System: Separated into 3 regional project alliance partners assigned work packages in separate geographical regions. Engaged to collaboratively manage the delivery, design, construction, refurbishment and management/maintenance of the project
GOVERNANCE	NT Government: Contracting entity, responsible for the delivery of the program, management of contracts, organisation of land tenure, capital works and development planning. Australian Government: Strategic guidance and management of the program and contracts; development and support during procurement process and program establishment.
ALLIANCE STUCTURE	Governed by the agreement between the federal and NT governments the alliances consist of a combination of the following: Head Contractor; Developer; Local Construction Firm; Engineering firm; Civil Contractor; Specialist Trade Contractor; Building service company; and Suppliers
ALLIANCE DELIVERABLES	The program alliance method led the Australian and NT Governments to select and engage professional services including: Program management services; Cost management; Design coordination; Construction management; Financial Audit services; Value for money; and economies of scale
TIME FRAME	Completed by the end of 2013
HOUSING DELIVERABLES	New Houses = 750 Houses Rebuilds = 250 Houses Refurbishments = 2500 Houses
ALLIANCE DELIVERY METHOD	Phase 1 Selection of alliance partners: Selection and engagement of for a collaborative alliance construction consortia though public and select tendering. Non-competitive environment to encourage partnering, innovation and commitment. Public Expressions Of Interest (EOI) in May 2008 Selective Request For Proposal (RFP)in June 2008 Detailed Selection and evaluation panel Engagement and development of alliance terms Phase 2 Planning and Development Develop and plan cost and scope packages based on community engagement Employment & Workforce Development including minimum of 20% local indigenous training & employment Detailed design and planning Phase 3 Delivery/ Construction: Procurement of local services Delivery of Houses Construction, refurbishment and rebuilding of houses Continuous community involvement, training and employment
ALLIANCE PARTNERS	Earth Connect Alliance: Canstruct Pty Ltd; WorleyParsons Services Pty Ltd; Force 10 International Pty Ltd; Greene & Associates Pty Ltd; and Ostwald Bros. Pty Ltd

	New Future Alliance: Leighton Pty Ltd; Broad Construction Services Pty Ltd; Opus Pty Ltd; and Ngarda Civil & Mining Pty Ltd Territory Alliance Partners: Sitzler Pty Ltd; Laing O'Rourke Australia Construction Pty Ltd; McMahon Services Australia Pty Ltd With a Sub Alliance Participant: Compass Group (Australia) Pty Ltd
INITIAL BUDGET	Australian Government: $ 547 Million NT Government : $ 100 Million Additional: $ 25 Million Total = $672 Million
ESTIMATED UNIT COST (Standard unit cost per dwelling, as determined from previous programs and cost planning	New House Target Cost: $350,000 Estimated Regional Package Cost: $30-$50 million

4.3 Principles for Success

Identification of the primary issues with remote indigenous housing is the first step in developing the objectives and desired outcomes for a housing program. The focus of the procurement and contract system must successfully address the issues present through the delivery of a housing project that achieve sustainable housing and associated outcomes (Tipple and Willis, 1991). Through thematic and statistical analysis of literature, government surveys and statistical reporting, a number of themes were established as key principles for success in the procurement of IH. These principles affect the success of remote housing programs and are critical issues that can assist in improving the outcomes of the remote IH situation in the NT. Each of these principles are highlighted and discussed below in order to elaborate on their success in delivering the SIHIP Project Alliance. 11 principles were identified in total, however, due to the word limit constraints of this paper, only the first three are reported in detail here. The 11 principles for success in the SIHIP Project Alliance are:

Cultural and Social considerations;

Design Suitability;

Economic Development;

Community Involvement and Consultation;

Regional Focus;

Value for Money;

Adaptability;

Sustainable Practices;

Effective Program Management;

Construction Standards; and

Time.

The following discussion of some of the key principles for success draws upon the outcomes and results of the SIHIP in accordance with 'The Review' (FaHCSIA, Australian Dept. of Families, 2009) and the PRA (SIHIP- Post Review Assessment, March 2010). These, together with the understanding of the Alliance system used in the SIHIP, discusses the degree to which the SIHIP Project Alliance addressed the key principles of remote Indigenous Housing.

4.3.1 Cultural and Social Considerations

The strong and unique cultural principles that guide the lives of Indigenous Australians should be a major consideration in any attempt to develop the built environment and community infrastructure which these people inhabit. The SIHIP Alliance has a defining characteristic of utilising early contractor involvement and community consultation during the preliminary stages of the Alliance. In these early stages preliminary scope of works are drafted and designs are developed based on the specific needs of the occupants and surrounding community. However this is completed on a large scale for each Alliance partner in their respective geographical area, for the entirety of the communities in that area. Indigenous culture is unique in its connection to the land and living environment, and each local area may have different cultural beliefs in connection to their landscape and location (Heppell 1979). The SIHIP addressed this through is strong emphasis on community involvement for each separate locality and community site, in attempt to ensure cultural appropriateness of the housing solutions (FaHCSIA, Australian Dept. of Families 2009).

Despite the emphasis on community consultation the Alliance governance structure does not demonstrate a substantial level of indigenous decision making into the management processes. This could be attributed to the consideration of cultural and social issues being of lower importance in the Alliance system. These considerations are likely overtaken by the cost considerations and attempts to utilise economies of scale for the entirety of the program. It is clear that the program is responsive to the communities cultural and social needs, the balance was lost between the endeavour to keep unit costs per house down, to meet targets over the life of the program. Overall the Alliance model ensures cultural and social issues are considered at a moderate level.

4.3.2 Design Suitabilty

As fundamental criteria to the success of the remote indigenous housing projects, the design and planning of the dwellings is affected by the procurement process. The design considerations are broad for remote housing including cultural and social elements (as above), climate, remoteness, and cost factors. The Alliancing framework provides for improved consideration for appropriate design through its consultation processes and the commitment to cultural and social issues.

The attraction of high quality designers, architects, planners and engineers through the Alliancing approach ensures commitment to appropriate designs and planning of communities. This is opposed to traditional forms of procurement which are based on competitive tendering and contractors are chosen heavily on price based criteria, and not their contribution to successful designs (Noble 2007). Early involvement of the contractors and consultants in the development stages of the Alliance, is utilised in workshops to propose potential designs leading to constant development of designs that are suited to the specific site conditions and occupant needs. Alliance teams develop a 'Project Development Report' for each of the regional project

locations, which defined the scope of works, designs and cost packages to provide value for money and meet the needs of the community. These processes involve large levels of community consultation and effectively are aimed at improving the suitability of the houses to achieve the objectives of the program (Dept of Treasury and Finance, 2006).

4.3.3 Economic Development

The SIHIP aimed to contribute to the economic development of the local communities, the state and federal economy and the Non-Owner Participants in the Alliance teams. The introduction of the large scale Project Alliance system into the NT government public works program is still in its early stages, this enables the NT government to develop new skills and resources that are required for the implementation of the SIHIP Alliances. Taking on responsibility and managing risk that is not generally borne by the public sector, additional resources, training and staff are required. Bringing new skills and experience in the innovative contract system, the Project Alliancing approach enables the economic and corporate development to the public and private sector of the NT. The use of Project Alliancing generally attracts large and innovative national and multinational participants, whom bring their resources to the NT to contribute services and contribute to the workforce and economic development of the Territory.

Across the life of the program, Alliance partners are in agreement to reach targets of local indigenous training and employment, as a major commitment to achieving improved social and economic outcomes for the region. The targets were set to reach 20% indigenous and local employment and training across all projects, and at the time of this research these were being exceeded in the Tiwi Islands and Tennant Creek projects. The training and development of the economy in the remote communities is integral in achieving long-term outcomes, the SIHIP must ensure that the development of the workforce and community is continued after the completion of the project, with integration of property management, maintenance and asset management into the program giving the community an understanding of the processes and principles of building and their maintenance. Further to the effect of the Alliance on economic development, the processes involved with selection and sourcing of resources, together with the level of works taking place in these otherwise isolated communities can in the short term provide economic stimulus to the area, and hopefully foster the development of future business endeavour and wealth creation.

5 Conclusion and Further Research

The standard of living conditions for indigenous Australians in remote areas of the NT is widely acknowledged as below the standard of the remainder of the population. Past programs have failed to address the problems of overcrowding, poor living conditions, homelessness and severe shortage of appropriate housing across the NT. The delivery of remote Indigenous housing is in need of reform to address the mounting problems and continuing disadvantage of remote Indigenous communities. The principal means for achieving successful housing outcomes lies in the procurement of design, construction, management and maintenance services to deliver housing and associated infrastructure. Via a case study analysis of the SIHIP Project Alliance, 11 principle factors were identified as being critical for the projects success. This paper identified all 11 of these principles, but due to word limit constraints, reported in detail on 3 of them, namely ‘cultural and social considerations’, ‘design suitability’ and ‘economic development’.

The SIHIP, which is the largest scale IH program, is improving the outcomes of remote Indigenous housing. The paper identified Project Alliancing as providing a departure from the traditional contracting methodologies and subsequently offered a range of benefits toward the improvement of IH outcomes in remote areas of the NT. The SIHIP Alliance framework was found to encourage collaboration, innovation and allowed all participants to work as an integrated team towards reaching the projects objectives. Characterised by the arrangements which ensure risk and responsibility is shared across all participants and a pain/gain-share payment system the Alliancing approach collectively ties project objectives together and ensures all participants are working together towards goals and either win or lose as a group. Repeatedly defined as being suited to complex, dynamic projects that have an undefined scope of works and potential to change substantially over time, Alliancing is as an appropriate procurement method to be applied to the ever-changing problem of remote IH delivery.

Project Alliancing is a pioneering method of procurement in the Australian government and SIHIP is the first time this approach has been applied to a housing or other Capital Works program in Australia's NT. Overall the innovation in procurement methods such as Alliancing has the potential to contribute successfully to remote indigenous housing and significantly improve future outcomes. Through greater experience with relational contracting systems and commitment from industry and the public sector, Project Alliancing will be instrumental in delivery of sustainable housing programs for remote Indigenous Australians, with flow on effects into the development and principles of closing the disadvantage gap.

5.1 Further Research

These findings warrant further research into remote Indigenous Housing procurement. SIHIP has shown that Project Alliancing has the potential to improve the outcomes of challenging and dynamic projects such as indigenous housing and relational contracting methods also have the ability to change the way in which other large-scale Public Works construction projects are procured. To improve the knowledge base of IH procurement approaches the following areas are recommended for further research:

Reporting on the other 'success' principles not discussed in detail in this paper;

Further analysis of Alliance outcomes from SIHIP on completion in 2013;

Tailored contracting and procurement methods for remote indigenous housing;

Investigation of the non-owner participants' experiences in IH projects; and

Assess the impact of policy and legislation on standard methods of procurement for IH and the development of relational contracting standard conditions in Australian construction contracts such as AS2124 and GC21.

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Impact of Bureaucracy on Project Change – A Framework for Evaluation

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Abstract:

Changes in construction projects represent risks for all project stakeholders, but without uniform and reliable metrics to record and compare, changes are subject to opinions and cannot be easily analyzed. This paper proposes a framework for the evaluation of the impacts of an environment on project change. Bureaucratic and Less-Bureaucratic environments are used as case studies for the application of this framework. The impact of the environment on project change is calculated based on 1) Dominant metrics and KPI; 2) Clear classifications of the sources of change; and 3) Sound analyses regarding the recorded outcomes. This paper illustrated the difference between these two environments by comparing their rates of change and suggested areas of improvement. The four (4) metrics to quantify change were: 1) Cost; 2) Schedule; 3) Client satisfaction or quality rates; and 4) Quantities of types of changes; and the four (4) metrics to classify the source of change were: 1) Client; 2) Contractor; 3) Designer; and 4) Unforeseen. The results indicated that there was a greater percentage differential between schedule delays versus cost impacts of the two environments. Additionally, the client was the greatest source of change, specifically schedule changes in Less-Bureaucratic environments.

Keywords:

bureaucracy, environmental impact, performance, performance metrics, project change

1 Introduction

The construction industry has been portrayed as inefficient and resulting in many project changes by sources such as Ibbs *et al.*, 2007; Thomas, 2010; Thomas and Napolitan, 1995; Wambeke *et al.*, 2011. Most of these sources identified the causes of change, but experienced challenges in quantifying the resultant inefficiencies. Measurable and quantifiable data regarding project changes is of use to the industry in order to properly analyze the rise and fall of the projects with respect to change and its causes.

The proper measurement of project change via performance metrics, coupled with the characteristics of the project's environment, would provide better insight into identifying the main sources of change and an estimate of the impact. Commonly, contractors will blame losses due to change and productivity on the client, whereas the client is likely to blame the contractor (Ibbs *et al.*, 2007). Furthermore, measurement of these factors and attributes of the environment in which these projects operate would provide an analysis of the impact that particular environment, specifically bureaucratic, has on project change. It has been stated that there are no current studies that definitively report quantities of change, their impacts, and potential causes (Ibbs *et al.*, 2007; Thomas and Napolitan, 1995).

Without proper classifications of the causes of project change and the quantification of their impacts, analyses cannot be carried out across different projects and environments comparing the causes of change, impacts of change, and matters to alleviate project change. The main reasons as to why this has not been easily carried out are lack of uniformity and reporting of data across projects and environments regarding: 1) Metrics or KPI; 2) Classifications of the sources of change; and 3) Sound analyses regarding the recorded outcomes. This paper will properly address these problems as well as define proper metrics and classifications of the main sources of change and apply this framework to projects in both Bureaucratic and a Less-Bureaucratic Environments for comparisons. By first defining bureaucracy, describing Bureaucratic and Less-Bureaucratic environments, and then utilizing two contrasting case studies to illustrate these differing environments, this paper compares their respective project outcomes and environments noting their rates of change, and suggests areas of improvement.

The questions that this paper addresses are: 1) What are the valid KPIs and sources of change to be utilized for a comparison of projects; 2) What are the results when valid KPIs and sources of change are applied to projects within two differing environments (Bureaucratic and Less-Bureaucratic); and 3) What characteristics make either Bureaucratic or Less-Bureaucratic environments more conducive to reduced changes? In the following summary and analysis, these questions will be answered as well as recommendations provided.

2 Literature Review

2.1 Research Problems Addressed

The determination of what and who to measure are challenges in quantifying changes and making recommendations. Models such as: lost productivity method, measured mile analysis, baseline productivity analysis, system dynamic modeling, earned value analysis, sampling methods, and comparison methods are commonly referred to (Ibbs *et al.*, 2007), but inconsistently used across case studies. More commonly, construction projects are measured via Key Performance Indicators (KPI). However, KPIs are often not uniform across projects and result in confusion regarding what should be measured, how it should be measured, what are the sources of change, and how to evaluate project success or failure. Furthermore, with these suggested models and KPIs, few studies utilize internal and external project data with measurable results to validate them.

2.1.1 Current Metrics

According to Cox *et al.*, Key Performance Indicators (KPIs) are compilations of data measures used to assess the performance of a construction operation or a particular task (2003). Generally, these measures have comparisons of estimated or planned and actual or completed quantities. Furthermore, the measures are often of both the intangible and tangible types. These generalizations make comparisons of KPIs quite challenging across projects and organizations. Cox *et al.* identifies that current models fail to identify which indicators will accurately portray the changes in performance (2003). This paper holds that the quality, rather than the quantity, of measurements should be upheld.

The KPI suggested by the majority of the literature are not incorrect, rather, they are not precise enough and result in an overload of subjective measurements. Examples of qualitative KPI suggested by the literature are: safety, turnover, absenteeism, and motivation (Bassioni *et al.*, 2004; Cox *et al.*, 2003; Ibbs *et al.*, 2007). In contrast, examples of quantitative KPI suggested by the literature are: units/man-hours, dollars/unit, cost, on-time completion, resource management, quality control, percentage complete, earned man-hours, lost time accounting, and punch list (Bassioni *et al.*, 2004; Cox *et al.*, 2003; Ibbs *et al.*, 2007). A survey and analysis revealed top rated KPIs in order of: on-time completion, no preference, units/MH, safety, and quality control/rework (Cox *et al.*, 2003). A common and concise list of KPI would be beneficial for proper project comparisons of change.

Two common references for quantification of KPIs and comparisons are industry studies or databases and construction productivity claims made in court; however, both have limitations of application. Industry studies and databases can be misleading, as Thomas found a range of error in predicting the inefficiency for a single project to be 10-40% differential (Thomas, 2010). Loss claims can become a source data and comparison for other projects, as contractors file and attempt to quantify cumulative impact of multiple change orders and productivity (Jones, 2001; Gulezian and Samelian, 2003). However, there are challenges in utilizing these measurements due to their litigious nature and highly project-specific variables.

2.1.2 Problems: Sources of Change

Change is commonly defined as any deviation to the original scope of work (Ibbs *et al.*, 2007; McEniry, 2007; Thomas and Napolitan, 1995). The KPI previously mentioned focuses more on intangible qualities, rather than those easily quantified. Thus, there is a misalignment of KPI and how change is measured. Additionally, KPIs are not assigned a source responsibility, thus project changes are measured as an overall value and not particularly attributed to a specific source. Changes should be measured with respect to the responsible parties or party for the deviation, instead KPI are commonly followed to measure the outcome versus the change itself.

The inefficiency caused by change has been most commonly associated with the cost of change orders. Estimates of the impacts of change vary from: 6 percent due to design errors, 30-60 percent total, 11 percent total (Ibbs *et al.*, 2007). This range in percentages suggests that metrics should be further divided into simpler categories. A total value can be misleading as it may be due to specific types of changes and have multiple sources. Knowing who is responsible is an important tracking mechanism if the rate of change has any hope of improving. Properly

identifying and assigning responsibilities can assist in accessing the efficiencies of each responsible party, or lack thereof.

Some studies have attempted to create a model to evaluate the performance of entire organizations or entities in construction with regard to overall and managerial impacts (Horta *et al.*, 2010; Yu *et al.* 2007). The construction industry and the businesses that it consists of are both similar and different to the common organization. For example, most businesses would focus on profitability as their main metric, while it is suggested that construction businesses should focus more on resource allocation and utilization measures (Yu *et al.*, 2007). The measurement of this becomes complicated; however, there exists a multitude and variety of resources and no direct tracking mechanisms. Rather than tracking organizations, projects the organization completes should be tracked with respect to changes, sources of change, and impacts, analyzing via comparisons if the environment itself is a hindrance.

2.2 Bureaucracy: Defined

Bureaucracy is a characteristic of an organization that, for the purposes of this paper, can be observed to have an impact on overall project performance within an organization and is generally a prohibitive quality. Bureaucratic organizations are often seen as being inefficient (Horta *et al.*, 2010; Luo and Junkunc, 2008). Thus an analysis of this particular environment would prove insightful of some of the more negative impacts and changes that could occur, according to its definition.

2.3 Bureaucracy: Highly-Bureaucratic Organizations

As an active scholar on the topic of public management, Pollit examined a series of case studies of various organizations and their bureaucratic aspects, finding the following characteristics of bureaucratic organizations (2009):

There is a clear hierarchy of offices;

The functions of each office are clearly specified;

Officials are appointed on the basis of a contract;

Officials are selected on the basis of a transparent set of requirements for certain levels of education/training;

They are paid a salary, linked to hierarchical position, and accrue pension rights;

Their posts are their sole or major occupations;

There is a career structure, and promotion is by seniority or merit (or some mixture), decided by the superior ranks;

Management of the office relies upon written files – decisions are inscribed in an official record;

The official may not appropriate the post or the resources which go with it;

The official is subject to unified control, and a disciplinary system;

The whole organization is rule-governed, and those rules are law or law-like.

From this, it can be seen that bureaucracy depends on the structure of the organization itself. The key tenants are: continuous central authority, a written record at the core of operations, and hierarchically defined rules and precedents. These factors may not seem unique to the case studies presented in this paper; rather, they are quite indicative of most organizations (Pollit, 2009).

2.4 Bureaucracy: Less-Bureaucratic Organizations

Pollit furthered his research into bureaucracies, identifying what he termed "post-bureaucratic" organizations that have put in place a conscious replacement for a traditional bureaucracy, resulting in increased speed, efficiency, flexibility, committed and more outward-looking outcomes. The move to decreased bureaucracy typically involves one or more of the following innovations (Pollit, 2009):

Hierarchies are flattened. Horizontal connections are emphasized

Significant parts of the organization's activity are no longer conducted by specific 'offices' with a fixed place in the hierarchy, but rather by temporary teams or networks which may include outsiders of various sorts.

Officials are still appointed on contracts, but the nature of these contracts becomes more variable. More are temporary or short term and tied to the achievement of specified goals rather than procedures and responsibilities.

Appointments may still be made on the basis of transparent criteria but the variety of criteria for the variety of roles becomes greater. All sorts of specialists may be hired on all sorts of specialist or local terms. This may well weaken the general sense of uniformity and hierarchy.

Salaries also become less uniform and less predictable. Top executives may be paid spot salaries to 'reflect the market'. At all levels of the hierarchy performance-related pay (PRP) means that competitive elements are injected;

At all levels, there is more part-time and temporary working. For many in the post-bureaucratic organization their 'post' may be only one of the things they do;

There is a career structure, but it may involve jumping from organization to organization, from public sector to private sector and back, in order to 'get on'. This alters patterns of loyalty, and the depth of experience high-flyers get of individual organizations;

The principle that decisions should be recorded is maintained, but the ways in which such recording takes place have become faster and more varied most notably through electronic systems;

The individual still may not appropriate the post or its resources. On the other hand, the increasing rate of movement between organizations and the increasing rate of part-time working for more than one organization combine to create larger possibilities for conflicts of interest.

The official is subject to control and discipline, but 6, 7 and 9 above all tend to weaken the effect of these controls on a significant proportion of staff;

The whole organization remains rule-governed, but (a) (at least rhetorically), flexibility and initiative are said to be prized more than 'rule-following'; (b) more of the rules are likely to be 'soft'– codes of practice; guidelines, for example; and (c) the rules are likely to change more quickly which also makes them harder to learn and internalize.

The mere existence of rules and regulations is not counter to less-bureaucratic environments. Rather, administrative barriers, including, "excessive documentation requirements, inadequate information on rules and regulations, inconsistent procedures mandated by different departments, lengthy registration or ratification periods, artificially imposed regulatory obstacles, redundant complexity of formalities, absence of a uniform system of fees, taxes, and other charges, complicated processes requiring multi-agency approval, and unsupportive attitudes from public and government institutions, among others" act in opposition to less-bureaucratic environments (Luo and Junkunc, 2008).

Organizations can fall somewhere on the spectrum of highly bureaucratic to a very low level of bureaucracy. The presence and the intensity of the aforementioned factors of: continuous central authority, written record of operations, and hierarchically defined rules and precedents will determine the appropriate level of bureaucracy. If there is a small central authority or a body with low authority over others, a short record or operations that do not rely solely on the record, and rules that depend on core business functions rather than a predetermined criteria or only one previous case, then there is likelihood that the bureaucracy level is low and corresponds to a Less-Bureaucratic Environment for the purposes of this paper.

3 Research Methodology

In order to validate the framework proposed here for the evaluation of the impacts of an environment on project change, it was tested against two different organizations, each with their own environment. Utilizing Pollit's classifications, the organizations' environments were characterized, with one being "Bureaucratic" and the other being "Less-Bureaucratic." The Bureaucratic environment in this analysis had a very large and highly powerful central authority, a lengthy written record of operations, and also an extended hierarchy that defined rules and precedents based on few representative cases. In comparison, the Less-Bureaucratic environment was characterized by lower levels of these qualities and is working more towards what Pollit identified as "post-bureaucratic" (2009). Within these environments, their projects are evaluated.

These organizations were chosen because they presented bureaucratic dichotomies, making testing of the framework presented here most effectual. Additionally, these organizations presented the best opportunities to evaluate multiple projects under the same organization. In this way, variables between projects could be held constant and a large project based could be

evaluated. The environments could test the framework under multiple projects, with their associated outcomes forming the basis of the research for this paper.

3.1 Metrics for these Case Studies

The analyses of project change for this paper held to the concept that any deviation to the original contract should be tracked in the following metrics: 1) Cost; 2) Schedule; 3) Client satisfaction or quality rates; and 4) Quantities of types of changes. Additionally, each change should be categorized according to its source or responsibility in the following classifications: 1) Client; 2) Contractor; 3) Designer; and 4) Unforeseen. The proper change measurement metrics, coupled with the appropriate sources of change form the basis of measurement and comparisons between the Bureaucratic and Less-Bureaucratic environments.

Data on the projects' changes were gathered via excel spreadsheets in which all deviations to cost, schedule, and satisfaction/quality were tracked and validated. These spreadsheets were completed by contractor PMs and reported on a weekly basis throughout each individual project. These deviations formed the main data sources for every project. Once a project received final payment, Client Project Managers were asked to rate the contractors and the process on a scale of 1-10, with 10 being high or satisfied. These closeout surveys were administered to ensure all matters were completed and there were no areas of dissatisfaction or misalignment between the Client PM and the project. Additionally, the surveys solicited feedback and lessons learned by the Client PM based on that particular project.

4 Findings and Discussion

4.1 Data from Case Studies

4.1.1 General Overview

Original costs and schedules for every project were captured in each respective environment and contained in the excel spreadsheets and changes were reported weekly by the contractor PM throughout the project. Percentages were calculated based off of the deviations from the original data established. Comparing Less-Bureaucratic (LB) to Bureaucratic (B) projects, the average proposal costs were within $200,000, total awarded cost within about $1,000,000, and their estimated budgets within $95,000 (Table 1). The Bureaucratic environment had nine projects, and the Less-Bureaucratic environment had thirty-four projects. The similarities in their projects' sizes and costs make these two environments valid case study comparisons to apply the framework of change metrics and source classifications.

Table 1. General Overview

Metric	LB	B	Δ
Total Number of Projects (Completed and In-Progress)	34	9	25
Awarded Proposal Cost (submittal total):	$ 9,880,692	$ 10,083,951	$ (203,259)
Cost Adjustment:	$ 981,913	$ (156,003)	$ 1,137,916
Total Awarded Cost (sum):	$ 10,862,605	$ 9,848,457	$ 1,014,148
Average Proposal Cost (sum from each project):	$ 10,717,007	$ 8,516,517	$ 2,200,490
Percent Awarded Below Average Cost:	-1%	-16%	14%
Estimated Budget:	$ 10,387,500	$ 10,482,672	$ (95,172)
Percent Awarded Below Budget:	5%	4%	1%

4.1.2 Cost Increases

In the categories measured of: client, designer, contractor, and unforeseen change orders, there was less than 0.7% difference between Less-Bureaucratic and Bureaucratic or no difference at all (Table 2). The Less-Bureaucratic environment had a lower rate in the areas of designer and unforeseen, while the Bureaucratic had a lower rate in the contractor category. The contractor category in the Bureaucratic environment actually experienced a savings, passing it on to the client in the form of a negative change order rate.

Table 2. Metric: Cost Increases

Metric	LB	B	Δ
Overall Change Order Rate	3.9%	3.9%	0.0%
Client	2.6%	2.6%	0.0%
Designer	0.3%	0.4%	-0.1%
Contractor	0.1%	-0.1%	0.2%
Unforeseen	0.3%	1.0%	-0.7%

4.1.3 Schedule Delays

Using the same categories for the origin of change orders, there were greater rates of differential between Less-Bureaucratic and Bureaucratic schedule delay rates than compared to their cost increases (Table 3). Overall data collected for schedule increases showed that the Less-Bureaucratic environment had a 25 percent lower delay rate. The highest differential was in the client category of delay rate, with the Less-Bureaucratic environment experiencing 10 percent more client schedule delays. The designer delay rate was the only rate that experienced a lower Less-Bureaucratic delay rate than the Bureaucratic. Client, contractor, and unforeseen all experienced a higher Less-Bureaucratic delay rate.

Table 3. Metric: Schedule Increases

Metric	LB	B	Δ
Overall Change Order Rate	46.8%	21.5%	25.3%
Client	22.2%	12.2%	10.0%
Designer	3.5%	4.9%	-1.4%
Contractor	5.1%	3.9%	1.2%
Unforeseen	4.8%	0.5%	4.3%

4.1.4 Satisfaction Surveys

Via a closeout survey administered to the Project Manager (PM) upon the close of each of the projects, satisfaction ratings were obtained. Due to the nature of the Bureaucratic projects, they are still being completed and have consequently not received final payment and are in the process of closeout. Since the Less-Bureaucratic projects are finished, all projects have PM satisfaction ratings. Nevertheless, comparing the satisfaction ratings, there is a differential of less than one for PM satisfaction of the vendor, with the Less-Bureaucratic environment having a higher satisfaction. In the last ratings, it can be seen that the Bureaucratic project required more management effort according to the PM than the Less-Bureaucratic projects. The analysis would have been further substantiated if PM performance was rated by the end client or client. However, this type of rating was not possible to obtain, due to organizational restrictions, in both the Less-Bureaucratic and the Bureaucratic environments. Please see Figure 4 – Metric: Satisfaction Ratings below for more details.

Table 4. Metric: Satisfaction Ratings

Metric	LB	B	Δ
Close out Surveys	34	1	33
PM Post Project Evaluation of Vendor	9.5	8.9	0.6
PM effort spent managing the project	3.0	5.0	-2.0

4.1.5 Number of Changes

There was a greater quantity of changes in the Less-Bureaucratic Environment than the Bureaucratic Environment (Table 5). Due to the fact that the Less-Bureaucratic environment had more projects, their greater quantity of changes is not a surprise.

Table 5. Metric: Changes

Metric	LB	B	Δ
Total Number of Changes	139	115	24
Average Number of Changes per Project	4.1	12.8	-8.7
Average PM Change Satisfaction Rating	9.0	9.1	-0.1

4.1.6 Feedback

Another source of data is the comments portion of the closeout survey. PMs are encouraged to provide feedback as lessons learned at the closeout of the project. From the Bureaucratic environment, we can see that PMs had comments relating to their desire to add more time and effort to pre-planning and risk management prior to commencement of construction. Additionally, the PM requested additional time to interact with the contractors and subcontractors, including involvement from the A/E. Given the nature of Bureaucratic companies wanting to exercise their authority, follow their record of operations, and hierarchically defined rules it is not surprising that they wanted to impose this with their contractors. The feedback from the surveys further substantiates the nature of the Bureaucratic environment in wanting to try to control and change things.

4.2 What are the valid KPIs and sources of change to be utilized for a comparison of projects?

Change was seen as any deviation to the original contract and was tracked via the metrics: 1) Cost; 2) Schedule; 3) Client satisfaction or quality rates; and 4) Quantity of changes. Additionally, each change was categorized according to its source or responsibility in the following classifications: 1) Client; 2) Contractor; 3) Designer; and 4) Unforeseen.

4.3 What are the results when valid KPIs and sources of change are applied to two projects with differing environments (Bureaucratic and Less-Bureaucratic)?

Despite having fewer projects, when compared to the thirty-four Less-Bureaucratic projects, the nine Bureaucratic projects experienced similar project outcomes in terms of cost, schedule, satisfaction, and change impacts. The total dollar value of the Bureaucratic projects was in line with the Less-Bureaucratic projects, thus making a valid comparison. In terms of cost impacts, the Less-Bureaucratic projects out-performed or were equal to the Bureaucratic projects. Less-Bureaucratic projects experienced the largest differential (0.7 percent) in the unforeseen change order category. In terms of schedule delay, Bureaucratic projects were timelier in order of client, unforeseen, and contractor. In the schedule delay of designer, Less-Bureaucratic projects were timelier. Overall, Less-Bureaucratic projects had a lower change order rate (except for the contractor category) and Bureaucratic projects had a lower schedule delay rate (except for the designer category).

In both environments, client based cost and schedule impacts were the highest. The effect that client-driven decisions can have on projects is easily seen in both contrasting environments, the client is the largest change. Thus, being familiar with the environments that these projects

operate in is critical to determining how to impact sources of change. The concept that the client is the largest source of change is contrary to some of the literature (Ibbs *et al.*, 2007). These client-impacts are further exacerbated by the level of bureaucracies in these organizations and are transferred to their projects. Upon review of the changes, certain client-driven factors were outside the purview of the contractor and uncontrollable. Examples of this type of change included: added scope, risks associated with added scope, security issues, and additional organization's funds become available. In fact, changes abound in both Bureaucratic and Less-Bureaucratic environments. Increase in funding may become available and allow more scope to be added to a project, which is a risk with the client as the source classification.

4.4 What characteristics make either Bureaucratic or Less-Bureaucratic environments more conducive to reduced changes?

Schedule shows a higher percentage of change occurring in comparison to cost, and attention should be paid to this rate. The schedule is consistently a major factor of concern for all project types: Less-Bureaucratic and Bureaucratic. As Wembeke *et al.*, emphasized, schedule impacts can have major effects that manifest themselves downstream on a construction project (2011). More attention should be paid to the schedule and factors that may affect future changes.

As noted in the response to question 2, client-initiated cost and schedule changes accounted for the largest amounts of deviations in all projects, Less-Bureaucratic and Bureaucratic. This finding suggests that more attention should be paid to accounting for potential changes the client will make in the future. The contractor cannot be expected to know all changes that will come about, nevertheless, awareness of this prevalent effect a client can have on a project will enable contractors to plan more appropriately. In this light, measuring and documenting performance becomes essential, as well as pre-planning for potential changes.

The mitigation and eventual elimination of the most prevalent factors of schedule changes and client-initiated changes will facilitate more successful project outcomes. To alleviate some of the client-initiated changes, environments should be fostered to encourage: awareness of the client to the severity of impacts of changes later in the project versus upfront, client to be constantly providing feedback to the contractor of potential changes, project scopes to be more clearly delineated at the start of the project, and, if changes must be made, they are not in excess to cause poor project outcomes. In most cases, the contractor has the capability to minimize risk, despite who caused it (Ibbs *et al.*, 2007). Thus, the contractor should utilize their expertise to minimize the impacts of change. Overall, if the contractor is more informed of potential changes, time is allotted to plan for these changes and risks, and their impacts are minimized upfront, projects can be more successful in these environments.

5 Conclusion and Further Research

A framework for the evaluation of the impacts of bureaucracy on project change was created, based on: 1) Dominant metrics and KPI; 2) Clear classifications of the sources of change; and 3) Sound analyses regarding the recorded outcomes. By first defining bureaucracy, describing Bureaucratic and Less-Bureaucratic environments, then utilizing two contrasting case studies to illustrate these differing environments, this paper compared their respective project outcomes and environments noting their successes or lack thereof, and suggested areas of improvement.

The four (4) metrics were: 1) Cost; 2) Schedule; 3) Client satisfaction or quality rates; and 4) Quantities of types of changes and the four (4) source classifications were: 1) Client; 2) Contractor; 3) Designer; and 4) Unforeseen.

Measurements showed a very small percentage differential for cost impacts between Less-Bureaucratic and Bureaucratic projects and a larger differential in schedule impacts. In the metric of cost impacts, there was less than 0.7% difference between Less-Bureaucratic and Bureaucratic projects or none at all. For schedule impacts, there were greater schedule delay rates than compared to their cost increases. The highest differential was in the client category of delay rate, with the Less-Bureaucratic environment experiencing 10 percent more client schedule delays. The designer delay rate was the only rate that experienced a lower Less-Bureaucratic delay rate than the Bureaucratic. Client, contractor, and unforeseen all experienced a higher Less-Bureaucratic delay rate. Less-Bureaucratic projects had a higher satisfaction rating, and were reported to require less management effort. Lastly, there was a greater quantity of changes in the Less-Bureaucratic Environment than the Bureaucratic Environment.

As the client category of change was the greatest, strategies for improvement should focus on this area. These environments could be improved upon and result in better project outcomes if client-driven changes were more predictable, transparent, and timely as well as if schedule impacts were minimized via proper communication and real-time tracking. As a result of this tracking, the Bureaucratic and Less-Bureaucratic case study environments are interpreting these project outcomes and are currently looking at strategies to improve their environments and minimizing the impact of project change. Understanding the type of change and the source of change has given these environments an opportunity and level of visibility not previously achieved.

Additional case studies that follow this framework of KPI and change source classification would further substantiate project and environmental comparisons. Projects would have to follow the four (4) metrics and the four (4) source classifications. Future research should also focus on potential strategies to alleviate the impacts of project changes, specifically client-driven. Innovative contracting strategies, delivery methods, and procurement approaches (Kashiwagi, 2011) should be investigated for their potential to alleviate changes in both Bureaucratic and Less-Bureaucratic environments that negatively impact projects.

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Organizational Change Models: A Critical Review of Change Management Processes

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Abstract:

Planned organizational change processes are of increasing need for organizations to maintain their competitive edge in today's global economy. Yet planned change efforts have been documented to have failure rates between 50-70 percent. Thus management skills and training in successful change processes is of high value. This article provides a critical review of organizational change models existing in the literature. Eleven literature change models were combined into a consolidated model of organizational change to identify the consistency in current research on this topic. The models were also analyzed according to their implementation (or lack thereof) into real-time change processes as well as documentation of performance information validating their success. Based upon these initial findings, areas of opportunity are identified to guide future research efforts towards improving the processes for planning and implementing organizational change.

Keywords:

change management, change model, organizational change, performance measurement

1 Introduction

Global competition has become ever more disruptive to organizations, and change is ever-present reality that affects all organizations at both the operational and strategic levels (Hamel & Breen, 2007; Todnem, 2005). Organizations worldwide are impacted by an accelerated pace of change efforts that occur in many forms, including restructuring, reengineering, mergers and acquisitions, downsizing, and the introduction of new technologies (Armenakis et al., 1999; Walker et al., 2007). Organizational change has become congruent with organizational strategy, and the effectiveness with which organizations manage change has become a critical element in their ability to maintain a long-term competitive edge.

Although the need for organizational change has never been greater, undertaking and implementing change is an extremely difficult task that is often met with failure. Many sources suggest that more than half of all change efforts fail to accomplish their original intended purpose (Choi & Behling, 1997; Kotter, 1995; Maurer, 1996; Pascale et al., 1997; Self &

Schraeder, 2009). Balogun and Hope Hailey report the failure rate for change initiatives to be as high as 70 percent (2004).

In response to this problem, this paper examined the current literature research on organizational change, specifically focusing on proposed change management models that provide systematic processes for planning, implementing, and institutionalizing organizational change. A critical review of the foremost change models was provided to identify a consolidated framework for managing change efforts as supported by the past 25 years of research theory and experience in change management practices. Further analysis of the literature change models change identified gaps in the current research, which resulted in important conclusions about the needed direction of future research. Among these conclusions was the opportunity to implement planned change processes in real-time initiatives to improve organizational efficiency. The results and impacts of such research should be documented with performance information to provide empirical validation of change management research.

2 Organizational Change Research

As organizational change has become an increasingly important factor of success for companies worldwide, the only way for an organization to be "ready" for change is by having people and structures that are prepared for and capable of change (Luecke 2003). Within this environment, the role of the managers has evolved such that they are typically the people who are responsible for changes that take place (Burnes 1992). Therefore a manager's ability to effectively plan and manage change has essentially become a required skill, and consequently their true effectiveness and competence is being measured differently than in the past (Burnes 1992). Companies have recognized that ineffective managers negatively impact even well-designed plans to improve organizational performance (Luecke 2003). In fact, American managers are often criticized for their propensity to focus on short-term, "quick-fix" solutions to organizational problems, which are not effective ways to achieve lasting change (Kinicki & Kreitner 2006). As a result, proficiency in change management practices is an extremely valuable skill for modern managers to possess.

In order to support the further development of change management practices and training, the objective of this paper is to review effective ways to manage the planned change process that have been proposed in the literature by organizational change researchers and consultants. Eleven prominent literature models of organizational change were reviewed to understand currently accepted change management knowledge and consolidate this knowledge into a single model of planned change. Included among the models reviewed were those proposed by: Bullock & Batten (1985), Nutt (1986), Hunsucker and Loos (1989), Judson (1991), Burnes (1992), Kanter *et al.* (1992), Kotter (1995), Galpin (1996), Armenakis *et al.* (1999), Moran and Brightman (2001), and Luecke (2003).

Yet before delving into a deeper review of suggested methods to effectively implement and manage change, it is important to first differentiate between the following phrases and topics exist within the field of organizational change research: organizational change (OC) refers to the overall activities that occur during an individual project or change initiative that improves performance of the organization. Typically project-based, one-time endeavors aimed at addressing an overall goal in the organization (McNamara 2011). OC is contrasted with

Organizational Development (OD), which is a large scale, more long term process of improving organizational effectiveness over multiple change activities.

Change management practices include the specific approach or methodology used to implement an organizational change project, program, or overall effort. Planned change follows clear goals that are set for the change effort and a planned, structured, and explicit approach is utilized (McNamara 2011). Unplanned change occurs when the overall vision may or may not be known, and the change itself is an unplanned and implicit natural progression (McNamara 2011).

3 Research Methodology

Each of the literature models reviewed presented a series of process steps to systematically approach, initiate, and implement organizational change. For each model, the authors outlined the process steps that were proposed in addition to major sub steps. The purpose of breaking each model down into its individual sub steps was to directly compare all the case studies based upon the change process components they included. For example, Judson's Five-Phase Change Process, which was based upon Judson's more than 40 years of experience in change management, was broken into the following process steps:

Analyzing and planning for the change.

Change management group with senior management and other managers and supervisors involved as well as staff specialists.

Understand the basis and justification for the change and determine goals and strategy.

Plan all elements of the change, prioritize and schedule events.

Communicating the change.

Educate the reasons and benefits of the change along with the plan of action.

Gaining acceptance of new behaviors.

Via rewards, persuasion, negotiation, bargaining, or participation.

Changing from status quo to a desired state.

Consolidation and Follow-up

Regularly measure and assess the effectiveness of the change.

This process was repeated for all eleven models of change, and all models were aligned side-by-side in tabular form. A gap analysis was performed to identify similarities, differences, and determine the overall consistency between models. Specific categories emerged once the sub-steps were aligned, and these emergent categories became the process steps that made up the consolidated literature model of organizational change.

3.1 Defining the Steps Within the Consolidated Literature Model

Each of the steps within the resulting consolidated model of organizational change was analyzed to determine the total percentage of the literature change models reviewed that incorporated that specific step. For example, it was found that 64 percent of the change models reviewed emphasized the need for a core team to lead the change effort. The individual process steps and their consistency across organizational change models in the literature are shown in Table 1.The consolidated literature model of organizational change resulted in a comprehensive change management model composed of twelve individual process steps within three broader phases of change implementation: Planning and Initiation, Implementation, and Institutionalization. Each of the individual process steps represents a component of the organizational change process. The scope of each step was defined along with a summary of literature model recommendations on how to best carry out the different components of the change management process.

Table 1. Consolidated Model of Organizational Change From the Literature Analysis

Consolidated Literature Model of Planned Organizational Change	Model Consistency
Phase 1 - Plan & Initiate	
1. Actively Create Motivation for Change	64%
2. Analyze Status Quo Problems & Needs	82%
3. Identify Desired Solutions, Goals, or Vision	91%
4. Establish a Core Team to Lead Implementation	64%
5. Secure Executive Support	45%
6. Convey the Change Message	64%
7. Identify Readiness and Manage Resistance	55%
8. Plan the Implementation Strategy and Tactics	64%
Phase 2 - Implement & Measure	
9. Implement on a Test Basis	55%
10. Implement Full Change Program	91%
Phase 3 - Institutionalize	
11. Transition to Institutionalization	82%
12. Long-Term Measurement	36%

3.1.1 Actively Create Motivation for Change

The first step in the consolidated model for planned change was to create a sense of urgency among employees and create the general desire to change. In creating the initial motivation to embark on a planned change effort, change agents may examine the internal and external conditions of the organization and realize the need for change exists. The focal point of this stage is to recognize the need to change in such a way that it acts as a catalyst to motivate the pursuit of change. This step does not involve in depth analysis of current practices or set a specific vision of change, but rather aims to create a broader sense of urgency within the organization to recognize the need to support change efforts.

3.1.2 Analyze Status Quo Problems and Needs

The purpose of this step is for change managers to analyze existing business processes and external conditions to determine specific areas of weakness for the organization to overcome. Managers may also enlist employee participation during this step to compile a more thorough understanding of problems within the organization. The end result of this step is to have identified specific problems and root causes that necessitate a change in business practices.

3.1.3 Identify Desired Solutions, Goals, and Vision

In response to the problems that necessitate change, a vision must be created to address the goals and solutions that are desired. This step primarily focuses on determining how the organization should operate and envisioning how this future state would look once the change effort is successful. This step does not yet call attention to specific implementation strategies or detailed tactical planning of the formal change process.

3.1.4 Establish a Core Group to Lead the Effort

For the purposed of this step, a core group was defined as a team of managers or other employees who possess operational-level knowledge of the problems and desired solutions. Members of the core group may not follow the typical organizational hierarchy and may not include executives; instead, emphasis is placed on their knowledge of key operational level issues that make them best suited to lead the change effort. Activities of the core group include the day-to-day leadership and management of the change program.

3.1.5 Secure Executive Support

The step of securing executive support was defined to include those literature models that emphasized the importance of gaining assistance or general backing for the change program from executives. Executives include high-level decision-makers who have the authority to generate financial and policy directives. Although executives are not necessarily members of the core group, it was noted that they still critical that they are bought in to the change program. Executives wield the clout within the organization to legitimize the change with their support and have the power to either sustain or remove the change through financial and policy means.

3.1.6 Convey the Change Message

This step stresses that change managers must give specific attention regarding how the vision of the change is communicated within the organization. Models that included this step typically emphasized the need to frame the change message in such a way that addresses the perspective of those who will be impacted. The purpose of this step is to educate those affected by the change on the basic purpose, goals, and implementation strategy of the change, as well as how they will be impacted the change and why the end goals are beneficial.

3.1.7 Identify Readiness and Manage Acceptance

The literature models recommended that change managers spend time to identify their organization's readiness for change by analyzing potential and actual sources of resistance that may counteract the change effort. This step also consists of any specific actions taken to minimize resistance such as various modes of employee participation, feedback, reward systems,

or political negotiations, all with the purpose of eliminating barriers and creating the conditions for change to occur successfully.

3.1.8 Plan the Implementation Strategy and Tactics

This component of the consolidated organizational change model refers to detailed planning of the technical aspects of how the change will be implemented. The technical aspects include the specific action steps required to enact the change, such as how individual business processes and employee functions change with respect to the organization's previous operational methods. Also considered within this component is ensuring the technical aspects of the change align with the strategic vision and goal of what is meant to be accomplished. Measurements are planned to determine the success of the change, specifically focusing on whether the tactical actions actually achieve the strategic vision.

3.1.9 Implement on a Test Basis

This step was addressed by models that underscored the importance of starting implementation on a test basis, which was defined as any scale that was smaller than the overall intended change program. Starting implementation on a test basis was also characterized by the intent of applying the lessons learned on the smaller scale to refine the change for full-scale implementation.

3.1.10 Implement Full Change Program

This step referred to implementing the change action steps on the fully intended scale or diffusing results of the original trial period into the larger organization. This step ends when the operational modes intended by the change are first achieved, but are not yet institutionalized within the organization.

3.1.11 Transition to Institutionalization

Following the implementation of the full change program and achievement of results, institutionalization consists of formalization or transition processes intended to achieve long-term adoption of the change. This step moves from active implementation of the change program towards formalizing the changed processes as traditional practices. Formalization processes include measures to reinforce and stabilize the change such that it becomes "the way we do things around here."

3.1.12 Long-Term Measurement

Long-term is defined as the time period following the main efforts of implementing and institutionalizing the change program. This final step comes into play when the change is no longer a foremost priority of management or employees and has seemingly been institutionalized within the organization. Maintaining a post-institutionalization, program-wide measurement system is intended to sustain the change once the organization's attention is focused on other items.

3.2 Documented Performance Information in Literature Organizational Change Models

3.2.1 Sources of Information for Model Development

The source of knowledge that was used by the various researchers to develop their respective models of planned change was documented to gain insight into base of knowledge that the literature models were based upon. This analysis was conducted according to four main sources of information used by researchers to develop their organizational change models:

Personal Experience: The model was based upon the researcher's personal involvement in management consulting and change management implementation. Reflection upon their experiences enabled the researcher to propose a model for change.

Literature Review: The source of knowledge used to create the model was a critical review of literature research. This category is limited to analysis and consolidation of previous literature research and theory.

Industry Feedback: The source of information was not related to a specific change effort that would serve as a case study, but instead included more general industry feedback regarding overall experience with change implementation. Managers and other individuals were surveyed and/or interviewed to gain a second-hand understanding of their general experiences with organizational change.

Case Studies: The model was based upon findings from in an in depth review of specific planned change efforts undertaken within organizations. Example cases of organizational change were reconstructed in a systematic manner to understand the methods of change implementation. Procedures used to reconstruct case studies of change implementation included interviewing and surveying managers to understand how the specific change process was implemented. The researcher was not directly involved in the reviewed case studies.

3.2.2 Performance Information of Model Implementation

From a research perspective, another important factor in analyzing planned organizational change is documenting whether their performance has been measured in real-time change efforts. In the context of the organizational change models considered in this paper, empirical documentation was equated to the existence of performance measurements. Performance measurements were defined as any metrics that show the level of success achieved through the implementation of a planned change model. In one literature model, performance measurement was as simple as documenting whether the original intent of the change effort was achieved for a "duration of time," whether short or long term (Nutt, 1986). Each of the eleven literature models reviewed in this paper was reviewed based upon their inclusion of empirical performance measurements.

In reviewing the empirical nature of the models, another point of emphasis identified was whether the reviewed models were tested in real-time or if they had been developed retroactively. Real-time testing was defined as any documented instances where the change model was directly implemented as the process used to achieve organizational change. To be considered a real-time test, the model was required to have been identified at the beginning of

the change effort and used as the process steps through which the change was then implemented. Conversely, retroactive development referred to models that were identified after real-time change efforts were executed. In retroactive cases, researchers created the change models based upon past experience, either by analyzing their personal experience, literature research, industry feedback, or case studies to identify the components of a successful change process.

Each of the eleven literature models identified in this paper was reviewed against these two criteria to determine whether they had been empirically documented through performance information and directly applied in real-time change efforts. For this analysis, the criteria were combines into the following four categories:

Real-Time Performance Measurement: The model of planned change was tested from start to finish in an organizational change effort and used as the process for planning and implementation. Real-time performance measurements were made to quantify model success.

Real-Time with No Measurement: The model was directly applied as the process for enacting a change effort, but measurements of success were not documented.

Retroactive with Performance Measurement: The model was created based upon past experience, literature review, or industry case studies and feedback. However, the full model was not directly applied in real-time throughout a change process. Individual instances of success were documented for case studies that were reconstructed and shown to follow components of the proposed model.

Retroactive with No Measurement: The model of planned organizational change was developed based upon past experience, literature information, or industry feedback. The model was not implemented in a real time change effort and no determinants of success were measured.

4 Results and Discussion

4.1 Consistency within the Literature Organizational Change Models

The literature models were compared to determine which individual process steps were most commonly recommended as part of a successful change management process. By analyzing all the individual change management stages included within the models, a view of the overall consistency among the literature research efforts was identified. Results are summarized in Table 3, with each process step of the consolidated model paired with the percentage of literature models reviewed the step was included in.

Table 2. Consistency in Recommended Process Steps in Literature Models of Organizational Change

Consolidated Literature Model of Organizational Change	Model Consistency
Process Steps	%
3. Identify Desired Solutions, Goals, or Vision	91
10. Implement Full Change Program	91
2. Analyze Status Quo Problems & Needs	82
11. Transition to Institutionalization	82
1. Actively Create Motivation for Change	64
4. Establish a Core Team to Lead Implementation	64
6. Convey the Change Message	64
8. Plan the Implementation Strategy and Tactics	64
7. Identify Readiness and Manage Resistance	55
9. Implement on a Test Basis	55
5. Secure Executive Support	45
12. Long-Term Measurement	36

The most commonly recognized components of successful planned change efforts were found to be identifying desired solutions, goals, or vision and implementing the full change program, which were both included within 91 percent of the literature models. 82 percent of the models identified the steps of analyzing the status quo problems and needs and transitioning the change to institutionalization. After these four steps, there was a drop off in the level of consistency between the literature models, with the following four steps suggested by 64 percent of the models: actively create motivation for change, establish a core team to lead implementation, convey the change message, and plan the implementation strategy and tactics. Incorporated into 55 percent of models were the steps of identifying readiness and managing resistance and implementing the change on a test basis. The least commonly identified steps were securing executive support (45 percent) and continuing long-term measurement to sustain the change (36 percent).

4.2 Documented Performance Information of Literature Organizational Change Models

4.2.1 Sources of Information for Model Development

The frequency with which the models used each data set is shown in Table 3. The percentages do not sum to 100 percent because researchers often utilized multiple sources of knowledge to develop their suggested model of organizational change. The majority of the eleven models were created based upon knowledge gained from the researcher's personal experience (55 percent), while slightly less than one-half of the models pulled information and findings from the literature. Three models were developed using lessons learned from industry case studies, while

two included feedback data from industry members who were directly involved in organizational change initiatives.

Table 3. Data Sources Used to Understand the Components of the Organizational Change Process

Data Set for Model Development	
Personal Experience	55%
Literature Review	45%
Industry Feedback	18%
Case Studies	27%

4.2.2 Performance Information of Model Implementation

A matrix was created in order to show where the eleven models placed according to real-time implementation and performance measurement (Table 4). Results showed that all of the organizational change models reviewed in the literature were developed retroactively. In order to create change models, researchers primarily reflected upon past management experience, reviewed previous literature research, and analyzed case studies and feedback from previous industry change efforts. None of the reviewed models were shown to have been fully implemented in a change process, so no real-time validation was observed. Furthermore, results show a lack of performance information in the research. Only two change models documented performance measurements showing the success rates of change efforts that followed the model.

Table 4. Empirical Documentation of Organizational Change Models

	Real-Time	Retroactive
Performance Measurements	0%	18%
No Measurements	0%	82%

It must be noted that in saying that none of the models were implemented, the authors do not mean to suggest that none of these models have been used by the researchers who proposed them. The fact is that the researchers who developed these models certainly used various pieces at different times throughout their careers as change management researchers or consultants. Rather, what the authors have documented is the fact that, from a research perspective, the reviewed models were not implemented from the outset of a change process and empirically shown to bring about change. This distinction is important to make, as it clearly reveals that literature models serve as a practical base of knowledge for implementing organizational change, yet have presently shown the direct application of this knowledge within real-time research efforts. As will be concluded later in this paper, the lack of empirical evidence supporting the implementation of these models presents a large opportunity for future research.

4.3 General Discussion

All the change models reviewed contain sound advice as the researcher models reviewed were based upon many years of change management consulting experience. Yet with the high rate of failure in change efforts that is currently documented, along with the fact that the majority of change models were developed retroactively, it may be concluded that these models have not frequently been applied to organizational change efforts. The lack of empirical evidence presents an important opportunity for future change management research: to directly apply organizational change models and their specific components in actual change efforts, and then document the progress and results of the change to demonstrate determinants of success.

The lack of performance information also indicated an opportunity to for future research to better define the determinants of success within planned change efforts. Even among the two literature models that were found to document whether success was realized in case studies of organizational change, success was not defined according to quantitative measurements, nor was the time period to properly evaluate success determined. This paper proposes that the impact of change efforts should be chronicled over a long period of time. In 1958, Lewin recognized that a change implemented to achieve a higher level of group performance "is frequently short-lived," as group behaviour often reverts quickly back to its previous manner (Burnes 1992). Therefore, as change models are implemented to achieve performance goals within organizations, it is important to revisit the program over longer terms to determine whether institutionalization has been achieved. Long-term success was not documented to occur using the reviewed literature models.

5 Conclusion and Further Research

This paper reviewed eleven prominent literature models of change and aligned their process steps into a single consolidated model of planned change. The sources of information used to create the models in the literature were shown to be dominated by the personal experience in change management (used in 55 percent of models) and literature review (45 percent), whereas case studies of change were a much smaller source of information (18 percent). Note that these percentages do not sum to 100 percent since the literature models were often based on multiple sources of knowledge.

These findings identified a need for future research to implement change models in planned change efforts and document success levels. The lack of performance information within the research demonstrated a lack of consensus among researchers in how to define and measure the determinants of success for planned organizational changes. The existing change management database would greatly benefit by documenting these factors through the measurement of performance information in planned change efforts.

The Performance Based Studies Research Group (PBSRG) at Arizona State University views these topics being critical to its research function of expanding performance measurement in the field of organizational change and development. The PBSRG is a world leader in efficient business practices that works with numerous research partners in a wide variety of industries. The PBSRG has developed and tested the Best Value Business Model to increase organizational efficiency by improving procurement processes, project performance, and business management

strategies. The PBSRG specializes in implementing planned change to achieve these results, and has collected extensive real-time data of planned change implementation on the project level. During 17 years of testing the Best Value Business Model, the PBSRG has run over 900 projects at a total value of $4.6 billion and achieved project success rates over 95 percent. Using the extensive performance information amassed by the PBSRG on projects of planned change, immediate next steps for the research group include providing empirical documentation and real-time performance information regarding the factors of success in implementing planned organizational change.

The PBSRG envisions future research to focus on using performance measurement to facilitate change on the level of organizational development. Within this framework, future research is suggested to focus on broader change efforts that link individual projects through measurement and focus on long-term results to understand institutionalization and sustainability of change.

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Building Regulation & Control

Local Authority Liability in New Zealand for Defective Homes

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Abstract:

The liability of local authorities in New Zealand for the issue of building consents and inspection, in respect of domestic homes where the dwellinghouse or home unit is later proved to be faulty, is assessed. The law in this respect differs from that in the U.K. In *Invercargill City Council v Hamlin* (1996) the Privy Council accepted that the decision of the House of Lords in *Murphy v Brentwood District Council* (1991) declining to impose liability for economic loss did not apply in NZ. But the NZ courts have not extended the duty of care on councils to apply to buildings used for commercial purposes. Recently the Supreme Court of NZ in *North Shore City Council v Body Corporate* 188529 (Sunset Terraces & Byron Avenue), has confirmed that local authorities owe a duty of care to the owners of multi-unit dwellings in the issue of building permits, supervision, and code compliance certificates. The duty is owed to both existing and future home owners, but may be reduced by contributory negligence. A 10 year logstop from council approvals applies to claims. In the last decade, problems with leaky homes, through the use of untreated timber and monolithic wall cladding systems, poor design and workmanship, have given rise to a substantial number of claims against local authorities. The provision for claimants of a formal mediation service and adjudication process is assessed. A recent proposal by the Government to assume liability for 25 percent of repair costs, with local councils accepting a further 25 percent, is considered. Conclusions are drawn as to the legal and practical outcomes.

Keywords:

building, consents, council, liability, mediation

1 Introduction

This paper sets out the legal position in New Zealand in 2011 concerning the liability of territorial local authorities (city and district councils) for defective homes.[109] The defects may

[109] Local Government Act 2002 (NZ), s 5 (definition territorial authorities). The LGA establishes the governance structure under which district and city councils are consent authorities for urban building work under the Building Act 2004. Regional councils have limited functions in respect of dam construction. In the Auckland region, the former seven local authorities were amalgamated to form a single Auckland Council (super city) from 1 November 2010: Local Government (Auckland Council) Act 2009. As a unitary authority the Auckland Council is the consent authority for all building work in the region. It has inherited liabilities of the former local authorities.

arise from inadequate foundations and water leaks and other causes. The paper considers the history of the determination by courts of liability, issues relating to the limitation period for claims, and the divergence of New Zealand law from U.K. law.[110] The question of liability for other buildings used for commercial purposes, such as hotels and motels is considered. The question of central government responsibility is addressed. The most recent decisions of the Supreme Court of New Zealand in the *Byron Avenue* and *Sunset Terraces* cases (2010) are discussed.[111] Finally, the systems available for mediating and determining liability under the Weathertight Homes Resolution Services Act are considered, together with a current proposal of government to share in the burden of repair costs.[112]

2 History of Local Authority Liability for Defective Homes

In 1972, in *Dutton v Bognor Regis Urban District Council*[113] the English Court of Appeal determined that a builder could owe a duty of care in tort law to a subsequent purchaser of a property which had defective foundations. The builder could be liable even though there was no immediate contractual relationship with the subsequent purchaser. More significantly, the Court determined that the local authority could also owe a duty of care to the subsequent purchaser for failing to carry out inspections with reasonable care. The council could be liable in negligence for this failure of duty. Assuming the builder remained solvent, the question of apportionment of liability between the builder and the local authority could be determined having regard to the degree of responsibility for the damage. Lord Denning, Master of the Rolls, was a driving force in the *Dutton* decision.

Within a short period, the *Dutton* decision was followed by the New Zealand Courts. In *Gabolinscy v Hamilton City*[114] the council was found to be liable to the purchaser of a dwelling erected on a former council refuse tip, for subsidence damage occurring ten years after construction. The property foundations were not adequate for the ground conditions.

The validity of the common law in the U.K. came before the House of Lords in *Anns v Merton London Borough Council*[115] being another case involving a claim for faulty foundations and subsidence damage. The Lords considered that on principle negligence liability should be approached in two stages. First, a question arose whether there was a sufficient relationship of proximity between the alleged wrongdoer and the person suffering damage, and secondly, if that proximity existed, it was necessary to consider whether or not there was a reason to exclude liability. This approach containing a presumption of liability advanced the scope of responsibility to a significant level where damage arose.

[110] Until the Supreme Court Act 2003 (NZ), the Privy Council (UK) was the highest appellate body in the New Zealand judicial system. The Supreme Court of New Zealand replaced the Privy Council.
[111] *North Shore City Council v Body Corporate 188529 (Sunset Terraces)* [2010] NZSC 158, [2011] 2 NZLR 289 (incorporating Bryon Avenue decision).
[112] Weathertight Homes Resolution Services Act 2006.
[113] *Dutton v Bognor Regis Urban District Council* [1972] 1 QB 373.
[114] *Gabolinscy v Hamilton City* [1975] 1 NZLR 150.
[115] *Anns v Merton London Borough Council* [1978] AC 728.

Returning to New Zealand, the *Anns* decision was followed by the Court of Appeal in *Mount Albert Borough Council v Johnson*.[116] The Court considered the liability of a builder and the council in respect of a block of flats which had been erected on a former refuse tip site. The foundations were inadequate, the dwellings subsided, and the claim was made. The Court held the defendants were jointly and severally liable, and apportioned the damages award at 80 per cent against the builder and 20 per cent against the council. This ratio of apportionment has been commonly adopted in the later decisions. Where the builder is insolvent and recovery cannot be made, under the law the council may be liable to pay the full damages award, and to seek any remedy for recovery of the balance against the insolvent builder.

3 Divergence of New Zealand Law following Murphy decision

In 1984, the House of Lords in the *Peabody Donation Fund* case[117] reconsidered the principled approach to liability enunciated in the *Anns* decision. The Peabody Group was developing a housing estate through a building firm and permits had been obtained from the Lambeth London Borough Council. An error was made in respect of the use of rigid drainage connections. The Lords declined to find any liability against the local authority holding that in determining whether or not a duty of care was incumbent, it was material to take into consideration whether it was just and reasonable that a duty should arise.[118] Further, the Lords considered that as the loss was essentially economic, and not related to personal injury, that would be a ground for not imposing any duty of care.

Subsequently in *Murphy v Brentwood District Council*[119], another claim relating to defective foundations and economic loss came before the House of Lords. On this occasion, the Lords determined that the loss was purely economic and the council owed no duty of care in exercise of its statutory building bylaw functions. A duty could only arise in respect of foreseeable harm in the nature of injury to health or safety. Furthermore, liability in torts should be established on an incremental basis, and the statements in the *Anns* decision were generally disapproved.

With this background, in 1994 the New Zealand Court of Appeal was faced with conflicting authorities in the case of *Invercargill City Council v Hamlin*.[120] A dwelling had been constructed in 1972 on a boggy site. The depth of foundations was approved by the council but found to be inadequate for the site conditions. Within a short period cracks appeared. Finally in 1989, with the doors sticking, a claim was brought against the local authority for negligence in approving the shallow foundations on the plans and also in failing to carry out proper supervision under the bylaws. The Court noted the differing views expressed by the House of Lords in the *Murphy* decision, as against the earlier *Anns* decision. Cooke P stated "While the disharmony may be regrettable, it is inevitable now that the Commonwealth jurisdictions have gone on their own paths without taking English decisions as the invariable starting point. The ideal of a uniform common law has proved as unobtainable as any ideal of a uniform civil law".[121] The Judge noted that New Zealand did not have any equivalent of the Latent Damage Act 1986 (U.K.), and

[116] *Mount Albert Borough Council v Johnson* [1979] 2 NZLR 234.
[117] *Governors of the Peabody Donation Fund v Sir Lindsay Parkinson and Co. Ltd* [1985] 1 AC 210.
[118] *Governors of the Peabody Donation Fund v Sir Lindsay Parkinson and Co. Ltd* [1985] 1 AC 210 at 241 (Lord Keith).
[119] *Murphy v Brentwood District Council* [1991] 1 AC 398.
[120] *Invercargill City Council v Hamlin* [1994] 3 NZLR 513 (CA).
[121] *Invercargill City Council v Hamlin* [1994] 3 NZLR 513 at 523.

in 1991, a longstop claim limitation of 10 years from the approval of plans or supervision by the local authority had been introduced for future claims. That particular limitation did not apply to the *Hamlin* facts where the claim was brought before the enactment of the statutory limitation.

Another member of the Court, Richardson J, stated there were six distinct and longstanding features of the New Zealand housing scene which justified a duty of care being owed by the local authorities. First was the high proportion of occupier-owned housing. The second reason was that much of the housing construction was undertaken by small scale cottage builders for individual purchasers and these builders may require some supervision. The third reason was the nature and extent of government support for private home ownership with provision of low interest loans. The fourth ground was the surge in house building construction. The fifth ground was the wider central and local government support for private home building, through model bylaws and close supervision. The sixth reason was that there has never been a common practice for new house buyers, to commission engineering and architectural examinations or surveys of the building or proposed building before purchase. The Judge summed up that the question of whether it was just and equitable for the local authority to be under a wider duty of care had to be considered against this background which was special to New Zealand.[122] The Court held the duty of care could apply to pure economic loss and the council was liable for the cost of repairs. Because the building company had gone out of business and was insolvent, the council would be obliged to meet the full damages award.

That decision of the Court of Appeal then proceeded to the Privy Council.

In *Invercargill City Council v Hamlin*[123], the Privy Council was faced with a relatively unique situation as to whether it should follow the decision of the House of Lords in *Murphy*, or affirm the traditional approach asserted by the New Zealand Court of Appeal. In giving judgment, Lord Lloyd of Berwick, noted that 17 years had passed between the construction of the dwelling and the later determination that the subsidence problems were due to the inadequate foundations. His Lordship noted the change to New Zealand law in 1991 imposing a longstop on claims of this nature.[124] It was acknowledged that the New Zealand judges were in a better position to decide on the appropriate divergence of the common law. It was also acknowledged that as the loss was economic loss, that no loss occurred until the defect was discovered or was so obvious to a reasonable owner that they would take action. On the facts, the claim was not time barred applying the claim period of 6 years from discovery of the cause of action. This important decision, accepting that in New Zealand a local authority could be liable for negligence in issuing a building permit, and in any failure of the inspection duty, has remained the legal position, but with an exclusion of liability in respect of commercial premises.

4 Limitation Period for Claims

An aspect of several of the earlier claims was the significant time between the construction of the faulty dwelling, and the possible visibility of the damage from subsidence. In the case of *Askin v Knox*, a dwelling was built in 1963 over an old creek bed with approval of inadequate

[122] *Invercargill City Council v Hamlin* [1994] 3 NZLR 513 at 524-525.
[123] *Invercargill City Council v Hamlin* [1996] 1 NZLR 513.
[124] Building Act 1991 (NZ), s 91.

foundations, and a successful claim was made against the council in 1986.[125] Similarly, in the *Hamlin* case, the claim was made 17 years after construction.

Following the *Askin* case, the variable bylaw standards applied by local authorities in respect of building permits, were replaced by a uniform building code for the whole country under the Building Act 1991. The existence of this Act was acknowledged in the *Hamlin* decisions, as being consistent with local authority liability for negligent inspections, and providing an assurance that the scope of liability would in time be capped by virtue of a longstop provision for all claims. Section 91 provided that in any proceedings arising from the construction, alteration, demolition of a building or the carrying out of supervisory functions, civil proceedings could not be brought against any person 10 years or more after the issue of the building consent or a building inspection or issue of a code compliance certificate upon completion. It may noted that had that longstop applied in the earlier *Hamlin* action, the case could not have succeeded.

That longstop provision has remained part of the law, and has been repeated in the replacement Building Act 2004[126]. The existence of that section can be taken as a statutory acknowledgment that civil proceedings are contemplated to be taken against a local authority, and this is a confirmation of the appropriateness of the *Hamlin* determination in the New Zealand context. Furthermore, under the Building Act 2004, a new provision imposes implied statutory warranties for building work in relation to household units.[127] A household unit is defined to mean a building or group of buildings that is used or intended to be used only or mainly for residential purposes and to be used exclusively as the home or residence of not more than one household but does not include a hostel, boarding house, or other specialised accommodation.[128]

The implied warranties state that the building work will be carried out in a proper and competent manner, in accordance with the plans and specifications of the contract, and in accordance with the relevant building consent; the materials used will be suitable for the purpose and will be new unless otherwise stated; the building work will be carried out in accordance with applicable laws and standards; the work will be carried out with reasonable care and skill; and the household unit will be suitable for occupation on completion. The owner of the building or land may take proceedings for breach of the warranties as if the owner were a party to the original building contract, and no provision in an agreement may take away the benefit of the warranty.[129] No time limit applies to the warranties but it would be expected the normal 6 year limitation period would apply.[130]

5 Local Authority Liability for Commercial Buildings

In *Three Meade Street Ltd v Rotorua District Council*[131], the High Court was required to determine whether the council owed a duty of care to the purchaser of a motel which was found to have various construction defects in the building. Venning J considered the application of the

[125] *Askin v Knox* [1989] 1 NZLR 248 (CA) (liability found for approval of faulty foundations).
[126] Building Act 2004, s 393.
[127] Building Act 2004, s 397.
[128] Building Act 2004, s 7 (definition household unit).
[129] Building Act 2004, s 396-399.
[130] Limitation Act 2010.
[131] *Three Meade Street Ltd v Rotorua District Council* [2005] 1 NZLR 504.

Hamlin ruling and also the decisions in Australia, Canada, and in *Murphy v Brentwood District Council*. The judge concluded that although there may have been a proximity between the council and the defects in the building relating to inspections, there were policy considerations which determined that the council did not owe a duty of care in respect of ownership of a commercial building or work done on the building. The purchaser company should be able to protect itself by contractual arrangements with the developers, and in any purchase contract if being a subsequent owner. The Building Act should not be construed to give rise to any statutory cause of action. The council did not owe a duty of care to the shareholder of the ownership company.

The *Three Meade* decision came before the Court of Appeal in *Te Mata Properties Ltd v Hastings District Council*.[132] In this case, the appellants were purchasers of two motels, and discovered that each suffered from the leaky building syndrome. The owner claimed against various parties including the district council for the cost of remedial works, the loss of value of the property, consequential losses and general damages. Allegations were made of negligence in granting the building permits, inspection of construction, and issue of certificating compliance. The Court of Appeal held that the earlier *Hamlin* decision did not extend beyond domestic dwellings and did not support the claim. A possible basis for liability could arise if health and safety issues had been pleaded, but the claim was for purely economic loss. The test of purpose of the building was the purpose stated in the building permit. Motels were not included as household units under the Building Act. Baragwanath J stated "So Parliament has treated owners of "household units" and "dwellinghouses" as deserving special treatment: protection in respect of building quality, privacy and procedures for dealing with leaky building claims."[133]

After traversing the earlier decisions going back to *Dutton*, *Anns*, Baragwanath J observed "There are obvious policy reasons for confining tort liability to home owners on account of the special and distinctive value of the home in any society as giving effect to the basic right to shelter".[134] The Judge stated "I am satisfied at this stage there is no justification for extending the *Hamlin* cause of action, based as it is on economic loss, beyond the specific limits of private dwellings".[135] The claim against the council was struck out.

In a subsequent decision *Queenstown Lakes District Council v Charterhall Trustees Ltd*[136], the issue concerned a chimney fault which caused a fire and damage to a luxury lodge. A claim was brought against the council for negligence in approval of the building plans and for failure of adequate inspection. On this occasion, a differently constituted Court of Appeal held the council did not owe a duty of care to the owner of a commercial building to prevent defects, including defects that affected the health and safety of occupants. Owners of commercial buildings were not vulnerable and dependent on councils to protect their interests but were able to engage their own advisers and manage risks through contractual arrangements. The claim was for financial loss. The Court held "In the result we accept …the Building Act does not seek to protect the value of buildings, or income streams from them, for commercial investors."[137] The Court noted

[132] *Te Mata Properties Ltd v Hastings District Council* [2009] 1 NZLR 460 (CA).
[133] *Te Mata Properties Ltd v Hastings District Council* [2009] 1 NZLR 460 (CA) at [12].
[134] *Te Mata Properties Ltd v Hastings District Council* [2009] 1 NZLR 460 (CA) at [36].
[135] *Te Mata Properties Ltd v Hastings District Council* [2009] 1 NZLR 460 (CA) at [73].
[136] *Queenstown Lakes District Council v Charterhall Trustees Ltd* [2009] 3 NZLR 786 (CA).
[137] *Queenstown Lakes District Council v Charterhall Trustees Ltd* [2009] 3 NZLR 786 at [44].

again that the imposition of a duty of care in the context of commercial buildings had been rejected in the U.K. following *Murphy*.

The conclusion is clear, that the liability of local authorities does not extend to defects in non-residential buildings or to residential type properties established as a commercial venture such as hotels, guest houses and motels.

6 Leaky Home Liability

In the past decade in New Zealand, a major problem has arisen from the construction of buildings which suffer from the "leaky home syndrome". This problem is distinct from the question of faulty or inadequate foundations, and relates to a combination of approval of inadequate building methods through the former Building Industry Authority under the Building Act 1991, together with design changes and poor workmanship. The major causes of the property leaks have been the use of untreated timber for structural framing, the use monolithic wall cladding systems, with both standards formerly being approved by the Building Industry Authority. A design trend by architects or property developers of dwellings with flat roofs, and no overhanding eaves, has further contributed to the problems with building leaks. In addition, poor workmanship in failing to install flashings around metal windows and other joinery, and widespread use of plastic sealants which break down, have resulted in ingress of water. Further design changes removing any air separation space between the building framing and outside cladding, partly due to insulation requirements, have exacerbated the rotting of wooden framing where water has penetrated the structure. The mould problems and costs of remediation of leaky homes has affected thousands of dwellings and other buildings, and has affected the health and wellbeing of many residents.[138]

In principle, the question of liability of a local authority has been determined by the *Hamlin* decision, namely that a duty of care is owed in respect of residential properties in relation to building consents, inspections, and the issue of code compliance certificates. The liability of local authorities has been confirmed in two recent decisions by both the Court of Appeal and the Supreme Court. The decisions known as *Sunset Terraces* and *Byron Avenue*, involved the owners of two multi-unit developments which were affected by water tightness issues and suffered significant damage from water ingress.[139] The claims against the local authority, the North Shore City Council, were substantial, to the extent that claims against other parties and the apportionment of liability, including the building developers, architects and subcontractors, would not necessarily be met due to insolvency.

In the *Byron Avenue* case, involving a 14 unit block of residential apartments, the council carried out nearly 100 inspections of the property, but within 4 years, water ingress was occurring around windows and causing structural damage. The High Court had found the council had been

[138] In *North Shore City Council v Body Corporate 188529 [Sunset Terraces]* [2010] 3 NZLR 486 (CA), at [64], Baragwanath J refers to research that estimates that 80,000 houses built with monolithic cladding in the 1990s had leaked or would leak. The reference is to Howden-Chapman P, Bennett J, Siebers R (eds), *Do Damp and Mould Matter? Health Impacts of Leaky Homes* (Steele Roberts, Wellington, 2009).

[139] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC). Affirming *O'Hagen v Body Corporate 189855 (Byron Avenue)* [2010] 3 NZLR 445 (CA); *North Shore City Council v Body Corporate 188529 (Sunset Terraces)* [2010] 3 NZLR 486 (CA).

negligent in carrying out the inspections, and there was a need to repair and re-clad the units. The fact that some of the owners may not have obtained a "land information memorandum" from the council (prior to purchasing the unit) was not a bar to an individual claim, but could be relevant to a reduction in the award of say 25 per cent for contributory negligence. The Body Corporate would be treated as agent for the unit owners in respect of the common property, and could represent the owners in a collective action. In respect of *Sunset Terraces* case, the fact that the ownership structure of some property owners was through a company or trust would not affect the plaintiff's right to claim for what were essentially economic losses. The Court of Appeal upheld the liability of the council.[140]

On further appeal, the Supreme Court (in a judgment in December 2010) affirmed the divergence of New Zealand law in the *Hamlin* decision from the U.K. position. Elias CJ stated that she did "not consider it would be principled to introduce restrictions on the liability of territorial authorities according to the form of ownership, the type of residence, or the value of the building".[141] The council argued that the *Hamlin* decision should no longer apply, but the remaining four Judges of the Court stated "Hundreds, if not thousands, of people must in the meantime have relied upon the proposition that the 1991 Act had not affected the common law position. For this Court to defeat that reliance retrospectively by holding that the true position was otherwise would represent an inappropriate use of our ability to depart from a previous decision of the Privy Council".[142]

The Court further stated "The duty affirmed in *Hamlin* is, in any event, a soundly and firmly based principle of New Zealand law. There are good policy reasons for it."[143] In response to a submission from the council that the duty should apply to single owner-occupied dwellings alone, and not multi-unit apartments that could be rented out to tenants, the Court stated "The duty affirmed in *Hamlin* is designed to protect the interest citizens have in their homes. As a matter of principle and logic that duty should extend to all homes, whatever form the home takes. Distinctions based on the ownership structure, size, configuration, value or other facets of premises intended to be used as a home are apt to produce arbitrary consequences. Furthermore the *Hamlin* duty must be capable of reasonably clear and consistent administration".[144]

The Court concluded "For these reasons we agree with the Court of Appeal that a building's intended use, in accordance with the plans lodged with the council, is the most appropriate determinant of the scope of the *Hamlin* duty. Councils owe a duty of care, in their inspection role, to owners, both original and subsequent, of premises designed to be used as homes".[145]

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[140] *O'Hagen v Body Corporate 189855 (Byron Avenue)* [2010] 3 NZLR 445 (CA); *North Shore City Council v Body Corporate 188529 (Sunset Terraces)* [2010] 3 NZLR 486 (CA).
[141] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [7].
[142] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [23].
[143] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [26].
[144] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [49].
[145] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [51]. The Court left open for later decisions application of the duties of care to particular premises.

The fact that with reference to the *Byron Avenue* building, the council had not issued a code compliance certificate, did not negate the duty of care in respect of acts and omissions prior to that point in time. The Court observed that the term "inspection" was defined under the former Building Act to mean "the taking of all reasonable steps to ensure that any building work is being done in accordance with the building permit".[146]

Regarding a liability issue that could arise where a claim had been brought and determined, and then the property had been sold, the Court considered a number of situations. The potential for an accrual bar was born out and reduced by the longstop 10 year limitation. It was held the duty owed to a first owner would not be transferred to the second owner on sale nor would the loss. The duty would be independently owed to the second owner and in principle that owner should be able to recover loss in respect to any breach of duty owed to that person independently of the first owner's position.[147]

Where there was a reasonable possibility of intermediate examination by a purchaser, the omission to carry out an inspection could be relevant to a question of contributory negligence or failure to mitigate, but would not defeat the claim. Further, the law provides for a prospective owner to request a land information memorandum (LIM report) from the local authority which could possibly include information as to the property being a leaky home. Where a report was not obtained in this situation, the failure to obtain the report could amount to contributory negligence and reduce the liability.[148] A council may be liable for negligent errors or omissions in the content of a LIM report.[149]

In summary, the Court confirmed that the *Hamlin* decision was correctly made; councils owe a duty of care in their inspection role to owners, both original and subsequent, of premises designed to be used as homes; subsequent purchasers of such premises are not barred from claiming for breach of the duty owed to them solely by reason of a cause of action having accrued to a predecessor in title.

As noted, the duty of care is owed in respect of a property erected as a residential property or home (including a unit rented out or leased), but does not extend to a property erected for a commercial purpose, such as a hotel, motel, school, or industrial purpose.

7 Liability for Actions of Independent Certifiers

The former Building Act 1991 (repealed 2004) provided for developers a choice to use independent certifiers for approval of building plans, inspections, and the issue of a code compliance certificate. A limited number of private companies or persons were approved as certifiers for this purpose. A condition was that the certifier should have adequate insurance cover for public liability claims. The Building Industry Authority was empowered to approve

[146] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [62]. Building Act 1991, s 76(1)(a).
[147] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [72].
[148] *North Shore City Council v Body Corporate 188529 (Sunset Terraces); North Shore City Council v Body Corporate 189855 (Byron Avenue)* [2010] NZSC 158, [2011] 2 NZLR 289 (SC) at [76]-[84]. See also Local Government Official Information and Meetings Act 1987, s 44A (provision to obtain LIM report from council as to factors affecting a property).
[149] *Vining Realty Group Ltd v Moorhouse* [2010] NZCA 104 (error in recording water permit for rural property).

the use of the independent building certifiers, in place of a local authority. Where the certifier approved building plans, carried out the building inspections, and issued a code compliance certificate, the local authority had no discretion to reject the approvals.[150]

In all cases where a local authority is the building consent body, involving a defective building or leaky home syndrome, the local authority would be one of the primary defendants, as the local authority would have sufficient resources to pay the full amount of any damages award. However, where a private certifier is involved in the whole approval and inspection process, the local authority has no legal liability or responsibility. That outcome has been upheld in the Court of Appeal. Consequently, where the certifier has gone into liquidation and the builder is also insolvent (being a not uncommon feature), a property owner may be unable to succeed on a claim or recover any damages awarded.[151]

8 Liability of Central Government (Crown)

Under the Building Act 1991, the Building Industry Authority was constituted with the function of making determinations on the accreditation of building products and processes, to the effect that where an accedited process was used, that standard would be the maximum standard required under the building code. Where the standard applied, a local authority was not entitled to impose a higher standard. The use of untreated pine timber for framing was part of an approval issued by the Building Industry Authority, together with the use of fixed faced monolithic cladding systems over the untreated timber. It became common ground from 1998 that this approval, given in 1995, was the basis of the growing leaky building syndrome complaints. Further, the approval of an independent certifier by the Building Industry Authority required the latter body to be satisfied that the certifier carried reasonable insurance cover in case of any liability.[152] With this background, the liability of the Crown for the actions of the Building Industry Authority itself became important, especially in a situation where an independent certifier had been employed but was insolvent, and the builder might also be insolvent.

In *Attorney-General v Body Corporate 200200*[153] the body corporate representing the 153 unit owners of the Sacramento complex claimed damages against the Building Industry Authority, together with other defendants, for damages for repairs estimated at approximately $20m (10m pounds). The Attorney-General, on behalf of the Crown and the Building Industry Authority moved to strike out the cause of action against the BIA. The Court of Appeal noted the background causes of the leaky building syndrome which applied to the Sacramento complex, and considered the issue of principle as to whether the BIA could owe a duty of care to the building owners in addition to a duty of care owed by the building certifier company. The Court determined that policy considerations pointed against a duty of care, namely that the roles of the BIA were of a quasi-judicial or legislative nature, and where building certifiers were involved

[150] Building Act 1991, ss 51-57. The system was a partial privatisation objective of the government. The Building Act 2004 has omitted the provision for private certifiers.
[151] *Auckland City Council v McNamara* [2010] 3 NZLR 848 (local authority under no liability for actions of independent certifier). Independent certifiers had a minor share of the building consent process.
[152] Building Act 1991, ss 7, 51, 56, 59.
[153] *Attorney-General v Body Corporate 200200* [2007] 1 NZLR 95 (CA) (Sacramento complex).

their certificates were conclusive.[154] Imposing a duty on the BIA would have significant resource implications for the BIA and its management of the Building Act 1991. The Court stated that maladministration by a public body was not in itself a ground for awarding damages. Importantly, proximity considerations pointed against any situation or duty to the building owner.

Likewise, the Court could not find that any duty of care would be owed to the building owner in the approval of a private building certifier, who subsequently went into liquidation and would be unable to meet any damages claim. The Court concluded that the relationship between the BIA and the building owners was extremely limited and matters of proximity and remoteness and causation were not able to be established. The claim against the BIA (and the Crown) was struck out.[155]

In considering the justice of this decision, it may be noted that, having regard to the earlier decisions and criticisms of the inadequacies of the Building Act 1991, the government moved to reform the law and practice by enacting the comprehensive Building Act 2004.[156] The Building Industry Authority was disestablished and replaced by an approval system under a new Department of Building and Housing. The provision for independent certifiers was abolished. A system of licensed building practitioners is established to improve the quality of specified work.[157] Although the Crown is presently under no liability directly for the leaky home crisis, the Crown is offering a partial grant of up to 25 percent of repair costs (without any admission of liability) under pending legislation (considered below).[158]

The present situation remains that the local authority will continue to be the building consent authority, and potentially liable for negligence in the approval of building plans, inspections, and issue of code compliance certificates, in respect of residential properties. Further, to the extent that in many claims the original architects, builders, subcontractors and other persons who may have a primary or secondary liability, may no longer be solvent or able to undertake remedial work, the local authority will be the "last man standing" and may be liable for the whole of the losses and damages established.

9 Weathertight Homes Resolution Services

Recognising the major and serious problems with the substantial number of leaky home claims arising, and the fact that ordinary household insurance policies do not usually cover losses arising from building deterioration or water ingress from normal rainfall, the government enacted the Weathertight Homes Resolution Services Act 2002. The Act established a process whereby a claim could be made to the Service for an assessment of the remediation costs, and for mediation

[154] *Attorney-General v Body Corporate 200200* [2007] 1 NZLR 95 (CA) at [62]-[69] .
[155] See also *Attorney-General v North Shore City Council* [2010] NZCA 324 (The Grange) (further claim by council of duty of care owed by BIA struck out).
[156] Hunn D, Bond I, Kernahan D, "Report of the review group on the weathertightness of buildings to the Building Industry Authority" 31 August 2002 (report critical of performance by BIA).
[157] The Building Act 2004, part 4 (system of licensed building practitioners to undertake or supervise specified works) .

[158] Weathertight Homes Resolution Services (Financial Assistance Package) Amendment Act 2011.

if possible of the liability. Due to the volume of claims and increasing complexity of issues, the Act was replaced in 2006.

The Weathertight Homes Resolution Services Act 2006 states the purpose, namely "The purpose of this Act is to provide owners of dwellinghouses that are leaky buildings with access to speedy, flexible, and cost-effective procedures for assessment and resolution of claims relating to those buildings".[159]

Several types of claim are stipulated. A dwellinghouse claim relates to a property built before 1 January 2012, and within a period of 10 years. The claimant must own the house and the claim can be brought where "water has penetrated it because of some aspect of its design, construction, or alteration, or of materials used in its construction or alteration; and the penetration of water has caused damage to it". Provision is also made for claims in respect of single dwellings in a multi-unit complex, and a multi-unit complex, and common area only claims, in respect of a complex.[160]

Provision is made for common representation in respect of multi-unit complexes. The procedures apply to a dwellinghouse which is leaking, and by definition, a dwellinghouse includes an apartment, flat, or unit and any attached garage or shed, but "does not include a hospital, hostel, hotel, motel, rest home, or other institution".[161]

Where a dwellinghouse owner has an eligible claim, the Resolution Services will arrange for an assessment to be made of the extent of the claim and estimated cost of remediation of the damage.[162] That assessment can then be taken to mediation with limited cost to the applicant. The mediators have powers to require other responsible parties to join in the procedure.[163]

Where a settlement is reached, and the local authority is the consent authority, it will probably be required to contribute to the award, in a proportion in the vicinity of 20-30 per cent responsibility. Where other parties found to liable default, the local authority may be required to meet a greater share of the liability.

If mediation is not succesful, the parties may take the matter to the Weathertight Homes Tribunal for compulsory adjudication. The Tribunal has the powers of a court to act in an appropriate manner in finding responsibility and apportioning liability. The claim may be for any remedy available in a court of law, and may include a claim for general damages to cover mental distress. A determination can be the subject of an appeal to the High Court.[164]

Local authorities (and their insurers) have continued to be concerned about assuming the principal financial burden for the ongoing liability under leaky homes claims. In 2010, after

[159] Weathertight Homes Resolution Services Act 2006, s 3. The WHRSA is administered by the Department of Building and Housing.
[160] Weathertight Homes Resolution Services Act 2006, ss 13-18.
[161] Weathertight Homes Resolution Services Act 2006, s 8.
[162] Weathertight Homes Resolution Services Act 2006, ss 31-51.
[163] Weathertight Homes Resolution Services Act 2006, ss 77-88.
[164] Weathertight Homes Resolution Services Act 2006, ss 57-76, 89-96, part 2, sch 3 (procedure). For lower value claims, the proceedings may minimise the use of lawyers. For an appeal, see *Findlay and Sandelin v Auckland City Council*, HC, Auckland CIV-2009-404-6497, 16 September 2010 (Ellis J) (damages apportioned 80:20 between builder and council – general damages of $25,000 for mental distress, reduced to $17,000 for contributory negligence).

consultation, the Government agreed, despite being not technically liable, to contribute towards claims by a qualifying claimant. The Weathertight Homes Resolution Services (Financial Assistance Package) Amendment Act 2011 provides that the Crown and the participating territorial authority will each provide 25 per cent direct payment for agreed repair costs. Where the territorial authority was not the consent authority but an independent certifier was used (pre 2004), the territorial authority will not be liable but the Crown will continue its offer of 25 per cent. If the home owner accepts the offer, the home owner must agree not to claim further against the territorial authority (or the Crown), but will be able to pursue legal action against other parties for the remaining 50 per cent of the remediation costs. Where the scheme applies, the third parties will not be able to claim back against the territorial authority for any additional contribution.[165]

This Financial Assistance Package has been enacted into law in 2011. In effect, central government accepts a moral responsibility for part of the leaky home problem. An advantage to local authorities of a contribution agreement is that their share will be pegged to 25 per cent with no risk of paying a higher amount if other parties are liable but do not pay respective contributions. In relation to all real estate valuations and transactions, much greater awareness is acknowledged throughout the country as to the need to obtain checks before purchasing houses and apartments.

10 Conclusion and further research

The history of legal liability in New Zealand of local authorities in respect of defective properties illustrates the adaptability of the common law to local circumstances. The liability is limited to residential properties, and does not extend to commercial properties. A 10 year longstop for claims applies from the date of approvals and actions of local authorities. The recent offer by central government to provide up to 25 per cent contribution towards the repair costs of leaky homes, in conjunction with a matching offer from local authorities, is regarded by local authorities and the wider community as a reasonable outcome. In the longer term, further research to achieve improvements in design and building standards should reduce the scale of claims for defective residential premises. The demarcation for liability between a commercial building and a residential building remains problematic.

[165] Weathertight Homes Resolution Services (Financial Assistance Package) Amendment Act 2011. The Minister may, on behalf of the Crown, give a guarantee or indemnity for a loan to meet the balance of the repair costs, and may recover any debt arising.

Affordable housing in Portugal and São Paulo Municipality: Comparison of space standards and socio-economic indicators

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Abstract:

This paper compares the space standards set for affordable housing in Portugal and in São Paulo Municipality (Brazil), and seeks explanations for differences in the socio-economic context of each territory. The Controlled Cost Housing (CCH) in Portugal and the housing built within the program My Home My Life (MHML) in São Paulo Municipality are studied. Three research questions are addressed: Which program has more demanding space standards? Which social-economic conditions explain the differences in space standards? How different space standards influence the users' satisfaction? To answer these questions, space standards, socio-economic indicators and the users' satisfaction are compared. Space standards compared the number and type of rooms, the internal floor area of dwellings, the size of rooms, and the size of furniture and equipment. The study has shown that space standards set for CCH are more demanding than those set for MHML program. For instance, a CCH dwelling has almost two times the gross area of a MHML dwelling with the same number of rooms. The housing deficit, the low income of poor households and the option to sell highly subsidized affordable housing are reasons that justify the low space standards in São Paulo Municipality when compared to Portugal. Although affordable houses are substantially smaller in São Paulo Municipality, the satisfaction level of dwellers with the size of dwellings is higher. Therefore, a direct link between space standards and users' satisfaction cannot be set. We conclude that different political options on how to provide housing to low income households directly influence the space standards set for dwellings.

Keywords:

Brazil, Portugal, affordable housing, space standards

1 Introduction

In Portugal and Brazil, it is generally accepted that the main goal of housing policy is to ensure decent housing for all households. This can be achieved by facilitating access to property, by providing access to a rented house or by ensuring minimum conditions of habitability in existing housing.

Both to enable access to property and to create a housing rental stock, the State may support the construction of housing, usually called affordable housing. Its main objective is to provide decent housing at affordable prices for low income households. Therefore, minimum parameters are set to ensure that dwellings have a quality level suitable to meet, at least, the basic needs of dwellers within the lifespan of the construction. Maximum parameters can also be set to guarantee that housing cost is compatible with the economic capacity of low income households, as well as to guarantee a good use of funds invested.

The general requirements for adequate or decent housing have been internationally accepted (UN-Habitat, 1996): it should provide a safe, healthy, comfortable and functional environment, at an affordable cost. However, the performance demanded for each requirement often varies from country to country according to the prevailing cultural, social, environmental, technological and economic conditions.

To ensure functionality, a dwelling shall be large enough to meet user's needs in terms of living, cooking, dining, sleeping, bathing and storing household goods. Space standards set the conditions to fulfil these objectives and usually specify the overall area, size and dimensions of rooms, ceiling height and layout of dwellings.

This paper compares space standards set for the construction of affordable housing in Portugal and in São Paulo Municipality, and seeks explanations for differences in the socio-economic context of each territory. The case studies consist of the *Controlled Cost Housing* (CCH), in Portugal, and the housing built within the program *My Home My Life* (MHML), in São Paulo Municipality. The three research questions addressed are as follows:

1) Which program has more demanding space standards?

2) Which social-economic conditions explain the differences in space standards?

3) How different space standards influence users' satisfaction?

The following section explains the research methodology and Section 3 describes the two case studies. Section 4 compares the socio-economic indicators and Section 5 presents the results of the comparison between space standards. The results are discussed in Section 6.

2 Research methodology

The study was developed according to the following methodology:

1) Identification of the problem and definition of concepts;

2) Characterization of case studies;

3) Comparison of socio-economic indicators;

4) Comparison of space standards set by building regulations;

5) Cross analysis of socio-economic indicators and space standards;

6) Summary of key findings and discussion of results.

3 Case studies

3.1 Controlled Cost Housing

In Portugal, affordable housing is called *Controlled Cost Housing*. The State supports financially the construction of CCH through the *Instituto da Habitação e da Reabilitação Urbana* (Housing and Urban Rehabilitation Institute). CCH can be promoted by municipalities, housing cooperatives or private companies.

The main objective of CCH is to optimize the relation between cost and quality: dwellings should meet the occupants' needs and have a reduced cost, which is assessed from a long term perspective (construction, use and maintenance) (Portugal, 1985).

When completed, CCH may be sold or rented. There are no limitations of income to households buying or renting CCH, but a sold dwelling is subject to special rules determining the conditions of transferability for a period of five years.

Figure 8. Cover of building regulations for CCH and photos of two developments
(Source: Imprensa-Nacional Casa da Moeda and Marluci Menezes)

The CCH construction program was created in 1983 (Portugal, 1983). Between 1984 and 2004, about 126,000 dwellings were built, with an average of 6,300 dwellings per year (Coelho, 2006). In later years, the construction of CCH decreased. In 2008, only 1,500 dwellings were completed (OHRU, 2009).

A CCH development shall comply with all the legislation applicable within the location where it is built and shall also comply with specific building regulations for CCH (Portugal, 1985; Portugal, 1997).

3.2 Program My Home My Life

In São Paulo Municipality, there are several programs to support the construction of affordable housing. The program "*My house my life*" was launched in 2009 by the Federal Government of Brazil. This program is run by *Caixa Econômica Federal* (Federal Bank) and the developments can be implemented by public or private bodies, or in partnership.

The MHML program aims to reduce the housing deficit in Brazil. The initial goal was to build one million houses, and therefore facilitate the access to housing for low income households. In 2010, the initial objective was increased to three million houses. The priority of this program is to provide houses for households earning no more than 3 minimum wages, but, within this program, houses for households with incomes not exceeding 10 minimum wages are also to be built (Brasil, 2009).

Figure 9. Promotion poster of MHML program and images of two developments (Source: CEF)

The MHML program supports the construction of new buildings. When completed, houses are sold to households listed by local governments. Households have to meet the requirements of the program to apply for a dwelling, including having an income within a certain range (Brasil, 2009).

A housing development built under the program MHML shall comply with all the legislation applicable within the location where it is built and shall also comply with additional conditions set by the program (ABNT, 2000; CEF, 2009a; CEF, 2009b).

4 Comparison of social-economic indicators

4.1 Population and territory

Although the total population of São Paulo Municipality and Portugal is similar, the territory is quite different. In São Paulo Municipality, almost all the population is concentrated in a vast urban area. The area occupied by the São Paulo Municipality is about sixty times smaller than that of the Portuguese territory, and therefore the population density is about sixty times higher. The rate of annual population growth is also higher in São Paulo (Table 1).

Table 1. Population and territory indicators
(Source: INE, 2002; INE, 2008; GESP, 2009b; INE, 2009; IBGE, 2009)

	Year	Portugal	São Paulo Municipality	
Population	2001/2000	10.36	10.43	millions of inhabitants
	2008	10.60	10.99	
Rate of annual population growth	2008	0.17	0.95	%
Number of families	2001/2000	3.65	3.13	millions of families
Size of the families	2001/2000	2.84	3.51	persons
Area of territory		92,094	1,509	sq km
Population density	2008	115	7,283	inhab. per sq km

4.2 Housing stock

In 2000/2001, the housing stock of São Paulo Municipality was about 55 % of the housing stock in Portugal. There was a small deficit of housing per family in São Paulo Municipality and a surplus in Portugal. The number of dwellings per 1000 inhabitants and the number of dwellings per family was higher in Portugal than in São Paulo Municipality. The housing tenure was very similar in both territories (Table 2).

Table 2. Housing stock indicators
(Source: INE, 2002; IBGE, 2009; GESP, 2009b)

	Year	Portugal	São Paulo Municipality	
Housing stock	2001/2000	5.02	3.39	millions of dwellings
Dwellings per 1000 inhabitants	2001/2000	485	286	dwellings
Dwellings per family	2001/2000	1.37	0.95	dwellings
Housing tenure:	2001/2000			
- owner occupied		75.7	69.4	%
- rented		20.8	21.6	%
- other		3.5	9.0	%

4.3 Housing demand

In 2000/2001, the housing deficit in São Paulo Municipality doubled the one in Portugal. The number of unoccupied dwellings in Portugal was 30 % higher than in São Paulo. In both territories, the unoccupied dwellings were enough to cope with the housing deficit, although they might not have the location or be suitable to meet the housing demand (Table 3). The housing deficit in São Paulo is probably undervalued given that the number of dwellings per family is less than 1 (see 4.2).

Table 3. Housing shortage
(Source: INE, 2002; Fundação João Pinheiro, 2005)

	Year	Portugal	São Paulo Municipality	
Housing deficit	2001/2000	100	203	thousands of dwellings
Unoccupied dwellings	2001/2000	543	420	thousands of dwellings

Also in 2000/2001, the main deficiency of the Portuguese housing stock was its poor maintenance condition (Guerra et al, 2007; INE, 2002). In São Paulo Municipality, the poor urban planning, the lack of urban infrastructures and overcrowded dwellings were the main deficiencies (Fundação João Pinheiro, 2005).

4.4 Housing price

The price per square meter in the MHML program is about 40 % of the same value in CCH. Due to differences in price per square meter and in the overall area of dwellings, the price of a two-bedroom MHML dwelling is about 20 % of the same dwelling in CCH. The prices for flats and single family houses are different in the MHML program (Table 4).

Table 4. Housing prices
(Source: Portugal, 1997; Portugal, 2008b; CEF, 2009a)

	Year	CCH	MHML		
			Flat	House	
Price of two bedroom dwellings	2009	102,102	20,124	18,576	€
Price per square meter	2009	1,201	479	531	€

4.5 Family income

The gross domestic product (GDP) per capita of São Paulo Municipality is approximately 74 % of the same value in Portugal. The minimum wage in the State of São Paulo is approximately 45 % of the same value in Portugal. The annual income of the 20 % of the population of São Paulo Municipality with lower income is 12.7 % of the same value in Portugal. The annual income of the 20 % of the population of São Paulo Municipality with a higher income is 68.9 % of same value in Portugal. The percentage of the population below the poverty line is not comparable since the threshold adopted in Portugal is 2.59 times higher than in Brazil (including São Paulo Municipality) (Table 5).

Table 5. Family income
(Source: PNUD, 2003; Portugal, 2008a; INE, 2008; INE, 2009; IBGE, 2009; GESP, 2009a)

	Year	Portugal	São Paulo Municipality	
Annual GDP per capita	2007	15,400	11,375	€
Monthly minimum wage	2009	450	195 to 211	€
Annual income per person:				
- average of 20 % of the population with lower income	2007	3,667	466	€
- average of 20 % of the population with higher income	2007	22,310	15,364	€
Poverty line	2007	406	73,48	€

4.6 Housing affordability

In the MHML program, the monthly mortgage is 10 % of the gross household income, with a minimum value of € 19.35. The amortization period is 10 years (Table 6).

In CCH, households can buy a dwelling with their own savings and/or obtain financing (a loan) from a financial institution. Each household negotiates the loan conditions and the monthly mortgage varies according to their options. Alternatively, a household can choose to rent a dwelling. In the Social Renting Regime, the rent is estimated based on the household income and composition. For households with an income below 3 minimum wages, the rent is less than 20 % of their income (Table 6).

Table 6. Mortgages
(Source: Portugal, 1993; CEF, 2009a)

	Portugal		São Paulo Municipality	
	Buying	Renting*		
Mortgage per monthly gross income	Varies	< 20	10	%
Amortization of housing price	100	–	From 12.5 to 39.8	%
Amortization period	Up to 45	–	10	years

* Household with an income below 3 times the minimum wage in Social Renting Regime

4.7 Housing satisfaction

To compare dwellers' satisfaction with affordable housing, two studies of post occupancy evaluation were used. The study for Portugal was carried out in 2004. Sixteen CCH developments comprising 1,283 dwellings, distributed by the Portuguese territory and representing different types of promoters, were assessed. Data on dwellers' satisfaction level was obtained by questionnaire. From the total of questionnaires placed in the post-boxes, 304 of them were received back (Menezes and Martins, 2005).

In São Paulo, there is still no information on dwellers' satisfaction with their homes from MCMV program, since this program started in March 2009. Therefore, the results of a post-occupancy evaluation study of a housing development with identical spatial characteristics were used. The Jardim São Luíz comprises 2,301 housing units, but to assess dwellers' satisfaction a sample of 81 dwellings was chosen. Data on dwellers' satisfaction was collected, in the second half of 1997, with questionnaires being conducted by students (Romero and Ornstein, 2003).

Both studies assess dwellers' satisfaction in a four level scale (i.e., completely satisfied, mostly satisfied, mostly dissatisfied, and completely dissatisfied). Among the several questions asked on dwellers' satisfaction, both questionnaires include a specific question about the satisfaction level with the size of the dwelling.

According to studies analysed, there are many similarities in the way dwellers of affordable housing in Portugal and in São Paulo assess the spatial characteristics of their dwellings. Dwellers positively evaluate the size of the dwelling as a whole and the organization of rooms. However, their assessment is negative for the size of the kitchen and service areas. The level of satisfaction with the size of the dwelling expressed by dwellers of affordable housing in São Paulo Municipality is higher than that expressed by dwellers of affordable housing in Portugal (Table 7).

Table 7. Dwellers' satisfaction
(Source: Menezes and Martins, 2005; Romero and Ornstein, 2003)

	Year	Portugal	Jardim São Luíz	
Dwellers' satisfaction with the size of the dwelling	1997/2004	2.62	3.12	1 to 4

5 Comparison of space standards

5.1 Number and type of rooms

The number of bedrooms of a dwelling is different between CCH and MHML programs. CCH dwellings can have from no bedroom up to five bedrooms (Portugal, 1951; Portugal, 1997). All MHML dwellings must have two bedrooms (CEF, 2009a). In both programs a dwelling must also have a kitchen, a living room and a bathroom.

5.2 Area of dwellings

Floor area of CCH dwellings must be within a range set by minimum and maximum parameters. The floor area of flats set in MHML program is 71 % of the minimum floor area and 61 % of the maximum floor area set for CCH. The gross area of flats set in MHML program is 63 % of the minimum gross area and 53 % of the maximum gross area set for CCH (Table 8). In MHML program, flats are slightly larger than single family houses because they cannot be enlarged.

Table 8. Area of two bedroom dwellings
(Source: Portugal, 1951; Portugal, 1997; CEF, 2009a)

CCH				MHML				
Floor area		Gross area		Floor area		Gross area		
Min.	Max.	Min.	Max.	House	Flat	House	Flat	
52	61	67	79	32	37	35	42	m²

Naturally, the dwelling floor area per occupant set in MHML program is also substantially less than that set for CCH (Table 9). This parameter is calculated by dividing the floor area of a dwelling by the maximum or probable number of occupants.

Table 9. Floor area per occupant for a two bedroom dwelling
(Source: Portugal, 1951; Portugal, 1997; CEF, 2009a)

		CCH		MHML		
	Number of occupants	Min.	Max.	House	Flat	
Maximum	4	13.0	15.3	8.0	9.3	m²
Probable	3	17.3	20.3	10.7	12.3	m²

For MHML program, the floor area per occupant is 8.0 or 10.7 square meters depending on the number of occupants. It is important to take into account that in dwellings with less than 8.0 square meters of floor space per occupant the prevalence of pathological situations tends to increase. In dwellings with 8.0 to 14.0 square meters of floor space per occupant, dwellers' satisfaction tends to be negative (Pedro, 1999).

Figure 3 and Figure 4 present two-bedroom flats and houses from CCH and MHML program. Plans are at the same scale. Figure 5 shows the furniture and equipment included in each dwelling. The standard physical and use dimensions of furniture and equipment are as defined in Figure 6.

5.3 Ceiling height

For most rooms, the minimum ceiling height set by MHML program is higher by 0.10 m or 0.20 m than that set for CCH (Table 10). This difference seems appropriate since it makes possible to partly compensate for the less floor area of rooms in MHML program and to obtain an internal volume that is not too low.

Table 10. Ceiling height of rooms
(Source: Portugal, 1951; ABNT 2000)

	Living room	Bedroom	Kitchen	Laundry	Bathroom	Circula-tion	Storage		
							A>2.5 m²	A≤2.5 m²	
CCH	2.4	2.4	2.4	2.2	2.2	2.2	2.2	2.2	m

MHML	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.4	m

5.4 Size and area of rooms

The floor area of bedrooms in MHML program is 82 % of that set for CCH. The floor area of the living room, kitchen and laundry in MHML program is 60 % of that set for CCH. The floor area of the bathroom in MHML program is 44 % of that set for CCH. No area is set in MHML program for storage and circulation (Table 11).

Table 11. Floor area of rooms for two bedroom dwellings
(Source: Portugal, 1951; Portugal, 1997; Portugal, 2006; ABNT, 2000; CEF, 2009a; CEF, 2009b)

	CCH	MHML	
Bedrooms	19.5	16.0	m²
Living room, kitchen and laundry	24.0	14.4	m²
Bathroom	5.0	2.2	m²
Storage and circulation	7.5	–	m²
Total	**56.0**	**32.6**	m²

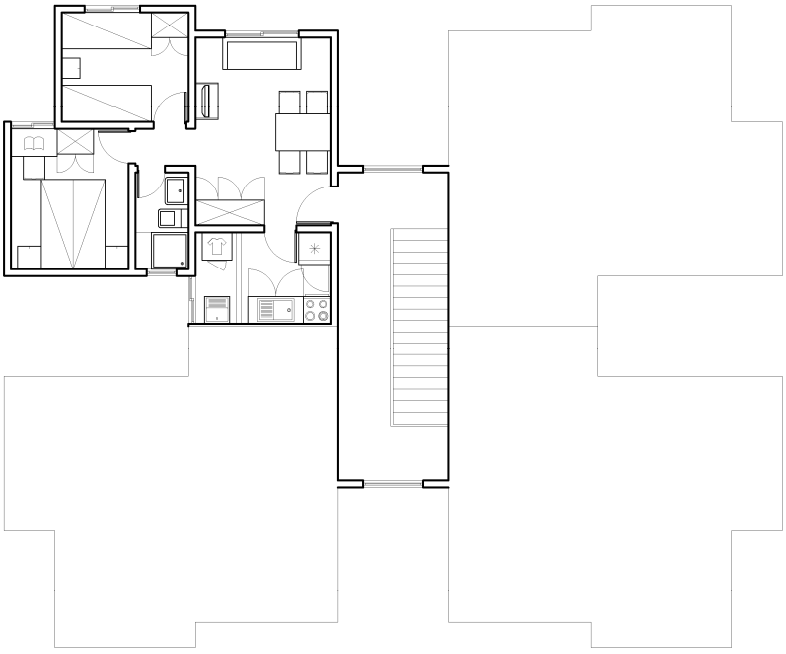
5.5 Furniture and equipment

The furniture and equipment that must be possible to include in a dwelling of MHML program is less than the one that must be possible to include in CCH (Figure 5) (Portugal, 1951; Portugal, 1985; Portugal, 2006; MSP, 1992; ABNT, 2000; CEF, 2009).

The standard physical and use dimensions of furniture and equipment set for MHML program are the same as or smaller than those set for CCH (Figure 6) (Portugal, 1985; Pedro et al., 2006; Pedro et al., 2011; ABNT, 2000; CEF, 2002; CEF, 2009b). The most significant differences consist of the furniture for the living room and the clear floor space for the kitchen, bathroom and foyer. In CCH, the clear floor space is larger to ensure the accessibility of disabled persons. It should be pointed that previous studies concluded that standard size of furniture set for affordable housing in São Paulo Municipality were smaller than furniture for sale in shops (Boueri, 2008).

Portugal - CCH
Location: Barranha/Matosinhos
Developer: Cooperativa Hazal
Year of construction: 1991
Designer: ENGIL

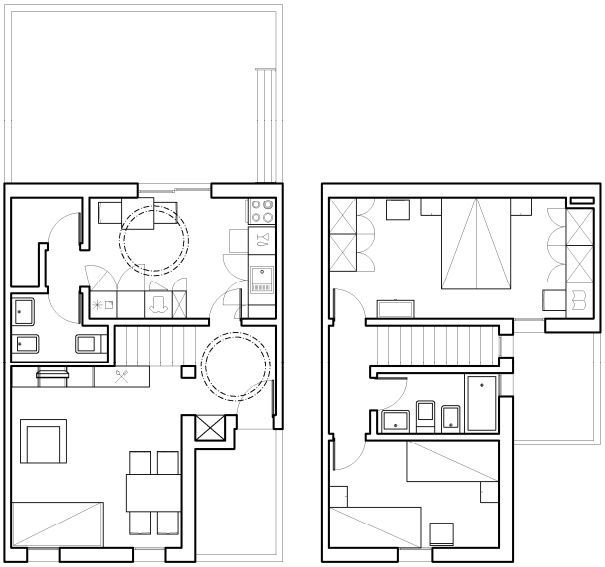
Floor area	
- Master bedroom	10,8
- Twin bedroom	9,8
- Living room	18,2
- Kitchen	7,4
- Service area	2,4
- Bathroom	4,0
- Storage	1,4
- Entrance	3,3
- Hall	4,2
- Dwelling	61,5
Gross area	
- Dwelling	75,0
- Common spaces	7,4
- Total	82,4



São Paulo - MHML
Location: Base design
Year of design: 2009
Designer: CEF

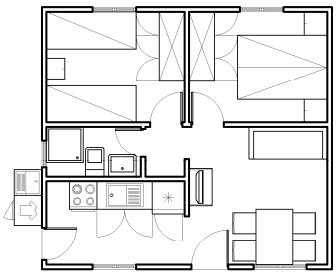
Floor area	
- Master bedroom	7,8
- Twin bedroom	6,6
- Living room	12,2
- Kitchen	3,9
- Service area	2,0
- Bathroom	2,5
- Hall	1,2
- Dwelling	36,2
Gross area	
- Dwelling	42,0
- Common spaces	4,2
- Total	46,2

Figure 10. Plans of two bedroom flats



Portugal - CCH
Location: Luz de Tavira/Tavira
Developer: CHE O nosso piso
Year of construction: 1992
Designer: GAT de Tavira

Floor area	
- Master bedroom	15,1
- Twin bedroom	8,7
- Living bedroom	14,7
- Kitchen	11,8
- Bathroom	3,5
- Toilet	2,8
- Pantry	2,1
- Entrance	4,0
- Hall	2,4
- Stair	2,6
- Dwelling	67,7
Gross area	
- Total	85,2



São Paulo - MHML
Location: Base design
Year of design: 2009
Designer: CEF

Floor area	
- Master bedroom	7,2
- Twin bedroom	7,2
- Living room	9,1
- Kitchen	5,4
- Bathroom	2,3
- Circulation	2,4
- Dwelling	33,6
Gross area	
- Total	35,9

Figure 11. Plans of two bedroom houses

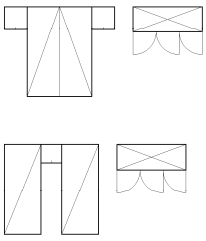
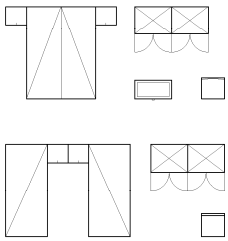
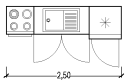
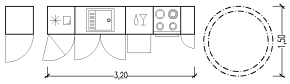
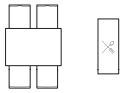
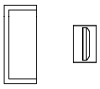
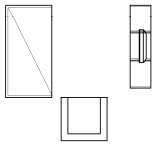
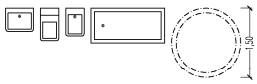
	São Paulo - MHML	Portugal - HCC
Sleeping		
Cooking		
Quick meals		
Dining		
Living		
Adolescents play/study		
Laundry		
Drying clothes		
Personal hygiene		
Entrance		

Figure 12. Furniture and equipment for a two bedroom dwelling

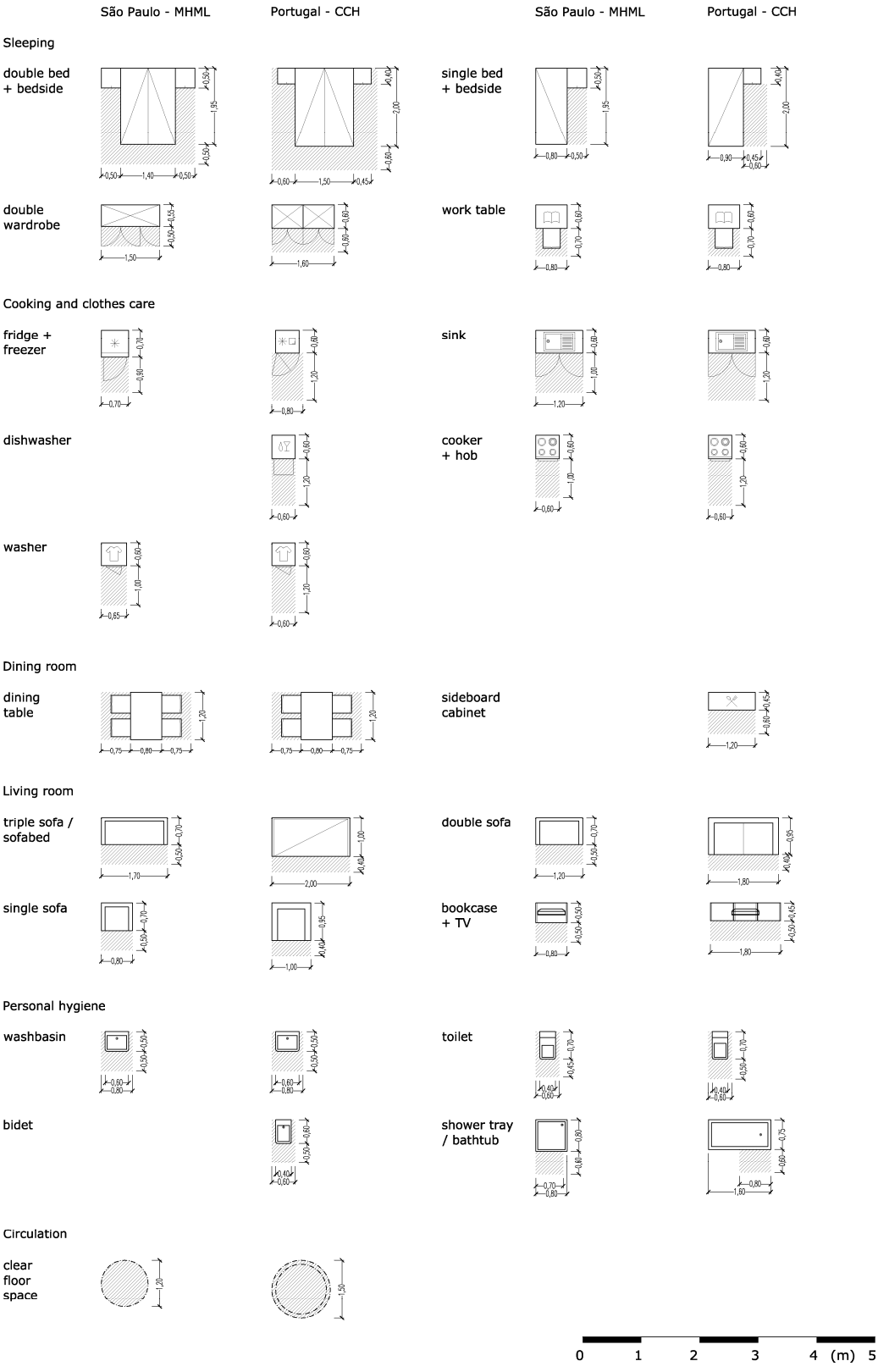

São Paulo - MHML
Portugal - CCH
São Paulo - MHML
Portugal - CCH
Sleeping
double bed + bedside
single bed + bedside
double wardrobe
work table
Cooking and clothes care
fridge + freezer
sink
dishwasher
cooker + hob
washer
Dining room
dining table
sideboard cabinet
Living room
triple sofa / sofabed
double sofa
single sofa
bookcase + TV
Personal hygiene
washbasin
toilet
bidet
shower tray / bathtub
Circulation
clear floor space
0 1 2 3 4 (m) 5

Figure 13. Physical and use dimensions of furniture and equipment

6 Conclusions and discussion

6.1 Results

Which program has more demanding space standards?

The space standards set for construction of CCH housing in Portugal are more demanding than those set for MHML Program in São Paulo Municipality.

Which social-economic conditions explain the differences in space standards?

Three main reasons explain the differences in space standards.

1. The housing deficit is still a problem in São Paulo Municipality, contrary to Portugal where there is a surplus. A greater demand for housing in São Paulo Municipality contributes to the acceptance of low space standards.

2. The income of poor population in São Paulo Municipality is substantially less than the income of poor population in Portugal. Therefore, low space standards of MHML program are a way to make the price of dwellings affordable for low income households in São Paulo Municipality.

3. The policy approach to provide housing to low income households is different. In MHML program, low income households buy highly subsidized housing. The non refundable investment of the Federal Government is more than half of the dwelling's price. In order to increase the number of households covered by MHML program, the cost of dwellings is minimized and, as a result, space standards are necessarily low. In Portugal, low income households may either buy or rent CCH. If households choose to rent affordable housing, the rent is estimated taking into account their income. Hence, the aim of affordable housing is to ensure adequate living conditions for dwellers throughout the lifespan of buildings.

How different space standards influence users' satisfaction?

Affordable housing in São Paulo Municipality has almost half the area of affordable housing in Portugal. However, according to studies analyzed, dwellers express a higher level of satisfaction with the size of dwellings in São Paulo Municipality. Therefore, a direct link between space standards and users' satisfaction cannot be set. The results suggest that dwellers of CCH in Portugal have higher expectations or different lifestyles than dwellers of affordable housing in São Paulo.

6.2 Discussion

The following paragraphs present an analysis of the relationship between space standards of MHML program and the main policy options for affordable housing in São Paulo Municipality.

1. The main aim of affordable housing policy is to ensure adequate housing for all households. Therefore, setting minimum requirements for housing should be based on a technical study of the occupants' physical, social and cultural characteristics. The following criteria should be used

with decreasing order: current population needs, foreseeable evolution in these needs and limitations determined by economic viability. In MHML program, it appears that political motivations and economic constraints led space standards to fall below the current population needs and their foreseeable evolution.

2. It is widely accepted that overcrowding can affect residents' mental and physical health (Wren et al., 2000; Sheridan, 2003; Carmona et al., 2010). The pressures arising from situations of overcrowding may lead to psychological distress, mental disorders and less ability to concentrate. Crowded conditions are also linked with increased interpersonal aggression, sexually deviant behaviour, as well as hygiene and accidents risks. Furthermore, cramped homes, which do not fulfil the occupants' needs, may lead to social cohesion issues (e.g. children who have no space at home to study and/or to play, hang around communal areas and housing estates) and to negative social behaviours (e.g. poor social control of children may give rise to violence and/or vandalism). These health and social problems have medium and long term costs for society. It can be argued that these costs may outweigh the additional public funding that would be needed to support the construction of better housing in MHML program.

3. Given the similarities between Portugal and São Paulo Municipality regarding how dwellings are used, the differences in space standards raise the following question: are space standards too demanding in Portugal or excessively lenient in São Paulo Municipality? To answer this question we should take into account that space standards specified for Portugal are similar to those set in several European countries, such as Spain and France (Pedro, 2009). Whereas the floor area per inhabitant set in MHML program is near the critical threshold below which the incidence of pathological conditions tends to increase. Therefore, we may argue that space standards set in MHML program only take into account the basic needs of present daily life.

4. MHML program sets the maximum selling price and the generic technical characteristics of housing (CEF, 2009a). The design of affordable housing in this program raises the challenge of finding solutions that, within the limit price, maximize the conditions offered to dwellers. Savings in construction costs could compensate for dwellings with larger areas. To reduce the construction costs various strategies can be adopted, such as: streamlining the design (e.g., minimize the water and sewage facilities), using more efficient construction procedures (e.g., modular dimensions and standardized components) or adopting more economical types of promotion (e.g., self built housing or evolutionary housing).

5. The booklet that sets the conditions for the application of MHML program includes, as an example, plans of a house and a flat. These examples can steer developers to pre-established solutions that are not adequate to the site conditions, population needs or local culture. For each development, a new design should be prepared taking into account the physical environment of the site and the social characteristics of the population. Beyond a proper integration, the research into new designs encourages diversity and innovation in architecture and construction.

6. A building has a long lifespan lasting in some cases for generations. It is not easy to foresee the change in users' needs. The flexibility of a dwelling facilitates its adaptation to the evolving occupants' needs, but strongly depends on its spatial characteristics. Very small dwellings have reduced flexibility. The space standards of MHML program only take into account the basic needs of present daily life. A desirable improvement in the quality of life of São Paulo's

population may mean that, in the sort or medium-term, the dwellings presently being built will become obsolete.

7. MHML program defines the requirements to be met in dwellings. However, no requirements are set regarding the building and the neighbourhood, except for one specification about minimum distance between buildings. The urban plot is driven only by the spatial planning instruments applicable to the location, if any. Therefore, the quality of the urban plot may not be guaranteed.

8. In the MHML program, only two bedroom dwellings are planned to be built. This type of dwelling is adequate for a nuclear family with one child or two children, but it is not suitable for other types of families such as single persons, childless couples, families with more than two children and extended families. If dwellings fall short of households' needs, they tend to modify their environments in an attempt to minimize the shortcomings. These changes, when performed without the supervision of the authorities, may endanger the building's safety and compromise the building's image.

9. The Brazilian media reported that in several States of Brazil applicants interested in acquiring a dwelling within MHML program formed long queues at registration offices. According to some reports, some applicants spent the night in queues to ensure their position (Diário Popular, 2010). Other reports refer to queues with more than 1,500 applicants (Tribuna do Norte online, 2009). These reports prove the population's adherence to MHML program.

For households with an income not exceeding 3 times the minimum wage, the conditions to buy a dwelling within the MHML program are very attractive. The monthly mortgage is 10 % of the household income during an amortization period of 10 years. After this period, the household owns a dwelling having paid, depending on its income, between 13.3 % and 39.8 % of the property value. However, the MHML program requires a non refundable investment by the Federal Government of more than 60 % of the selling price of the building. Without enough return of the initial public investment it is difficult to have funds to continue building new developments. MHML program will probably fail to provide housing for all low income households, being thus debatable if it is a fair and efficient application of public resources.

10. Taking into account the previous paragraphs (indicated between brackets), the following improvements in MHML program were recommended (Pedro and Boueri, 2010):

- Increasing the total floor area of dwellings to include larger bedrooms, living room, and toilet, as well as to provide storage space (paragraphs 1, 2, 3);

- Counterbalancing the possible rise of dwellings cost, due to the increased area, with strategies to reduce the construction cost per square meter or the monthly mortgage (paragraph 4);

- Promoting and rewarding developments that achieve high quality and innovation (paragraph 5);

- Encouraging innovative spatial and construction solutions that are economic and adequate to the dwellers' needs (paragraph 6);

- Setting requirements on the quality of the neighbourhood that address parking spaces, accessibility, urban facilities and services, public spaces and green areas (paragraph 7);

- Enabling the construction of dwellings with one, two, three or four bedrooms and adjusting the program of each development to local needs (paragraph 8);

- Increasing the return on public investment with other economic models (e.g., subsidized rents, self built housing, evolutionary housing or by simply expanding the amortization period) (paragraph 9).

11. In view of constraints imposed by the MHML program, building houses rather than flats may be a better option. In houses, it is easier to design solutions that start with an initial core, where the essential functions take place, and evolve with the progressive addition of new rooms. Evolutionary housing may be a path towards building decent housing, adjusted to the dwellers' needs at a reasonable initial cost.

6.3 Limitations of the study

When analyzing the results it is important to consider the limitations of the methodology listed below.

1. Only space standards that apply to the dwelling were compared. There can be some compensation of space between the exterior and the interior of dwellings (e.g., the lack of enough leisure space within the dwelling may be counterbalanced by a large private outdoor space).

2. To compare the satisfaction level of dwellers, studies of post-occupancy evaluation of housing developments in Portugal and in São Paulo Municipality were used. The methodology used in both studies was identical, which enabled the comparison of results. In the study for Portugal sixteen developments were assessed. In the study for São Paulo Municipality only one development was assessed. This development is similar to other affordable housing developments in São Paulo Municipality, but results about the satisfaction level of dwellers may not be representative.

3. MHML program is meant to be applied in municipalities all over the Brazilian territory. The São Paulo Municipality has different characteristics from most other municipalities. Some inconsistencies detected in the regulatory framework governing MHML program in São Paulo Municipality may result from the specificity of the territory examined. The urban parameters of MHML program may be undefined due to the need of extending its implementation to the whole Brazilian territory.

6.4 Future developments

Only space standards were compared. To enable a more complete understanding of the quality level of affordable housing it is important to compare other requirements, such as safety, health and comfort.

Designers and developers of affordable housing have a practical knowledge resulting from designing, building and sometimes dealing with dwellers. It is important to know their opinion about space standards presently enforced in both territories.

Besides MHML program, other programs are being implemented in São Paulo Municipality to support the construction of affordable housing. As MHML program, these programs have manuals containing requirements or guidelines for housing developments (CDHU, 2008). The requirements for these programs may be compared to understand how the new MHML program situates in the affordable housing being constructed in São Paulo Municipality.

A comparison of the affordable housing in Portugal and Brazil is particularly interesting since both countries share a common language and culture. However, extending this comparison to other countries could contribute to put the findings in the context of a more comprehensive framework.

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Code of Ethics for the Contractors as a Mechanism for the Self-Regulation in Malaysia : An Appraisal

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Abstract:

The new enforcement strategies in business operation have challenged the control by regulatory mechanism where it evidences the emergence of self-regulation as a new enforcement mechanism in doing business. This recent trend is seen as the response to the critics that bureaucracy and laws limit businesses' freedom and autonomy. Construction industry is also one of which that receive the imperative handling of self-regulation and one that manifests this, is the formulation of code of ethics for the contractors within this industry. Code of ethics for the contractors is viewed as crucial given that the level of disputes involving them in construction project are high and their profession is often tainted with the reputation of involving in unethical behaviours or at least highly seen as such by the community. However, the impact of implementation of the codes at times is debatable due to its self-regulatory status. This paper will discuss the code of ethics for the contractor as a mechanism for the self-regulation in the perspective of Malaysian construction industry with special reference to the practices of good ethics for the contractors as highlighted in Malaysian standard form of contracts.

Keywords:

self-regulation, construction, code of ethics, standard form of contracts, Malaysia.

1 Introduction

1.1 Background of study

It is generally accepted that self-regulation brings the benefit to various industries in terms of its flexibility in the mechanisms adopted by particular specific industries or associations. Nevertheless, some perceive it as only a myth and are sceptical on its enforcement (Mustapha Kamil, 2009). Construction industry, being very complex and integrated by many aspects and institutions; which is commonly subject to various disputes is seen to benefit a lot from this self-regulation approach if it is enforced efficiently. The business industries in most countries approach self-regulation voluntarily, even though under certain circumstances and methods, it is backed by legislative sanctions. This allows the industry to accommodate its own types and operation in preparing mechanism for self-regulation for example, the Code of Ethics. However,

as a result, the industry tends to be lackadaisical in its enforcement. Therefore, this paper is aimed to examine the Code of Ethics as a mechanism of self-regulation in Malaysian construction industry and determine what can be the legal pressures for the Code of Ethics to be enforced. Data analysis has been made by reviewing the contents of literature on self-regulation and code of ethics. Interview also has been performed to obtain practical insights of Code of Ethics enforcement. This study is hoped to pave the way for further researches regarding the Code's enforcement in Malaysian construction industry.

1.2 Construction Industry in Malaysia and Self-Regulation

Construction industry has become among the major concerns for Malaysia in recent decades. For example, in 2011, the Government has intensified Public-Private Partnership through implementation of several projects with the allocation of RM1 billion from the Facilitation Fund which amounted to GBP206 million. Such projects for example are construction of more highways, power plant in Kimanis, Sabah, health academic centre and facilities project such as International Islamic University Malaysia Teaching Hospital, Women and Children's Hospital and Integrated Health Research Institute Complex. Government's commitment in development is further observed in the implementation of growth corridors development such as Iskandar Malaysia, North Corridor Economic Region (NCER), East Coast Economic Region (ECER), Sarawak Corridor of Renewable Energy (SCORE) and Sabah Development Corridor (SDC). For the development expenditure of the corridors in the Midterm Review of the 9th Malaysian Plan, RM6 billion is provided in the 2009 Budget which amounted to GBP 1.2 billion. Major construction projects are involved to deliver these growth corridors. This is further accelerated in 2011 where RM850 million has been allocated for their infrastructure support which amounted to GBP175 million.

The move towards self-regulation in construction industry is treated as significant in Malaysia. The Malaysian Construction Industry Master Plan 2006-2015 (CIMP) developed seven strategic thrust envisioned to place the Malaysian construction industry as a world-class, innovative and knowledgeable global solution provider. The second strategic thrust of CIMP is to strengthen the construction industry image that had been criticised for many weaknesses such as abandonment of government projects, shoddy work, discriminatory awarding of contracts, not being environmentally-conscious and others (Construction Industry Development Board Malaysia.(2006).[166] Thus, self-regulation is recommended to achieve this thrust. Among the key initiatives are professional bodies and association self regulating, tightening the particular schemes and licences as well as establishing code of ethics by construction-related associations. Malaysia goes further by providing 'Strategic Recommendations For Improving Environmental Practices in Construction Industry'[167] and promotes self-regulation as one of its recommendation.

Various parties are involved in the construction industry. The owner (employer), the designer (design professional) and the contractor are the key players in a construction project. Meanwhile,

[166] Construction Industry Development Board Malaysia. (2006). *Construction Industry Master Plan 2006-2015*. Available from http:// www. cream.com. my / publications/cimp.pdf). [Assessed 27 April 2010].
[167] Construction Industry Development Board Malaysia. (2007). *Strategic Recommendations For Environmental Practices in Construction Industry 2007*. Available from http://www.cidb.gov.my/cidbweb/bin/ information/HSE/ Strategic%20v5.pdf. [Assessed March 12 2009].

the authorities (regulators), subcontractors, material vendors and others are the supporting players.[168] These players are governed by various legislations, guidelines and policies for example the Town and Country Planning Act 1972, the Street, Drainage and Building Act 1974, the Uniform Building By-Laws 1984 and the Environment Quality Act 1974. An important institution, Construction Industry Development Board has been established under Malaysian Construction Industry Development Board Act 1994 (CIDB) whereby the Act establishes a Board to promote, stimulate, improve and expand the construction industry. Various tasks have been undertaken by this Board for instance, carrying out research, providing consultancy research, accrediting and registering the contractors (Natkunasingham I. et al, 1999). This Board is also responsible in regulating the conduct of the contractors by providing many seminars, trainings as well as developing Code of Ethics as guidance for the contractors.

Other important institutions are such as Malaysian Institute of Architects that controls, promotes and organizes in the matters of architecture, Board of Architects Malaysia which is a statutory authority responsible for the enforcement of the Architects Act 1967, Board of Engineers as well as the Board of Quantity Surveyor in Malaysia which operates similar functions. As the key players in the construction industry, these institutions play important role in promoting self-regulation by being given the tasks to develop schemes and incentives as well as various codes of ethics to increase construction performance.

2 Self-Regulation as a New Mode of Governance in Industries

The role of coercive and punitive methods found in regulatory mechanisms as the important enforcement system has attained a challenge by the wake of new enforcement strategies. Through regulatory method of governance, private individuals and businesses lose their freedom and autonomy to bureaucracy and laws. The development of globalization views the role that is being played by the market or private parties in rule making and its enforcement. This gradually shows the emergence of business entities at the place where it surpasses the legal and economic control by the government. Self-regulation is one of the evidence that proves this new trend.

The term of self-regulation is widely known to exist in various fields. Religion, philosophy, education, health, law, policy and corporate are among those fields that receive self-regulatory treatment thus, various definition can be found in accordance to each respective area. It literally means acting according to one's own volition and not as a response to an external constraint (Carver and Scheier, 2000). This meaning is also commonly used in psychology where self-regulation is an important area of human behavioral studies. On a more specific perspective, Ogus, (1999) interprets that the concept of self-regulation 'covers an infinite number of self-imposed behavioural standards, including those determined internally by the management of a firm'. It also can be determined as 'variety of attempts by corporations to establish rule-based constraints on behavior without direct coercive intervention of states or other external actors' (Graham and Woods, 2006). Meanwhile, Sorsa, (2010) establishes that self-regulation is a collaborative effort where it demands the collaboration between various industry partners at various levels as well as with other stakeholders. This is evident in the industry self-regulation

[168] Construction Industry Development Board Malaysia, (2007). *Guidelines for Implementing Environmental Management System in the Construction Industry 2007*. Available from http:// www. cidb. gov. My / cidbweb/bin/information/ HSE/EMSCI FEBRUARY 2007.pdf. [Assessed March 12, 2009].

where it ‘entails collective action by member firms to improve the reputation of the industry as a whole’ (Lenox, 2006). Thus, to limit self-regulation meaning into a single, standard definition is definitely might not be possible. As a result, the concept of self-regulation itself becomes complex and diversified. Furthermore, its compliance may be subjective and vary according to particular approach in the industries or areas.

The types of self-regulation can be found in various approaches. Van den Heuvel, 1994 as cited in Van der Heidjen, 2007 for example, defines the types as follows. Firstly, pure self regulation where initiatives are left totally with the parties by the government which become neutral if no law has been offended. Secondly, substitute self-regulation where the government has right to legislate if public interest is insufficiently served even though parties have their own initiatives. Thirdly, conditioned self-regulation where the government sets conditions to the results despite leaving the initiatives with the interested parties and lastly, covenants or contracts where the government is the participant in setting rules of conduct.

Meanwhile, Price and Verhulst, 2000 as cited in Van der Heidjen, 2007 categorise its types into firstly, mandated self-regulation where the government defines the framework and requires the industry to formulate and enforce the norms. Secondly, sanctioned self-regulation where collective groups formulates the regulation that later subject to the government approval. Thirdly, the coerced self-regulation where a collective group itself formulates and imposes regulation due to the reaction on threats of statutorily imposed regulations by the government. Finally, voluntary self-regulation where there is no active state involved.

From the above definitions, it is observed that most types of self-regulation require the intervention of government legislation regardless of how and at what stage it is required. It is argued here that even in voluntary self-regulation, the enforcement also depends on the principles of general law as its background.

The emergence of self-regulation as a mode to govern the industries is due to many reasons as can be seen today. It can be legal, political, social and economic reasons for the industries to self-regulate. Mainly, it is due to the perceived shortcomings in the enforcement of legislation, seen by the industrial community as a barrier to efficacy. The rapid growth of global economy creates many emerging complex modes of transactions, administrations and leaves huge venues for disputes in the markets. Many are skeptical to the sufficiency and ability of the legal infrastructures to cope with these market explosions where for an instance, they are perceived as ‘too-slow, cumbersome, and complicated (and hence too costly)…’ (Hadfield, 2010, as cited in Sorsa, 2010). The expansion of companies’ businesses globally especially in countries with a weaker regulatory systems also demands that the industries need to be governed with the private regulator’s hand rather than ‘old-fashioned’ legal infrastructure. In some developing countries, self-regulatory chances put up by the government in their unwillingness to regulate, might become incentives for the multinational corporations that are attracted to their weak regulatory systems to invest in these countries. (Haufler, 2001 as cited in Graham and Woods, 2006). Thus, it is submitted here that self-regulation emerges in these countries, politically motivated in the need of changes in their economy as a mechanism for the country’s growth.

Self-regulation also emerges as response from the industries to the pressure from the society members such as consumers, activists and NGO. (Graham and Woods, 2006). Strikes, boycotts

and campaigns adversarial to the companies which involve in particular unethical practices are commonplace. Hence, many standards, schemes, management systems or codes are being developed or complied with to avert criticisms by public.

Public regulations normally involve some lengthy process of formalities than private self-regulation. Thus, more time is involved, higher costs are required and more expenses as regard to the technicalities as well as expertise also need to be spent. In contrast, costs of formulation, preparation and enforcement within the self-regulation mechanisms are much lower since these activities are mostly centralized around the experts within the industries themselves. Williams, (2004) suggests that 'the emergence of self-regulatory regimes within selected industries is a rational response to external pressures in the marketplace and the broader societies in which firm operates'.

3 Self-Regulation and Code of Ethics for the Contractors

The construction industry has familiarly associated with the image of being "Dirty, Dangerous and Difficult". [169] Many problems have been associated with construction industry. For examples, according to the statistic released by the Ministry of Housing and Local Government, until 31 December 2009, the construction of 281 housing projects in the country were categorized as sick projects, involving 40,686 buyers meanwhile 148 projects were abandoned projects involving 31,824 buyers.[170]Meanwhile, a survey regarding how professional ethics including by the contractors impact on construction quality demonstrates that 'ethical standard in Malaysian construction industry is considered lower', while 'quality-related issues are found to have correlation with unethical conducts of the construction players'. (Abdul Rahman, et al 2010). It is thus pertinent to transform this perception in order to ensure the sustainability of construction industry and self-regulation is seen as significant in changing the way business is done. Obviously, it departs from the usual approach since through self-regulation, industry is more flexible in the enforcement frameworks within its own sphere.

Self-regulation can be enforced through various tools. Among them are the codes of conduct, reporting activities, environmental, social and sustainable management systems, certification schemes, CSR values, labelling schemes, transparency and disclosure guidelines as well as stakeholder engagement and dialogue and rating agencies. (Albareda, 2008). Reviews on the literature on the subject of code of ethics somewhat found out that in many occasions, the term of 'code of ethics' has been used interchangeably with or defined inclusively as 'code of conduct'. For example, Anon. (2003) refers corporate codes of behavior as 'corporate codes of ethics, corporate codes of conduct, or less frequently, as standards of a corporation'. Meanwhile, Langlois and Schlegelmilch, (1990) as cited in Mcdonald, (2009) describe that codes of ethics as 'a statement laying down corporate principles, ethics, rules of conduct, code of practice or company philosophy, concerning responsibilities to employees, shareholders, consumers, the environment and society' and they expand the discussion of 'code of ethics' to include ethical

[169] n 1 above.

[170] Ministry of Housing and Local Government, 2011. *Perangkaan Terpilih. Kementerian Perumahan dan Kerajaan Tempatan Sehingga 31 Disember 2009.* Available from http:/ /www. kpkt.gov.my/kpkt /fileupload /perangkaan_ terpili/ pt2009/Buku_Buletin_Perangkaan_Terpilih_KPKT_Sehingga_3112 09. pdf.

guidelines, ethical policy, codes of conduct and governance directions. Further, their study highlights the difference between corporate code of ethics and professional codes whereby the former affects within the particular organization and the latter works within members of a professional body.

To achieve second strategic thrust of Malaysian CIMP 2006-2015, namely through self-regulation in addressing construction problems, the Government is aware of the necessity to have a specific code of ethics for the contractors. Based on the resolution of the Forum on Integrity in the Construction Industry in September 2005, CIDB has been given the task to develop this code and the Code of Ethics for Contractors (The Code) became effective on 1 March 2008. It outlines six key principles regarding the contractor's ethical practices as below:

Principle 1 : Honesty in carrying out responsibilities.

Principle 2 : Compliance with the laws and regulations.

Principle 3 : Respect for individual and community

Principle 4 : Importance of quality, skills and standards.

Principle 5: Importance of safety and health.

Principle 6: Importance of environmental preservation.

The Code is accepted and adopted by all building contractors in Malaysia, whether local or foreign contractors, in accordance with the definitions in Act 520 (Construction Industry Development Board Act, 1994 whereby all contractors are obligated to abide by this Code of Ethics. (Clause 1.2 (i) and (ii), Code of Ethics For Contractors, 2009). The wordings in the Code itself are thus unclear as regard to its compliance and enforcement and it has to be studied further to look at these issues.

Stevens, (1994) illustrates that the intent behind an application of a corporate code of ethics can be determined based on the following issues such as the manner of how the codes are communicated to employees and the extent of how the code is enforced as well as the impact of violation. These can lead to the answer whether the intent is 'self-protection, an attempt at promoting ethical leadership or management of a public image'. In this study, review of several corporate codes of ethics studies has been made and it shows that most codes are having little information on the issue of how they are communicated in the companies. Meanwhile as regard to enforcement, it discloses that the degree of code's enforcement varies for these companies where some codes did not have enforcement and implications mechanism while the others do have them for examples, requirement to sign affidavit of compliance (Cressey and Moore, 1983 as cited in Stevens, 1994), termination on code's violation (Pitt and Groskaufmanis, 1990 as cited in Stevens, 1994) and even some minority are having discussion as to legal prosecution (Matthews, 1987 as cited in Stevens, 1994). Regarding this, Sandersen and Varner, (1984 as cited in Stevens, 1994) appeared to conclude that the codes of ethics in their study were not effective given the general and non-descriptive language in the code regarding enforcement.

This study can be explored in comparing the Malaysian code of ethics for the contractors where focus should be made to look on how the Code is applied and enforced against these construction companies. As mentioned above, all building contractors including foreign contractors under the definition in Act 520 are required to accept and adopt the Code under clause 1.2. However, it provides for the application in general as no wording such as 'shall' has been used. The Code also outlines all obligations by using the word 'must', Nevertheless, there is nothing in the Code that provides for the implication in the event any violation arises albeit clause 1.2 (ii) that provides for the obligation of all contractors to abide by the Code. It also appears that no method of application is provided in the adoption of the Code. Thus it is not clear whether the construction companies have to adopt the Code in their policy framework or not for the purpose of application. Likewise, the Code also does not provide for the administrative procedures for the handling of any violation. In the absence of such provisions, it can be deemed that the compliance of the Code on its wordings is very much voluntary in nature. Based on the language of the Code regarding enforcement and application, it can be assumed that the Code is a collection of mere guiding principles for the contractors to ensure their ethical behaviours that have no binding effect.

To inculcate the ethical principles among contractors, CIDB in practice has nevertheless taken steps for examples, mandatorily requiring the contractors to attend integrity courses in applying or renewing licenses. Even though, there is no specific monitoring Board has been set up under the Code presently, however at internal level, an informal enforcement team will be put up by CIDB that functions to provide advices for the contractors if any unethical case has been reported against them. Practically, the contractors will normally alert on this step since they have the reputation to be taken care of with CIDB as their regulatory body. (Ahmad Mahyadin, personal communication, June 21, 2011). In addition, the registration of contractors is also subject to specific conditions that also include ethical aspects where the registration can be cancelled, suspended or revoked if they involve in any fraud or misrepresentation in obtaining the certification or fail to execute any work unreasonably.[171] However, it is submitted that these ad-hoc based actions should be completed with a formal task-force enforcement mechanism.

4 Application of general law against the Code of Ethics

The above analysis shows that there is no mandatory requirement for the construction companies to implement the Code of Ethics as a self-regulatory mechanism for contractors. The question thus arises as to how does compliance to ethical practices could be safeguarded?

It is noted that self-regulation operates within the backdrop of the law. Therefore, it is necessary to examine construction contract as mechanism of ethics compliance in construction industry and some principles of general law to look at their applicability as background legal redress for non compliance of self-regulatory mechanisms. In fact, some ethical practices for the contractors have been found mandated but are scattered throughout various pieces of legal mechanism.

The rights and obligations of construction key players are guarded by the construction contract they entered into. To date, the main construction contracts applicable in Malaysia are Standard Forms such as Public Works Department 203A (PWD 203A) (Revised 2007) which is applicable

[171] CIDB Malaysia, Contractor Registration Certificate.

to government projects and Persatuan Arkitek Malaysia (PAM) Contract 2006 which is applicable to the private projects. As the main tool that controls the relationship between these players which includes contractors, it should also be an important mandating mechanism for ethics implementation pertaining to contractors. Therefore, some important express and implied terms of the Standard Forms should be analysed.

4.1 Express terms in Standard Forms of Construction Contracts

4.1.1 Performance of the Contract.

There are many obligations of the contractors that reflect the required ethical practices. Nevertheless, there are some important obligations that must be carried out for example, in the PWD 203A where bills of quantities form part of the contract, clause 9.2 (a) provides that the contractor undertakes that it shall comply with all requirements, statutory or otherwise, regulating or relating to the conduct, trade, business or profession of a contractor, and the contractor shall be fully and solely liable for all costs incurred thereby. This clause is thus arguably refers to all requirements including the Code of Ethics which is not statutory that regulating the conduct of contractors. Based on this clause, any breach of Code of Ethics should be treated as breach of this contract.

In clause 10.1(b) of PWD 203A, it is provided that the contractor shall perform the works in a proper manner and in accordance with good management practice and to the best advantage of the Government and clause (d) provides among others that the performance shall be done with the exercise of professional judgment and practice, requisite skill, care and diligence.

PAM 2006 Contract also provides that the employer may determine the employment of the contractor if the contractor fails to proceed with the works regularly and diligently under clause 25.1(c). These in fact imply that the contractor shall take the responsibility and use the skill, care and diligence to exercise construction activities that is more responsible towards the stakeholders. These clauses are thus reflecting the principle 4 outlined by the Code of Ethics where the contractors must uphold quality, skills and standard in their works.

4.1.2 Compliance with the Law

The contractor also shall comply with the relevant laws. This is provided in clause 21.1 of PWD 203A whereby it states that the contractor shall comply with any law, regulation or by-law, or any order or directive issued by any public authority or public service company relating to the works or in the case of public authority or public service company, with those systems the same are or will be connected. Government also should be indemnified against all penalties and liabilities if the contractor breaches any such statutory requirements.

Similar obligation can be found in clause for of PAM 2006 Contract whereby clause 4.1 provides that the contractor shall comply with and submit all notices required by any laws, regulations, by-laws, terms and conditions of any appropriate authority and service provider in respect of the execution of the works and all temporary works. Meanwhile, PAM 2006 Contracts clearly by clause 4.4, places liability against the contractor to pay and indemnify the employer in respect of any fees, levies and charges including any penalties which may arise from the contractor's non-compliance with any law, regulations, by-laws, terms and conditions.

These obligations are in line with second principle of the Code of Ethics, namely compliance with the laws and regulations. There are many legislations or rules involved in the procedures and process of construction projects. For example, the Environmental Quality Act 1974 imposes prohibition and restriction on main pollution activities into a specific environmental medium. Here, it implies the ethical practices as required in sixth principle of the Code, whereby all contractors must preserve the environment in carrying out their works.

Regarding the workmen, the contractor also shall comply with the Employment Act 1955, Employee's Provident Fund Act 1951 and the Industrial Relations Act 1967. For instance, clause 17.1 of PWD 203A provides for duty of the contractor to register local employees that includes permanent resident workers under the Employees's Social Security Scheme in accordance with the Employee's Social Security Act 1969. In the default to comply this, the government or the superintending officer may withhold an amount from any money which would otherwise be due to the contractor and which in the opinion of the superintending officer will satisfy any claim for compensation by workmen that would have been borne by the scheme had the default was not occurred. The Government may also pay for such contributions which are due and unpaid and deduct it from the amount due to the contractor by the Government.

PAM 2006 Contract provides similar obligation in clause 19. Since foreign workers are allowed to be engaged in private projects unlike the government projects, it further provides for the duty of the contractor to take out and maintain insurance policy for these workers. These reflects the fifth principle of the Code where among others, 'the contractors must pay attention to the welfare of their workers on humanitarian grounds in all circumstances throughout the period of their services as required by law'.[172]

4.2 Implied Terms in Construction Contracts

The implication of terms into contract is one of the important elements in contract law. In many occasions, courts are required to determine these by implying the terms into the contract necessary to give effect to the contract apart from its express terms. In *The Moorcook case (1899) 14 P.D. CA.,* Bowen LJ explained that the implication made was derived from the presumed intention of the parties, with the object of giving business efficacy to the transaction that should have been intended by the parties. The construction contract is similar to the other types of contract in its application of common law rules. Courts will imply terms in construction contract to make the contract works. This study submits that implied terms that applicable in construction contracts which underlie the notion of ethics are as follows:

4.2.1 Workmanship.

The contractor must use proper skill and care in carrying out his obligation under the contract, which means one of workmanlike standard. The workmanship exercised by the contractor is the ordinary skill and care that can be expected from a reasonably competent contractor. It has been suggested that this is a continuing duty during construction process, not only upon completion (Furst and Ramsey, 2001). Thus, as the ethical competent contractors, in performing the construction works, all measures should have been reasonably observed to ensure a socially safe built environment. Construction companies should ethically control and monitor many aspects in

[172] CIDB, Code of Ethics for Contractors.

their works, for example construction waste management, where they need to professionally scheduled the minimization and recycle of waste program that affect the soil, water and air largely, especially in major projects. Those in fact are the ethical practices within the scope of contractors' works.

4.2.2 Duty of Good Faith

The application of the duty of good faith, has received different treatment in commercial world. The courts in England hardly acknowledge this duty but on the other hand, other common law countries such as Australia and New Zealand are willing to accept this duty while US recognizes it in contracting. Even though no unanimous definition of good faith has been upheld, nonetheless, the concepts such as fairness, honesty and reasonableness have been associated with the proposition to acknowledge the duty. There are three notions which embrace the doctrine of good faith as suggested by Sir Anthony Mason. Firstly, an obligation on the parties to co-operate in achieving the contractual objects (loyalty to the promise itself), compliance with honest standards of conduct and compliance with standards of conduct which are reasonable having regard to the interests of parties. (Peden, 2003). It is viewed that this duty can be strongly held as the basis for ethical compliance. Construction companies and the employers should be responsible, reasonable and honest in their works. They should govern their relationship ethically to give effect to win-win situation including to the other stakeholders. Good ethical governance thus is reflected through the duty of good faith owed by them towards each other.

4.3 Law Relating to Criminal Offences

In self-regulatory method, nothing should be tolerated if any law has been offended, for example as regard to corporate crime. Corporate crime is defined as 'the offences committed by corporate officials for their corporation and the offences of the corporation itself' (Clinard and Quinney, 1973 as cited in Shuan, ca 2011). As an example, it is an ethical practice that the contractors should be honest as provided by the Code, thus they have to abide by the rules of proper tendering process. In the event of non-compliance, this may trigger fraudulent and unfair transaction and if the contractors involve in unscrupulous acts that are against these rules, the criminal law can be used for example by using the Penal Code.[173] If any issue of bribery is involved, then anti-corruption legislations could also be invoked.[174] This shows that the autonomy given to the self-regulation is always safeguarded by the laws, particularly if it involves serious breach or misconduct.

5 Conclusion

It is obvious that where the Code comprises a broader context of stakeholders where ethical practices should be upheld, the construction contract merely binds and covers the parties in the contract. Therefore, problem will arise where unethical practices are being complained against

[173] Under Malaysian Penal Code (Act 574) Cheating is provided under section 415 **:**Whoever by deceiving any person, whether or not such deception was the sole or main inducement,—*(a)* fraudulently or dishonestly induces the person so deceived to deliver any property to any person, or to consent that any person shall retain any property; or *(b)* intentionally induces the person so deceived to do or omit to do anything which he would not do or omit to do if he were not so deceived and which act or omission causes or is likely to cause damage or harm to any person in body, mind, reputation, or property, is said to "cheat".

[174] Anti Corruption Act 1997 (Act 575) provides for anti-corruption offences including bribery.

the contractors by parties outside the contract (Ahmad Mahyadin, personal communication, June 21, 2011).

Tay, (2009) views that implementation of code of ethics should be made compulsory for the companies where instead of being mere guidance, it should be made rules to follow. Meanwhile, Jenkins, (2001) views that to have real impact, it is significant that provisions should be made for the implementation of a particular code and effective monitoring. In addition, there is a suggestion by Judge Thornton that relevant parts of ethical code of Society of Construction Law, UK could be incorporated into among others, standard forms of contract (Uff, 2005). Comparatively, code of ethics for the contractors should be made compulsory for the construction companies to implement. It can also be part of our Standard Form of Contract. This can ensure that the Code does not serve as a mere window-dressing. It is also viewed that the Code can play the role as an important tool for self-regulation in construction industry, but needs to be mandated. Additionally, it is argued that even though no mandatory requirement has been provided regarding the Code, application of general law comes in hand to safeguard the compliance of ethical practices among contractors. However, to secure effective compliance, express provision mandating it should be in place.

The debates regarding the mandatory and voluntary nature of implementation of ethics in construction industry might never ends. The types of self-regulation as discussed above also illustrate that intervention of government regulation is required regardless of how and at what stage it is needed. Even for the voluntary self-regulation, the enforcement should also depend on the principles of general law as its background. The advantages of having mandatory ethical practices in fact are beyond doubt. By having these mandated, the construction companies will have ethical obligations to preserve and liabilities to answer. Even if Code of Ethics is practiced by construction companies, lackadaisical enforcement is expected due to its voluntary nature. Thus, it is possible to examine the situation in the construction contracts since the contracts govern the relationship between the construction players. It is submitted that clauses in construction contracts regarding the performance and compliance of law by the contractor as well as the implied terms of workmanship and good faith are the basis of ethics in the construction contracts, thus placing ethics on the mandatory nature in these contracts. However, this is insufficient as other stakeholders outside the contract will not be safeguarded against unethical practices of contractors. This study is limited in its scope to look at the impact of the Code of Ethics for the Malaysian contractors. In a nutshell, emphasis should be given to extend future researches on how this Code is adopted, communicated and complied within the construction companies since they involve complex issues that provide prolific grounds for discussions. It seems that in near future, this self-regulatory mechanism should not be treated as a mere catalyst in its functions anymore but rather the weaponry substance for the construction businesses to succeed in their ‘business battlefield’.

6 Acknowledgement

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8 Appendix

Problems arise in complaints of unethical practices against the contractors by parties outside the contract according to Mohd Nazli Ahmad Mahyadin (personal communication, June 21, 2011).

Steps taken by CIDB for unethical practices complained against the contractor despite no specific monitoring board according to Mohd Nazli Ahmad Mahyadin (personal communication, June 21, 2011).

En route to a knowledge based Building Regulation and Control that interlinks societal requirements, scientific knowledge, education and building practice

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Abstract:

The regulatory system in the Netherlands was one of the first performance based systems. Successful as it was, there are still many problems with its practical application. Research by the Dutch ERB indicates that most of these can be attributed to a poorly functioning knowledge system in which regulations should be embedded.

Building regulations can be considered as a manifestation of knowledge and political decisions that enable practitioners to design and build such that minimal key societal needs will be met. It enables also owners and users to demonstrate that in the existing stock minimal key requirements are fulfilled. They are part of a knowledge cycle that involves all actors in the construction value chain. The actual goal of regulations is essentially to protect the public (general) interests of the end user and/or final owner. The end user / owner, however not part of the system, is remarkably enough legally liable in the case of default.

With this understanding as a basis, it is possible to reconsider structure and content of the regulatory system. Instead of being a tool for disputes, it should be a purposeful tool for actors in the construction value chain. This paper presents an innovative approach to the regulatory system. It comprises three levels for plan evaluation or judging of existing works. Processes and responsibilities are reconsidered, as well as education and roles of actors. The envisioned new approach stipulates better and more economical buildings, avoidance of unnecessary summons, and substantial cost savings in control.

Keywords:

building regulations, enforcement, knowledge system

1 Introduction

The Dutch Building Decree has been under discussion for decades. Excellent building rules and regulations form an important, even an essential link between building practice and society, aiming primarily at the availability of safe, healthy, usable and sustainable buildings. How effective building rules and regulations are, depends largely on their practical applicability, costs and the extent in which they provide for building innovations.

With its Building Decree 1992 Dutch legislation took an important first step en route to renewal of the system. As opposed to the traditional building regulations, the Building Decree does not prescribe in detail how to build, but indicates, by means of performance requirements, which objectives a construction or construction unit will have to meet. This system leaves space for the application of fresh, innovative solutions.

Now, almost twenty years later, it is time to evaluate the concept. Although the Building Decree has emerged to be successful in many aspects, various problems have also been noted which appear to be structural in origin.

The Expertisecentrum Regelgeving Bouw (Expert centre Regulations in Building-ERB) published its first, overall analysis in 2008 (Scholten *et al*., 2008). One of its conclusions was that the end user – who, as the owner of a building, is legally accountable for it to meet the rules and regulations set – is represented too feebly in the building process, and often does not even play any role at all in the decision-making. Because of this, the end user could become the loser. As a result ERB assigned a group of experts and scientists to further investigate this issue and to come with a solution to this undesirable situation.

Other conclusions were that in the public and private sectors two separate courses of knowledge development took place, and that the building regulations in their present form insufficiently warrant that societal objectives are realised.

2 The present system

As a reaction to the abominably bad housing of city immigrants in the second half of the 19th century The Netherlands created the Housing Act in 1901. From then on the municipalities were responsible for the drawing up and enforcement of regulations in the form of local building codes. In the 20s and 30s of the 20th century, the Housing Act advanced the construction of good - and still attractive - dwellings.

After World War II building contractors began to operate more and more nationwide. They were confronted by masses of different and inconsistent local regulations. In order to be able to rationalise the building process, countrywide uniformity was required. In the first instance the answer were the Modelbouwverordening (the Model Building Bylaw), issued by the Vereniging Nederlandse Gemeenten (the Association of Dutch Municipalities). Because many municipalities stuck to their own building regulations, the call for countrywide uniform legislation became increasingly louder.

In 1982 the Lubbers-1 cabinet took the initiative that finally resulted in the 1992 Building Decree. The Housing Act determined that from then on municipalities, fire brigades and utility companies were no longer allowed to issue regulations supplementary to or deviating from the Building Decree.

This first Building Decree had a completely different structure of directives from what people were used to. In the old system, the building regulations described specific solutions to many regularly occurring construction problems; innovative solutions were not allowed. As the

Building Decree starts from the performance, required of complete buildings, constructors could from then on apply both standard and new, equivalent – or better - solutions.

Between 1992 and 1998 the government worked on the second round of the Building Decree which was never enforced. In the year 2003, the presentation form of the Building Decree was changed at the request of the market: the so-called table's legislation. However, the Dutch government simultaneously introduced a new modelling principle of works which did not link up with the experience of either the construction partners or citizens.

Since its publication in 1991, the Building Decree has been changed 29 times.

The Building Decree does not cover the whole spectrum of regulations relevant to building. For fire safe use the Decree on fire safe use of structures holds. For the demolition and the use of a building, municipalities still determine the contents of the regulations by local building bylaw. For specific buildings and safe and healthy work, specialised ministries published their own technical regulations.

Besides these, EU regulations for construction products were introduced, due to the free movement of goods.

In order to reduce the burden of too many regulations and organisational fragmentation the Dutch government recently decided to opt for four important measures:

(a) one 'environmental counter' for the dealing with 'environmental' related permits (the Wabo = General Physical Environmental Rights Act).

(b) bundle any knowledge at the enforcement level by combining the responsible local services at regional level; on the advice of the Mans Committee (Report Committee Mans, 2008).

(c) organise the fire departments regionally (Wet op de veiligheidsregio's = Act on Safety Regions).

(d) skip 25 per cent of the content of the Building Decree, 'deregulation', and combine: the Building Decree 2003, the Decree on fire safe use of structures, the demolition regulations and other works relates regulations of the building bylaws and the Besluit aanvullende regels veiligheid wegtunnels (BARVW) = supplementary rules and regulations on the safety of tunnels, in the Building Decree 2012; intended to become in force on January 1st, 2012.The Dekker Committee (2008) advised to research whether - a substantial part of - preventive public enforcement of the building regulations could be evaded in case the private sector would take responsibility for compliance (Report Committee Dekker, 2008)

3 A necessary review of the system

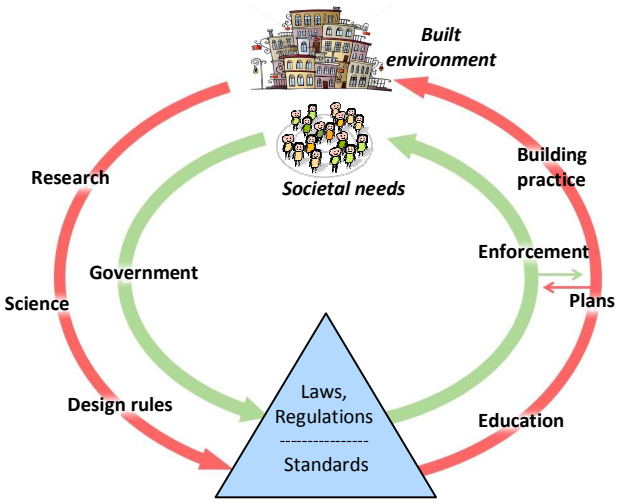
The four recent measures are administrative and organisational answers to problems that are rooted deeper. Both, the public legislation and privately developed system of Standards form part of a knowledge system we need in order to realise and manage safe, healthy and sustainable

buildings. That system must therefore function properly, which is not the case at present. Regulation becomes the more effective, the better it complies with this knowledge system. In other words: everybody involved in building and its management, must be able to properly understand, interpret and apply the regulations.

This knowledge should also lead to possible adaptations and the development of new regulations. Of course, these regulations should comply with the practice of design, construction and use. Lessons from practice should in turn lead to research and improved regulation. So, attention must be paid to the transfer of knowledge as well as to the restructuring of the regulations and the way in which regulation is affected.

3.1 The cycle of knowledge

The skill of designing and constructing good and reliable buildings is rooted in building science. This in its turn has largely developed empirically and is continually developed further. With a view to practical applications, scientific knowledge has been incorporated in design regulations, governmental rules and regulations and Standards. We may assume that buildings are sufficiently safe, healthy and sustainable when architects adhere to these regulations. Naturally, the same holds good for owners and users when managing and running their real estate. Should they not do so, we ought to change the regulations or stimulate people's adherence to the regulations. Occasionally, or in case of technological innovations, people should be able to deviate from the details in the regulations without necessarily endangering safety, health or sustainability. We have depicted the process outlined here as a circle of knowledge (see figure 1):



The *public* learning track (green): societal requirements are translated into rules and regulations through legislation, enforced according to public law by means of a licensing system, general terms and conditions, or sanctions recorded in the Housing Act, *Gemeentewet* (Municipalities Act) and the *Algemene wet Bestuursrecht* (provisions of administrative law);

The *private* learning track (red) runs from research and science, through technical specifications and known solutions which are transferred in training programs, leading to professional practice. Some of these specifications and agreements have been laid down in Standards and assessment guidelines.

Figure 1.Knowledge circle
(Source: Scholten *et al.*, 2010)

Building regulations combine the two tracks to become a crossroads. Knowledge of Standards and their background is also essential for enforcement, and knowledge of rules and regulations is

just as important for education and training programs. On the basis of the ideal model we are able to clearly illustrate the practice related hitches.

Figure 2 charts these hitches.

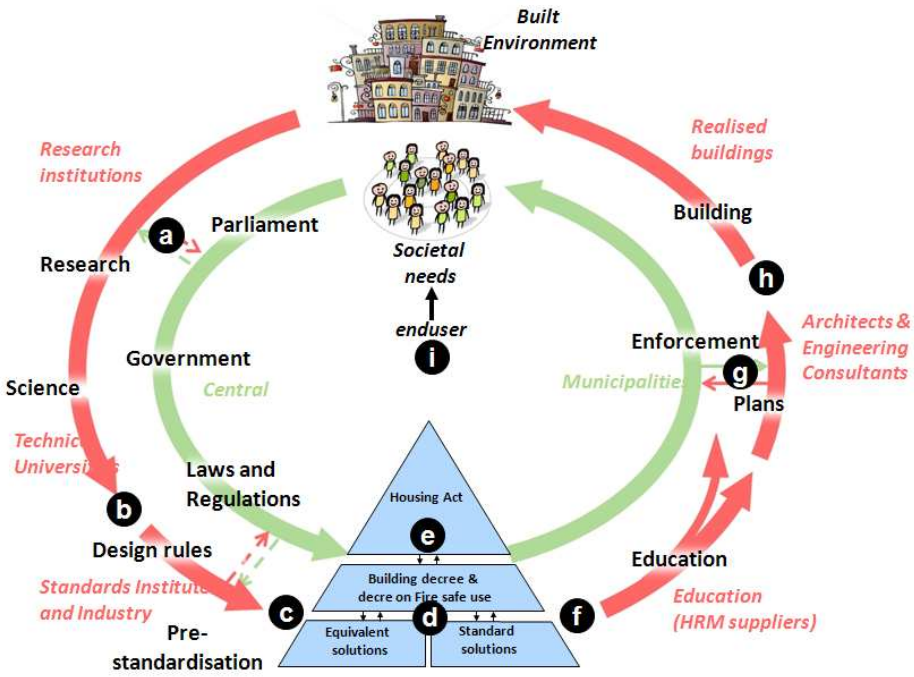


Figure 2. Hitches in the knowledge circle
(Source: Scholten et al, 2010)

The first general problem is that the various actors in the private-law circle of learning work totally independently from each other. Universities, research institutes, schools for professional training, commissioning clients, designers, engineering consultants, building contractors, fitters, suppliers and consumer representatives, they all adhere their own policies, focusing specifically on their direct self-interests, and without much mutual coherence.

The next problem is caused by both a highly fragmented sector and the fact that not a single party individually obtains a competitive advantage from investing in the development of communication systems and therefore does not do so, however these systems are necessary to structure and improve mutual understanding in such a fragmented sector. Centralised communication systems are no–one's priority, and no 'central market superintendent' exists who could organise this.

And then there are other factors. We refer to the characters in the black circles of figure 2.

In order to make public-law rules and regulations and private- law agreements match, the two learning tracks on the left-hand side should be linked up with each other. At present there is no interaction whatsoever.

Standardisation must be based on research. The performance requirements must be based on measurement, determination or calculation methods. At present, unfortunately, many terms and conditions, and Standards are insufficiently founded by science. Due to the lack of proper financing, universities have little interest in the methodology and modeling necessary to formulate rules and regulations. The large technological institutions such as TNO (Netherlands Organization for Applied Scientific Research) largely depend on occasional commissions from the government and industries. This is the reason why they miss the long-term stamina necessary for the development of scientifically sound rules and regulations or Standards.

The knowledge on which the development of regulations and Standards is based has been insufficiently recorded and managed in the present system. After the successful completion of a regulatory project, everybody should be able to easily find the relevant background information with a view to an unambiguous interpretation, and support of the equivalence of possible, fresh solutions. Now, this knowledge seems to ebb away to such an extent that even the responsible bodies themselves do not always understand their regulations.

Individual private-law regulations, such as Standards, have been drawn up based on different disciplinary backgrounds, for instance: by constructors, experts in fire safety, and those in building physics or materials specialists; so these regulations do not match nicely. One result is a differing and inconsistent use of language. As the Building Decree (2003) refers to such regulations, unavoidable inconsistencies develop in legislation. The legislator's language use is not that of the standardisation commissions, while neither speak the language of the man on the building site (shop floor). The performance approach requires a level of abstract thinking which is not used on the shop floor; specialists with secondary education only understand problems by means of practical solutions. Would regulation be consistent and in shop floor language, the correct application of regulations would improve greatly.

The scope of application of building regulations should probably be extended. According to the original Housing Act, building rules and regulations were meant for the safety and health of the users of a building. Later, as an effect of these, regulations were added with a view to its usability and energy efficiency, later followed by accessibility and sustainability. Up to now, economic and cultural aspects and the prevention of criminality have been included only to a small degree. However, the regulations which have to promote the well-being of construction and aid-workers, such as firemen, have been laid down in the Arbowet (Law on Conditions at the Workplace); one can only find them implicitly in building regulations. Although the construction industry is one of the most dangerous, unhealthy and energy-consuming economic sectors. Presently, the building regulations pay very little attention to maintenance, renovation, and demolition. Surely, a building application or process should not only meet the building regulations, but also satisfy the Warenwet, (the Commodities Act: elevators and appliances), the Wet milieubeheer (Environmental Management Act), the Kernenergiewet (Nuclear Power Act: ionisation alarm), Politiewet (Police Act), Archiefwet (Records Act) and the Law on Conditions at the Workplace. With such complexity it is not surprising that people experience regulations related stress.

Rules and regulations only form a minor part of the curricula in secondary and tertiary professional education and universities. This creates an important lacuna in knowledge both within industries and law enforcement organizations of the government. It seems as if people no

longer see how closely the administrative and building laws as well as technical regulations are connected.

Preventive assessment governed by public law is done only on the design stage of a building. So, one cannot even be sure that buildings realized actually comply with the relevant regulations.

In today's building processes the end user, often the owner (to be) of a building, hardly plays a role. As the end users often are parties differing from the commissioners of buildings, their individual interests will generally be insufficiently represented according to private-law in the design and construction stages, so they will have to be able to rely on the public rules and regulations to sufficiently protect their interests. Many commissioners completely ignore all kinds of aspects that, for a society, are desirable and beneficial in the long run – think of the accessibility of buildings for persons with functional limitations, or the adaptability to various purposes of a building. If these requirements have been carefully dealt with in their design and construction, the layout of buildings will need to be converted less often, they will have a lower risk of vacancy, and early demolition due to their being unfit for purpose, will be their fate less often. The only way in which to realise this societal interest is for the government to list minimum regulations and enforce them.

4 A suggestion for improvement

Starting point is the enforcement of regulations whose societal usefulness have been proven. To diminish the burden of overregulation we can classify building plans on three different levels of argumentation per assessment aspect.

A first level is meant for easy assessment of 'standard solutions'. We assume that possibly 80% of the building plans or existing buildings are or consist mainly of 'standard solutions'.

The middle level more or less resembles the present Building Decree 2003 that focuses on performance.

The third level we propose, concerns building works in which unconventional and innovative solutions are to be implemented, using a probabilistic approach.

Should an applicant and the law enforcement organisation differ in opinion on whether a proposal meets the level of the standard solutions or the level of the ordinary assessment according to the performance requirements of the Building Decree, the third level would then provide the possibility of assessment according to the societal objectives regarding safety, health, usefulness, energy efficiency and sustainability. In that way discussions as regards technical content need not end in legal disputes.

For many people the introduction of these two new levels will substantially diminish the overregulation burden. At the levels of building and standard solutions assessment of the existing stock, one could then implement the greatly simplified regulations instead of those of the Building Decree 2003. While, at the third level, one can judge innovations according to societal objectives which present regulation does not provide for.

It is in no-one's interest to enforce regulations that are understood insufficiently. The supplements suggested greatly increase the practical usefulness of the regulations and they enhance the legislator's actual objective - the enforcement of safety, health, usefulness, energy efficiency and sustainability. That is why regulation is linked with objectives. The guarding of different, but coherent, assessment levels can thus be solved methodically.

We propose also to improve the process of securing regulation related knowledge. Assessment of building plans by local authorities contributes far too little to this end. Together with all those involved in the building process - from science, knowledge institutes, education, architects and engineering consultants, to and including the actual builders and the real estate sector - we must try and form a secure chain of knowledge with properly linked up sub processes. Only with a properly functioning knowledge system can we rely on the building sector to realise of its own accord the societal objectives which we may expect from it.

Procedural innovations are required. We need to attune the three assessment levels. The accepted standard solutions will be assessed according to the performance requirements as laid down in the second category and the question whether the performance requirements themselves meet the objectives set, is answered by means of the risks approach which we will apply in the third category.

The elements which the three levels have in common, we have to establish at a generic level: objectives, risks models, user models, functional models and performance requirements.

The general structure of rules and regulations as presented below, in figure 3, has been depicted in the form of a grey triangle. This part of the structure ensures that the system remains consistent, also when societal objectives change and renewals are introduced. The parts relevant to applicants and assessors are in blue.

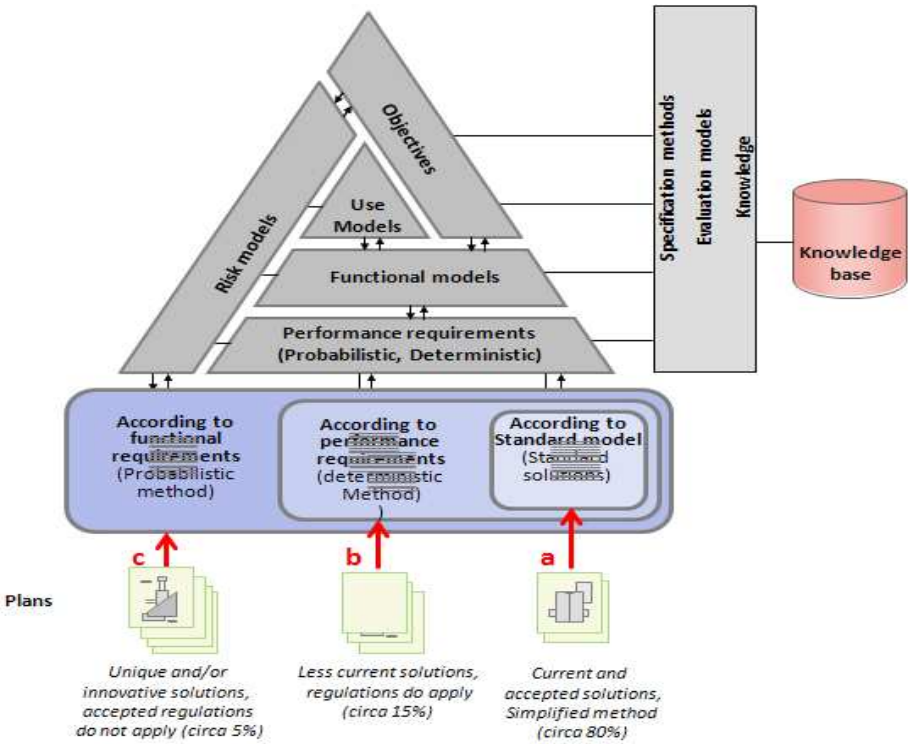


Figure 3. Vision on a durable anchoring of development of building regulations (Source: Scholten *et al*, 2010)

Table 1. Explanation of captions used in figure 3
(Source: Scholten et al., 2010)

Objectives. Regulations must follow from a single coherent system of societal objectives. It is best to record these in a separate part of the regulatory system.
Risks models. Absolute guaranties for safety, health and sustainability cannot be given. Objectives always deal with *possibilities* and *risks*. They deal with the possibility of collapse, the risk of permanent physical injury or death, and the possibility of environmental damage. The present regulations often provide strict limit values for these possibilities and risks. Does exceeding these limit values immediately lead to unsafe and unhealthy situations or limited sustainability? Depending on varying circumstances or the use expected, a building may still, in an acceptable measure, meet the objectives laid down.
That is why we will again have to standardize the whole system of regulations, standards and limit values according to the objectives by means of risks models and theory of probability. These models must become an integral part of the regulatory system. This too would greatly simplify regulation.
User models. We can only translate objectives into specifications for buildings if we also know how these are going to be used and who their end users will be. Models are necessary because of the variation of use in practice. That is why there is a need for realistic rules and regulations *user models*. By projecting these user models onto the model of a building, in terms of floors, working spaces and partitioning elements, we can then list functional and performance requirements.
Functional and performance requirements. Functional requirements describe the requirements of a building in a functional sense. The performance requirements we set for a building and its parts depend on their function and use.
Modifiability. Naturally, the rules and regulations system reacts to ever changing societal opinions. In the past decade, for instance terrorism, climate change and sustainability took top positions in agendas. Undoubtedly, new requirements and objectives will be added in the coming decades which cannot be foreseen for the moment. One should be able to change the rules and regulations as easily as possible, with minimum economic effects for users and real estate managers, while retaining previously acquired rights.
Knowledge. Many rules are clear-cut. But it is not always clear why certain rules exist or why others *don't*, or why specific terms are used. Often, the persons involved have stored this background knowledge in their minds, but it is not at all or hardly available to third parties. That is why this knowledge has to be publicly recorded so everybody will be able to properly interpret and apply them.

Methodical aspects also deserve attention. One can formulate regulations in such a way that computers can interpret them. This can then be linked up with the latest generation of computer assisted methods and systems already used by the industry. Methodology renewal is also essential to keep the increasingly complex law-making system manageable.

The government wishes to withdraw from markets that might just as well be left to trade and industry, as underlined in the report of the Dekker Committee 'Privaat wat kan, publiek wat moet' (private whenever possible, public whenever required).

Differing from most of the other industrial sectors, the knowledge process in the building sector is highly dispersed, as has been shown earlier and depicted in figure 2. Most of the parties only take responsibility for their own part in the process; nobody feels any overall responsibility.

The system of regulations and Standards forms an essential link in the knowledge process, so we should continue to invest in it for further development and maintenance. However, that does not happen sufficiently.

In figure 4 we have indicated several points of improvement in the knowledge cycle. The question now arises: should the government leave all this to the market?

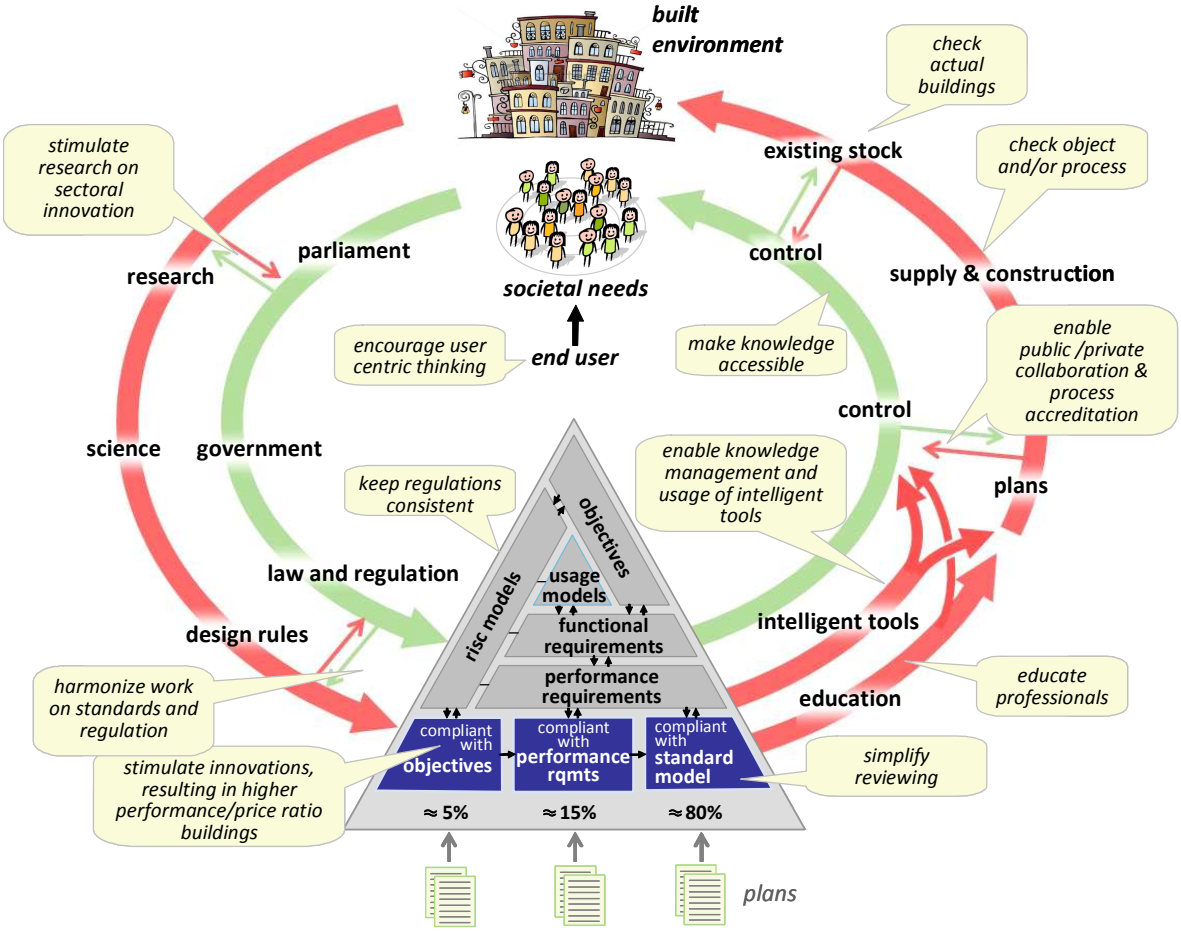


Figure 4.Vision on future development of building regulations in closed and linked public and private law chains of knowledge

(Source: Scholten *et al*, 2010)

Another option is: a combined public/private system.

The present public system of assessment against building regulations is directed at the granting of an Omgevingsvergunning (environmental permit). Moreover, the insurance industry could develop a generally acknowledged private assessment system, covering everything, including conveyance. In this scenario insurers should only be willing to insure risks after a commissioning client has first performed such an assessment. This reduces risks for the insurer and increases guarantees on quality delivered for consumers. For simple construction works, built according to the solutions method, such a guarantee is not required; in which case the client can choose for building with or without a guarantee. The private system proposed is also suitable for matters concerning labour conditions. Should contractors construct buildings with such a guarantee, the authorities could then reduce their administrative charges, or they could even decide to drop the public law assessment altogether. In any case, this solution would require less public law

inspection on the spot. In the same way an insured guaranty at the sale of a building can prevent claims of insufficient performance.

In an organisational sense, acknowledgement should be organised for independent technical-legal arbitration, so that for applicants which have a conflict with authorities on technical points, the dispute can quickly be settled on technical-legal arguments. The formal road of objection and appeal according to the Algemene Wet Bestuursrecht (General Administrative Law) is much too cumbersome for this.

Furthermore, the knowledge should become easily accessible and actively promoted through training, publication, the internet and knowledge systems – and transferred to - professionals in - the building chain as well as the law enforcement organisations.

Moreover, emphasis could shift from design to process assessment, and possibly to process certification. That is to cover the complete process from design to the building process, including quality management and guarantee after conveyance. This quality related thinking (ISO 9001) has been accepted in many sections of industry, but what would this mean for the organisationally strongly fragmented building sector? The ultimate test in quality related thinking is customer satisfaction, but as already stated, the actual customer, the end user, generally, takes not part in the Dutch building process. Besides, designers, contractors, suppliers, and authorities have shared responsibilities: nobody feels accountable for the whole process. Although integrated contracts are becoming increasingly popular -owing to the need of integral accountability -they still only constitute a tiny part in the present market.

Furthermore, we now see the development of computer-interpretable provisions and regulations and knowledge based rules as well as methods of numerical analysis; thus everybody can automatically assess a design according to BIM, building information models, before applying for a permit (Gielingh *et al.*, 2010). Naturally, the applicant and law enforcing organisation ultimately remain accountable for the integrated design. Only when builders and applicants do have the overall knowledge, buildings will be realised that not only actually meet the regulations on paper but also in practice.

Moreover, with a coherent approach also methodical improvements can be implemented and monitored leading to consistency that, by means of reference, forms part of the same chain of knowledge.

5 Economic and societal relevance

Structural regulation fulfils a key role in the translation of essential societal needs regarding the built environment. As we are all regular users of that built environment, whether it be living, working, recreating or travelling, that regulation is of essential societal significance.

However, everything has its price. When we look specifically at the development, learning, applying, enforcing and implementation of the rules and regulations – which we have symbolically represented with the two knowledge circles in figures 2 and 4 – then this refers to a process which involves thousands of specialists on a daily basis. There are no exact figures on the commitment of people and costs.

Also, the construction, management and maintenance of real estate involve substantial amounts of money. Some expenses directly contribute to the quality of the built environment; other expenses are needed solely to apply regulations, so at the best they contribute indirectly to the safety, health and sustainability of buildings. The latter expenses are probably partly unnecessary and too high.

Moreover, costs arise when a design or existing works does not meet the regulations set, because the applicant simply knows them insufficiently and/or due to limitations in the enforcement system. At present, enforcement takes place mainly by means of random checks based on paper building plans. Enforcement should take place much more on the basis of buildings actually constructed, specifically with a view to the real risks for which these regulations have been written.

According to some estimates tens of millions of euro could be saved with our proposals for renewal of the system as a whole. When the knowledge circle is ignored there is a risk of needless costs for society. The unnecessary costs to renew the existing building stock in case of Building Decree 2012, developed with the only goals to diminish the volume of regulations to get less administrative burden, are estimated ad € 5 mld and the administrative burden will still be the same. On the other hand a lot of interpretative discussions are expected and technical insufficiencies are not solved. The reason for more than 170 questions of the Parliament to the Government.

How much the improvements we propose will actually yield, cannot be estimated accurately, but with a conservative estimate we set it at 10-20% of the direct costs; with an estimated annual regulatory effort of € 1.2 – 1.6 billion and a building production of about € 60 billion, this would lead to an annual cost reduction of € 120-240 million for local authorities and trade and industry (Scholten *et al.*, 2010). We have here excluded the societal and economic advantages for the building sector, management and use of real estate, but these advantages will as estimated also be very high, expressed in money: hundreds of millions of Euros per year.

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Energy saving goals require reform of building regulations and control

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Abstract:

The energy saving potential of the building stock is large and considered to be the most cost efficient sector to contribute to the CO2 reduction ambitions. As long as the price of renewable energy is still not competitive with fossil energy, the energy saving goals can only be reached supported by severe governmental policies. In Europe the Energy Performance of Buildings Directive is a driving force for member states to develop and strengthen energy performance regulations for new buildings and energy certificates for the building stock. The goals are to build net zero energy buildings in 2020 and to reach a neutral energy situation in the whole stock by 2050. Research delivers signals that, although technically feasible, actual results of the policies and regulations are not as expected. Theoretical energy use calculated on base of the design standard for newly built houses and assessment standards for energy certificates of existing dwellings differ largely from the measured actual energy use. The potential of the existing building stock is even higher, but harder to harvest. The paper will present findings of several research projects providing evidence of malfunctioning of current approaches. Based on this, the paper will present some ideas of innovations in the regulatory and control systems and suggestions for research to support alternative solutions.

Keywords:

energy saving, energy performance, building regulations, building control

1 Introduction

The European building sector is responsible for about 40% of the total primary energy consumption. To reduce this share, the European Commission (EC) has introduced the Energy Performance of Buildings Directive, the EPBD (2010/31/EC). This framework requires member states to develop energy performance requirements for new buildings and a system of energy performance certificates for all buildings. It also requires member states to develop policies that require to built only ‘low energy or Passive Houses’ by 2020. More and more countries, but also regions or municipalities, formulate ambitions for net zero energy or carbon neutral houses also on the shorter term.

Most savings can be realised in the existing stock. National and local governments have formulated ambitions, stimulation and subsidy programmes to stimulate large scale renovations.

Formulating ambitions and sharpening regulations is relatively easy to do. Technical solutions are currently available to realize the passive house standard in building projects. There is quite some evidence however that the mainstream of building processes do not lead to the pre-defined quality. Traditionally the municipal departments of building control in most countries had an important role in assuring that building plans and construction processes would lead to buildings that meet the minimum required quality levels. There is a tendency to put more emphasis on the responsibilities of owners and private parties to ensure quality. This means that the private parties will have to improve their working process and will have to learn to handle performance guarantees. Owners will require guarantees from the designers and building companies for the quality of their property. Certification and accreditation of parties, processes and products will become more important for building processes in general.

For the realization of high energy performance standards, a reliable quality assurance system will be very important. In most countries that have some experiences with passive houses some form of performance guarantee and associated quality assurance scheme exists. It is important to study these examples.

In this paper some developments in building regulations and building practice will be described to highlight the role of building regulation and building control in the context of the increasing energy saving target for new as well as for existing dwellings. We start in section 2 with an elaboration on the trends in regulations and building control. In section 3 the results of a study on the relation between the levels of energy performance regulations and the actual energy use in newly built houses are presented. In section 4 we show the example of certification of passive houses as a valuable contribution. In section 5 the situation of the development of policies for the existing dwellings is described. Section 6 presents some conclusions. Finally section 7 introduces the goals and working programme of the CIB-TG79 task group ‘Building Regulations and Control in the face of Climate Change’, which addresses all these issues.

2 Developments in systems of building regulations and building control

Building regulations are the subject of an ongoing debate between, on the one hand, those in favour of deregulation and reducing the administrative burden and, on the other hand, new quality demands that require government intervention. Energy and climate change concerns belong to the core of policy developments of the European Union and lead to directives that demand member states to develop regulations and enforcements schemes that ensure very energy efficient new buildings and instruments that stimulate the improvement of the existing stock. So, although the general development in European countries leads to less government intervention in the building sector, in the field of energy efficiency the number of regulations increases and become more stringent.

Currently in the Netherlands, both sides of this debate appear to be gaining in importance. The desire for deregulation is leading to the opinion that greater emphasis should be placed on the responsibility of property owners, which could lead to less government intervention. However, the existing forms of quality control for private actors in the Dutch building industry seem to be

of quite a low standard. Accidents occur and physical quality does not appear to be sufficiently important. As the CO_2 and energy targets increase, stronger regulations and accurate building control become a priority. In the past ten years, it has become increasingly clear that the quantity and quality of assessments carried out by many municipal authorities leave something to be desired (VROM Inspectorate, 2007).

In this context we should remember that the client and the parties who engage for the design and construction stages have primary responsibility for complying with regulations. When a building permit is granted, this suggests that the plan has been shown to comply with all the regulations. But this is not the case. In practice, a permit is granted because, during the checking process, the plan was not found to deviate from the regulations.

We will now return to the continuing call by politicians for greater deregulation and easing of the administrative burden. In 1997 we contributed to the building-regulations project as part of the MDW (Market Forces, Deregulation & Legislative Quality) programme of the Ministry of Economic Affairs. The purpose of our research was to formulate deregulation proposals on the basis of examples from other European countries (Visscher, 1997). Notably, in those countries, many private-sector parties are involved in assessment and inspection. We have studied (Visscher, 2000) how the responsibility for these tasks could be transferred to the private sector in the Netherlands too, primarily through the certification instrument. The Ministry of Housing, Spatial Planning and the Environment (VROM) also took up this idea. Since the end of the 1990s, it has been developing a process certificate for assessing building plans against the requirements of the Building Decree.

In current government is aiming to drastically reduce the administrative burden. Again, the field of building regulation is seen to have a great deal of potential in this regard. A few years ago, the government appointed the Construction Sector Fundamental Review Committee (Commissie Fundamentele Verkenning Bouw) chaired by Sybilla Dekker, a former Minister, to draw up proposals for the far-reaching simplification of building regulations. The committee recommended the abolition of preventive assessment of building plans by local authorities. The client should be responsible for complying with the regulations and should also ensure that sufficient checks are in place. It can engage a certified body to do this, but there may be alternatives. The role of the municipal authorities will shift towards that of process auditing, i.e. supervising the checks. The question is then: how this can be put into practice?

In many countries there are problems with a lack of compliance with building regulations, and this often serves as a stimulus for reviewing and improving the system of building control. The considerable pressure to deregulate in the Netherlands has parallels in other countries. There is a clear trend towards increasing the role of private parties. In many countries, the role of local authorities in carrying out assessments and implementation inspections has virtually disappeared.

Therefore it is interesting to study innovative ways in which quality is guaranteed by private parties. The certification of passive houses is a field that requires building actors to transform the usual building process into a performance based approach and to learn by doing. In section 4 we illustrate quality assurance processes for passive houses that exist in some countries. First in the next section the need for more quality assurance will be illustrated.

3 The realisation of required energy performances in building processes

In 1995 energy performance regulations were introduced in the national building regulations. It consists of a calculation method laid down in a national standard EPN (energy performance norm) and a limit value, the EPC (energy performance co-efficient). Since the introduction the EPC was sharpened several times. It started at 1.5 in 1995 and since the 1st of January 2011 it is now on the level of 0.6. The EPC is a non dimensional digit. All building characteristics and building services that affect the energy demand for space and hot water heating, ventilation and lighting are incorporated in the calculation of the energy index (EI), which is the basis for the EPC.

After more than 15 years of Energy performance regulations in the Netherlands, only few representative statistical studies were conducted to assess the effect of the regulation on the actual energy use. The samples were of limited size. In two of these samples, no statistical correlation was found between the EPC-level and actual energy use per dwelling or per square meter. In the analysis of the WoON survey, carried out on behalf of the Ministry for Housing, Planning and the Environment in 2006 and which is representative for the Dutch housing stock, no correlation was found between the different levels of the EI and the actual energy use per dwelling and per square meter.

We found that building characteristics (including heating and ventilation equipment) were responsible for 19 to 23% of the variation in energy used in the recent building stock. Household characteristics and occupant behaviour seem to be responsible for 3 to 15% of the total variance. Neither our study nor the studies found in the literature allow to state that building characteristics, household characteristics and occupant behaviour altogether are responsible for more than 38% of the variation on energy consumption of dwellings built after 1995. Therefore at least 62% of the variation in energy use is unexplained yet.

There are indications from literature that the explanation for this remaining part could be related to buildings being realized differently than written in official documents and to HVAC services running under very different conditions than assumed on paper. A report by Nieman (2007) showed that in a sample of 154 dwellings, 25% did not meet the EPC requirements: the EPC was incorrectly calculated; nevertheless the building permit was issued. In 50% of the dwellings, the realization was not in accordance with the data used to calculate the EPC. Gommans (2007) monitored for 17 years the energy performances of energy efficient buildings. 40% of solar boilers appeared to function poorly. Only 25% of the heat pumps reached the expected efficiency. This was essentially due to realization faults, lack of control and lack of continuous monitoring. Another study by Elkhuizen e.a. (2006) in office buildings showed that up to 28% energy could be saved by better monitoring.

Taking into account the fact that tightening the EPC did not lead to less energy use for heating and that 62% of the variation in energy use is still unexplained, it seems legitimate to be careful about a further tightening of the EPC and to search if there are more efficient means to really decrease the energy consumption of newly built dwellings. This could be done by ensuring a correct realization and monitoring of the calculated performances, putting attention on the knowledge needed by contractors and on an effective building control process.

4 Certification of passive houses

According to the EPBD recast before 2020 all newly built buildings will be at the level of nearly zero energy buildings. In section 3 we have seen that in the Dutch practice current required levels of energy use are not met and it is not likely that the European targets will be realised by only putting the regulations at a higher level. In this respect it is useful to look to examples of quality assurance of passive houses that exist in some countries.

Quality assurance of passive houses, and associated technologies, has its origin in the verification and prediction of a restricted energy demand. Passive house project certification is not focused on issues like stability, safety, or more general environmental performance. Guaranteeing an energy performance is a relative new issue in building processes, requiring a shift in general thinking from means contracting to performance contracting. The urgency of the energy issue requires a swift implementation of (energy) performance contracting in the construction sector. In this paper passive house certification is regarded as an innovation in building processes to provide better building quality in general. Related to the introduction of passive house certification schemes the issue was raised how such initiatives can also upgrade knowledge in the construction sector.

Different European countries show a different embedding phase and related market penetration of passive houses and quality assurance of passive houses. Some countries like the UK, Ireland and the Netherlands are still starting up initiatives, while others like Germany, Austria, Switzerland, Belgium, France, and so on, provide a framework for grants and/or tax reductions and associated quality control procedures. In Western Europe the passive house standard is still a voluntary standard, while regions in Central Europe are already developing initiatives to include the passive house standard as a legal instrument and/or obligation for new constructions. Existing voluntary certification initiatives are different in different countries. Some harmonization between the different national initiatives might be interesting. Especially countries with no certification can already duplicate the most successful initiatives. Early adaptor countries have developed financial aid for passive houses, as well as a performance oriented quality approach for the design and construction process of passive houses. Control of quality of the design process, the construction process and the post construction inspection and testing of passive houses is considered as an essential feature, before stimulating the dissemination of information considering best practice demonstration projects.

Since the implementation of the European Directive 2002/91/EC and since the introduction of project related energy performance requirements and e.g. the passive house concept, problems about guaranteeing (energy) performances and information flow among building partners and quality control have become more significant. The EPBD and the passive house certification are being used to improve product and process modelling in commissioning for existing and new buildings as they are accompanied by a process of certification. EPBD calculation procedures are in many countries still not adapted to specific passive house technologies. This means that in many countries for passive house projects both PHPP and EPBD calculations have to be performed. The cost of an extra certification next to the legal energy performance certificate is considered to be a bottleneck.

As part of the process of demonstrating compliance with required energy performance, assessment of the energy performance of design of new dwellings is becoming mandatory in many countries and regions. For most buildings with a building permit, requirements are set for the energy performance as a consequence of the implementation of the EPBD, but also aspects of indoor climate and ecological criteria are sometimes introduced at the same time. It is generally perceived that a good energy requirement does not necessarily bring thermal comfort and good indoor air. Especially summer comfort can be a critical issue to be included in passive house certification as well as the proper working of balanced ventilation systems. In many cases the existing structures for energy performance evaluation, developed in the framework of the EPBD, are not sufficient to guarantee the quality and definition of the passive house.

PHPP software is mostly used as a basis for certification of passive houses. Its main advantage compared to other design and evaluation tools is that is has been specifically created as a design and certification tool for passive houses and that it regularly takes up new research results in its calculation procedures. Certification of passive houses usually also includes an air tightness test. In some cases, also the functioning of technical systems and its effect on indoor climate is directly, or indirectly through evaluation by PHPP, considered. Some countries express the need to include, besides the PHPP calculations, comfort criteria (e.g. Belgium) or health criteria (e.g. UK, Austria). A differentiation in standard including low energy definitions, like in the Klimahaus CasaClima programme, can contribute to success of widespread certification.

In most advanced countries educational programmes for specific target groups were introduced, accompanying the introduction of certification systems. Experiences in Germany, Austria, Switzerland, Belgium and Italy illustrate that quality assurance of passive houses is necessarily related to the provision of passive house education initiatives. New fields like non-residential buildings and renovations require for the further development of more specific quality assurance procedures. It is not clear if the strict passive house definition can or should be maintained, especially since it is sometimes difficult to achieve for small houses or renovations. Also, PHPP calculation procedures in themselves are often not sufficient to evaluate the design of, for example, technical systems in office and school buildings.

5 Policies and instruments for energy reduction in existing dwellings

The largest energy saving potential is in the existing building stock. National and local governments have formulated ambitions, programmes policies and instruments to stimulate the improvement of the energy performance of the existing stock. The most important policy tool required by the EPBD in the European member states, is the issuing of Energy Performance Certificates. In most countries it is current practice to produce an energy label for a building at the moment it is sold or re-rented. In the Netherlands the labels are also mandatory for all dwellings of social housing associations. The label indicates the energy demand for heating and cooling. It is a communicative instrument and there are no obligations to improve buildings as a consequence of a low label, but the labels are used as a basis for recommendations of improvement. Subsidy schemes are more and more related or combined with the labels. And there are some signs that a better label affects the price of houses.

The label data bases already cover a reasonable share of the housing stock in the Netherlands. They form a basis to monitor the progress of the renovation practices. Besides this it is also

useful to study the effect of improving energy labels on the reduction of the actual energy use. Later in 2011 accurate figures and insight can be produced by the OTB Research Institute of the Build Environment of Delft University of Technology. As for now already some expectations can be formulated.

The progress of renovations and energy upgrading measures stays far behind expectations and formulated ambitions in 2008 when most of the policies, covenants and improvement programmes were set up. The social sector in the Netherlands is still relatively large (35%), well organised and relatively ridge. A few years ago the sector formulated ambitious programmes, but these are nowadays scaled down because of several reasons. The economic crises reduced the financial position of the housing associations. The housing market also dramatically slowed down which also affected the funding for renovations because this largely depends on the sales of property. Also it proved to be difficult to get improvement of tenant for renovations that require an increase of the rents (70% of the tenants have to agree). It is hard to assure the saving of energy costs resulting of the improvement of the dwellings. The actual energy use is largely influenced by the use and behaviour of the tenants. The aforementioned study of OTB will provide good insight in this relation, but there are already some preliminary figures that demonstrate the difficulty in 'forcing' reduced energy use by improvements of dwellings. The dwellings with the worst energy label (G) in practise use far less energy as expected, while the most advanced dwellings (A) use much more. This can be explained by a combination of the rebound effect and an increase in comfort level of the dwellings.

In the home owner sector the issuing of energy labels stays yet far behind. Although they were mandatory, until now there has not been an enforcement system. From 2012 on a label will be required for each property transaction and this will be checked by the notary in the Netherlands. Energy labels will become common practice and affect the sales price. Still there are no obligations foreseen to make improvements and higher labels mandatory. It is hard to require investments and property rights are probably an obstruction. Still there are some ideas for taxation measures. Bad labels could be punished with higher transaction taxes or higher property taxes than good labels. Such measures were suggested by the Platform for Energy Transition in the Build Environment. It is not likely that these measures will be adopted by the government on a short term however. But if the saving potential of the existing stock is taken seriously it seems that firm policies and regulations will be needed.

6 Conclusions

The necessity to drastically reduce fossil fuels seems without any doubts these days. The built environment offers a large potential of savings. Severe insulation and product innovations can reduce the energy demand for heating and cooling for a large part. The remaining energy demand can be delivered by renewables like sunlight and heat, district heating, heat pumps etc. The remaining electricity demand for appliance's can in the first place be reduced by further product innovation and then be provided by photo voltaic panels. Solutions are there. There are no reasons not to apply this in new buildings at a large scale on the short term. However, a successful transition requires a lot from the designers, engineers, installers and builders. They will have to use new techniques and improve the quality and accuracy of the work. Solutions have to be found that are robust. Solutions that are vulnerable for the application in practice

and/or for the unpredictable use of the occupants should be avoided. Evaluations of the current practice show that there is still a large world to win. The building regulations should set demanding targets, but what is surely needed is a better quality control in the whole process. This control should be carried out by the building practitioners themselves. They are the experts! But this will only start working if it is demanded and supported by regulations for certification of people and processes.

Although the potential is higher, the existing stock will be harder to tackle. Experiences show that it is hard to increase the numbers of severe renovations. And even more that the savings in renovated dwellings stay behind expectations because of rebound effects. There are many barriers: renovations are expensive, occupants mostly do not want the trouble and sometimes aesthetics make a change of the facade unwanted or impossible. On the other hand a large share of the current existing stock will have a very long life span, just because the replacement grade by new dwellings will simply be too low to provide enough new dwellings. In this perspective, there will always be a large need for renovations to expand the life span and this provides possibilities to improve the energetic quality. The fear however is that this 'normal' process goes to slowly. Maybe there is still a need for further smart product innovations to develop solutions that have a high contribution to the reduction of energy demand, are cheap, easy to apply and do not cause trouble to the occupants. The fast decrease of the price of PV cells is promising. The markets needs to be stimulated by regulations. It is especially hard to persuade homeowners to invest in energy saving measures. Besides that more insight has to be developed in the effect of behaviour on the actual energy use. Possibly the pricing of energy could contribute to more consciousness use.

7 CIB Taskgroup 79

Since a few years the attention for building regulatory systems and enforcement procedures is growing. Various developments in society, politics and the construction industry have influenced changes in the systems of building control in the last 20 years. The influence of climate change and the related demands on buildings will have a very strong impact of further transformations in this field. Therefore CIB has established Task group 79, Building Regulations and Control in the Face Climate Change. It will be useful to compare developments of the systems of building control in countries worldwide. How do the various countries deal with the demand of deregulation and privatization of enforcement tasks? What are the effectiveness and efficiency of the systems? Could green promotion incentives be incorporated to improve the systems? How do the public regulations and enforcement systems contribute to the basic quality of buildings? Are the current systems suitable to ensure that buildings will have a very low energy demand and are comfortable, healthy and safe at the same time? What are the ideas to improve or change the systems? And what will be the impact on these systems from climate adaptation measures in the longer run?

The task group will make an original contribution to the CIB Sustainable Construction priority theme. The majority of research on sustainable construction addresses the development of innovative techniques. However, there is now awareness that it is equally important that mechanisms are developed which can effectively implement the new techniques on a large scale. These will include building regulations which incorporate appropriate incentives for the

promotion of the green agenda and which therefore stimulate the use of new techniques. Equally, systems of building control will also be required which are capable of monitoring the effective and accurate design and construction of the buildings. These and similar issues will be addressed by the proposed task group.

7.1 Working programme

The core interest of TG79 is: new alternative visions on the role, the system, the formulation, the content, the organization of building regulations and building control because of the changing circumstances of climate change.

The changing circumstance leads to research to address:

The balance between command and control regulations versus incentives;

The balance between the role of public and private parties in carrying out the tasks of control;

The new role of control and supervision: form a strong focus on control of the design to more monitoring of the building process and testing of the quality of the final building and post occupancy monitoring.

The role of regulations for existing buildings and adaptive re-use of buildings.

Alternative approaches to reduce the gap between level of energy regulations and level of actual energy use?

Contributions of members of the task group can be various and will report about recent research findings from different countries worldwide that lead to new insight in these matters.

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Urban Villages in China

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Abstract:

There are two main types of land ownership in China – state owned land, and land owned by village communes. During the rapid urbanization of China in the past 30 years, state owned lands were sold and developed into high densities apartments. These apartments were built literally surrounding existing rural villages. Village lands were, however, not allowed to be developed because of its rural history. But when the villagers saw the profits of development, they simply build new apartments illegally at rates and densities even higher than those on state owned lands. By now, the political problems of these illegal developments are too large to be handled by local city governments. Hence, as we now see, there are high density apartments built by villagers right inside city centres. Very often these apartments are poorer in qualities. This paper traces the history of this development, and tries to induce property right implications on excessive land exploitation, in the absence of effective building regulation and control.

Keywords:

building regulation and control, property rights, state owned land, urban villages, village communes.

1 Historical background

In mainland China, there was basically a feudal land system before the Chinese Revolution in 1911. After 1911, a system of private land ownership was still, by and large, enforced by the Chinese Nationalist Party. The Communist Land Reform started in 1946. Basically in this reform, land and other properties of landlords were expropriated and redistributed. And after the Peoples' Communes and the Great Leap Forward in the 1950s, collective agricultural land ownership was established. Starting in 1978, these collective lands were assigned to individual families under Household Responsibility Contracts.

By now, there are basically three types of land ownership in China: (a) land for family village-houses (宅基地); (b) Collectives' land (集体所有土地); and (c) state owned land (国有土地). Except for a small portion of land on which family village-houses were built, lands in China were basically non-privately owned.

In December 1987, land use rights were first auctioned in Shenzhen. State-ownership rights on land were then separated from use rights; thus allowing private ownership of land use rights for a given number of years, to be bought and sold.

After 1989, the rights to develop land were decentralized - down to the local "xian" level governments. Xians in China should not be confused with counties in the west. Xians are much smaller: there are altogether 2,860 xians in China. Each is, on average, 3,000 square kilometers in area; and 0.45 million in population.

The tax sharing reform in 1994 allowed the Chinese central government a much larger share of the total national tax revenues than that of xians. But on land sales revenues, the xians share much more. In order to make up the loss, local governments started selling much more land.

The actual shares are as follow. Xians can sell land development rights to prospective developers and industrialists; and share 75% of the land sales proceeds; and the remaining 25% goes to Beijing and higher level governments. On the other hand, xians share 25% of the valued-added taxes, which are levied at 17% on any production on the land sold upon development. Xians rely on these incomes to build infra-structures and other facilities to attract even more investors. See Cheung (2009). Under this xian system, land sales income, plus subsequent value-added taxes, are the keys to government finance; and hence there is a financial dependence on land sales.

Cheung (2009) argued that the introduction of the xian economic system was the most influential economic institution contributing to China's economic success over the past twenty years. It took just 30 years for the urbanization rate to grow, from less than 20% in the early eighties, to 46% in 2009. Urban population in China is now 0.622 billion. See United Nations Statistics (2007). Together with the corresponding growth in income, house prices had increased tremendously, while cities had sprawled into rural areas.

Given this background of rapid urbanisation, the demand for housing in the cities is so large that villagers are more than willing to give up farming entirely, and start thinking of development on their farmlands. Local xian governments were able to acquire many of these farmlands and legally covert them into state-owned land on which land use rights were sold for the purpose of development. Seeing the huge profits themselves, many villagers simply refuse acquisition offers, and start planning high rises for themselves.

2 Urban villages

Urban village is a special phenomenon in the mainland of China. In the amended version of Constitution in 1988 (The National People's Congress, 1988), a clear statement was made saying that, "Land use can be transferred according to the law", but apparently rural collective lands were excluded as exceptional. Originated from the rural collective land system, urban villages can then be distinguished from other non-village urban regions for their incomplete nature of property rights. Compare to state-owned urban lands, the incomplete property rights in urban villages are also called the "small" property rights, for buildings on rural lands together with the land parcels themselves are not allowed to be transferred.

Previous studies on urban villages are mostly in Chinese. There are two categories, one is focusing on the urban villages as a small society and tries to discuss it using a sociological perspective, the other is focusing on economic analysis, especially on benefits/costs analysis. The former includes the new society issue by Lan (2003), and the self-help housing issue for temporary migrants by Chan, Yao, and Zhao (2003). The latter includes the institutional change analysis by Li and Meng (2004), the public interest analysis by Wang and Ren (2009), the urban village renewal analysis by Liang and Cai (2009), the property rights analysis by Jiang and Wang (2002), and a general economic analysis by Zhou (2007). The only paper with a topic close this study is by Gu and Zou (2002). In their study, they calculated the total rent receivable for urban villages in Guangzhou and their nearby non-villages estate. The comparison shows that urban villages are less efficient for the reason of rent dissipation. However, a fatal defect of their study is that the comparison was between total rents, instead of per floor rents. Since urban villages are much lower in terms of height, such comparison is simply imprecise. Nevertheless, even using their data, the comparison of per floor rents still supports the argument.

3 High densities in urban villages

The urban village case provides a rare example demonstrating both a production change and a possible contract change induced by incomplete rights. The land use pattern in urban villages is completely different from nearby non-village estates in terms of the higher densities, measured by the site coverage (SC), and the lower rents. The higher densities indicate a possible overdevelopment problem and the lower rents indicate possible rent dissipations. Table.1 shows the site coverage values and the estimated per square foot rent per month for six urban villages in Shenzhen in comparison with nearby non-village residential estates (TR--Total Rent).

Non-village estates are normally under site coverage controls, for example, <=0.25 for multiple floor residential buildings in Shenzhen (Shenzhen Land and Planning Council, 1997, 2004, and 2007). It is normally believed that such regulations, if set right, can confer property rights and reduce transaction costs. However, if set inappropriately, certain rent losses can be induced. In Shenzhen's case, planning regulations are set as unified metrics, regardless of location difference, which implies that a possible underrate problem, especially for locations in urban centres. However, the total rent collectable psf of land for most urban villages is still lower than non-village estates, showing that, except for a few central locations, more severe rental losses can be expected for urban villages. The planning regulations are thus playing a controversial role similar to a double-edged sword. Once, as a first element, rights are delineated, voluntary exchange can resolve externalities, if and only if there is no or minimum transaction cost. Furthermore, rules and laws specifying detailed metrics based on theoretical deduction or empirical analyses or both can be set as secondary tools to reduce disputes and smooth transactions. Hence, planning regulations can be so classed as facilitators, but only if such metrics--site coverage or plot ratio--can be set properly across each location. Without the initial rights setup, it seems no way to specify any detailed rules and accordingly, marked case 1, there must be unavoidable excessive land exploitation and value losses, as we have seen in urban villages. However, if the metrics are set inappropriately for all or some locations even with well set initial rights, they may still put unnecessary restrictions on profitable development and thus value losses, which can be even worse than case 1, as we have observed in a few central locations, marked case 2. If the metrics can be set properly for each location with initial rights

well set (case 3), then as we have observed, non-village estates can bring more rental income not only in terms of total collectable rent, but also in terms of rent per floor unit of land, thereby surely more superb than the other two cases.

Similar patterns can also be found in Guangzhou and Xi'an, which represent the other two main cities with large amount of urban villages. Table. 2 shows the situation for five urban villages in Guangzhou and Table. 3 shows the situation for Xi'an.

The density pattern can be clearly identified using satellite images (free online). Map.1 is an example showing the difference between Gangsha in Shenzhen and its nearby non-village estates.

4 The cost of assembly

Land owned by village collectives can be viewed as a common property which, in theory, is subject to common exploitation and therefore rent dissipation. See Gordon (1954) and Cheung (1974). It is, however, not conclusive that the profits per square foot of the site area in urban villages are higher or lower. That will depend on a number of other factors including: the height of the buildings constructed, and the cost of construction. In Tables 1, 2, and 3, comparable examples of similar building heights and qualities are chosen to simplify the analysis.

Comparing to nearby housing developments, it is, however, clearly observed that (a) the densities of urban villages (SC) are much higher; and (b) the rent collected per square foot built floor area are much lower. However, comparing the two columns labelled as Total Rent (TR psf) in each Table, there is rental dissipation but not distinctive. The differentials in rent depends more on the densities allowable by law.

An alternative view is to include the cost of assembly as a substantial entrance fee to develop the land legally. A typical village may consist of hundreds of families. Getting them all to agree to a scheme of acquisition offered by the local government is an enormous task. More often, the price offered to acquire a piece of farmland is often far too low compared to the potential profits to development the site.

According to the Alchian-Allen Theorem (see Umbeck 1980), imposing a substantial entrance fee to the consumption of a good would result in either the consumer (a) not paying the entrance fee at all; or (b) paying the entrance fee but consumes a much better quality product. In cases of the urban villages, apparently the costs of assembly are too high compared to the foreseeable profits of selling the site to the local government or to developers. Given a high cost of assembly, it would also be very costly for one villager to negotiate with all his neighbouring villagers to agree that everybody would build less, thus enabling a better environment. An agreement of this kind is hardly enforceable. Hence, despite of the risk for being prosecuted, villagers may build up to the highest possible density, leaving minimum common spaces in between, and thus resulting in much lower rentals. This situation could be dealt with using game theories, but for the time being, the high cost of enforcing a low density agreement is sufficient for our purpose.

A testable implication of this view, of assembly cost, is that individual blocks within the urban village development were owned and sub-divided by village families even before construction.

The urban village constructed as a whole can be viewed merely as a means to enjoy economies of scale by hiring one a single contractor. Such subdivisions are largely consistent with the facts of ownership, although the legality of such ownership is questionable.

5 Figures and Tables

Table.1 Comparison between six urban villages and nearby estates in Shenzhen

Urban Village	SC	Rent psf	T R psf	Compare to	SC	Rent psf	T R psf
Gangsha	0.50	2.3225	1.17	Shenda Garden	0.23	4.2734	0.98
Baishizhou	0.55	2.3225	1.27	World Garden	0.40	3.9947	1.60
Shazui	0.53	2.0438	1.09	Haojing Haoyuan	0.31	3.5302	1.11
Xinzhou	0.49	2.0438	0.99	Xinzhou Garden	0.30	3.6231	1.09
Baole New Estate	0.47	1.1148	0.52	Panlong Estate	0.33	2.8799	0.95
Songzai Garden	0.54	0.5574	0.30	Richuyinxiang	0.27	2.3225	0.63

Table.2 Comparison between five urban villages and nearby estates in Guangzhou

Urban Village	SC	Rent psf	T R psf	Compare to	SC	Rent psf	T R psf
Tianhe	0.61	2.4154	1.48	Shanghe Estate	0.35	5.574	1.97
Shipai	0.57	1.858	1.06	Dongyuan	0.33	3.9018	1.30
Pingan	0.60	1.1148	0.67	Pingan Street	0.34	3.0657	1.04
Luo	0.52	1.1148	0.58	Longzhu Garden	0.32	2.9728	0.94
Datang	0.55	0.929	0.52	Jude	0.23	2.4154	0.55

Table.3 Comparison between five urban villages and nearby estates in Xi’an

Urban Village	SC	Rent psf	T R psf	Compare to	SC	Rent psf	T R psf
Changlepo	0.61	0.4645	0.28	Rongde Garden	0.20	2.0438	0.41
Dengjiapo	0.69	NA	NA	Yangguang	0.33	1.858	0.62
Tangjia	0.66	NA	NA	Xijing Residence	0.29	1.7651	0.51
Zaoyuan	0.75	0.58063	0.43	Zaoyuan Estate	0.27	1.5793	0.43
Jiangjiawan	0.70	NA	NA	Huaqing Garden	0.27	1.1148	0.30

Map.1 The satellite image showing the differences indensities between Gangsha (red) and its nearby estate Shenda Garden (green)

6 Conclusions

In this paper, we had introduced the background for urban villages in China. We also observed that these villages are often built in higher densities, but rented out for much lesser incomes. Further studies are needed to determine the level of rent dissipation under common ownerships. We also find that assembly cost and the risk of being prosecuted are key factors in determining whether villagers would develop the land illegally for rental incomes. Detailed data on rental and project data are necessary for the verifications of alternate hypotheses explaining the high development densities in urban villages.

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Building regulations and control in the face of climate change: Overview of the Portuguese situation

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Abstract:

This paper presents an analysis of the main initiatives implemented in Portugal aimed at improving the environmental performance of buildings. The study is focused on the building regulatory system. However, to describe its framework a wider context is analysed for the following reasons: a) strategies and plans on environment and energy establish main goals and actions to minimize the production of greenhouse gases and to prepare for the challenges of climate change; b) building regulations and their control system set and enforce mandatory minimum requirements for the building stock; c) voluntary certification and labelling set requirements above regulatory minimums and prove their enforcement; d) incentive programs and tax benefits give financial support to change the characteristics of the building stock; e) training and technical information increase the capacity of professionals, and finally, f) sensitization campaigns raise public awareness among consumers and contribute to changes in their behaviour. The results are that there is a coordinated set of initiatives to improve environmental performance of buildings. The initiatives to improve environmental performance of buildings are intended to: change the characteristics of the existing building stock, improve the performance level set for new buildings, and encourage more responsible environmental behaviours. Energy is the resource on which more initiatives were focused. Some initiatives set mandatory command and control regulations but most of them are incentives for voluntary improvements. Despite the numerous initiatives to improve environmental performance of buildings, their actual implementation and effectiveness must be assessed.

Keywords:

building regulations, Portugal, climate change

1 Introduction

Climate change has been recognized as one of the greatest environmental, social and economic threats that the planet and humanity face today. The answer to this problem represents a double challenge: to adopt measures that minimize causes of the problem derived from human activities (mitigate climate change) and to prepare society to deal with the biophysical and social-economic impacts of climate change (adapt to climate change).

It is well-known that buildings are of great importance in the consumption of environmental resources and in the production of greenhouse gases (GHG). Therefore in compliance with international commitments, several legal initiatives to improve environmental performance of buildings were adopted in Portugal, in recent years. The construction sector has also developed initiatives complementary to official ones. As a result, the set of regulations, certification systems, tax exemptions, incentive programs, training courses, technical information, knowledge dissemination and awareness campaigns aimed at contributing to improve the environmental performance of buildings is particularly complex.

This paper presents an analysis of the main initiatives implemented in Portugal to improve the environmental performance of buildings construction and operation. In this context the research questions addressed are as follows:

1) What are the guidelines set by national and local strategies and plans?
2) What are the environmental provisions set in the regulatory framework?
3) What are the voluntary certification systems oriented to construction products and buildings?
4) What are the incentive programs and tax benefits?
5) What were the recent training programs and awareness initiatives?

Answering these questions provides an overview of the modifications carried out in the Portuguese building regulations and control due to the challenges of climate change. The results may be useful for decision takers, stakeholders, technicians and the general public.

The following section explains the research methodology. The results are presented in sections 3 to 7, which deal with plans and strategies, regulatory and control instruments, voluntary certification and labelling, incentive programs, tax benefits and, finally, support and information. Section 8 describes and discusses the conclusions.

2 Research methodology

Key documents with provisions relating to environmental performance of buildings were collected. Summaries presented for each topic were based on the analysis of information collected. Final conclusions bring together and discuss the partial results.

The study addressed the building regulatory system, though a wider context was analysed in order to describe its framework. The following types of documents were considered relevant to the study due to the reasons mentioned hereafter:

1) Strategies and plans on environment and energy set guidelines for the production and review of the regulatory framework.
2) Building regulations set minimum quality requirements and the building control system guarantees the enforcement of these requirements.
3) Voluntary evaluation and certification systems of the environmental performance of buildings are intended to guarantee levels above the minimums set by building regulations.
4) Incentive programs and tax benefits support the implementation of some provisions set by technical building regulations.
5) Training courses provide competencies to technicians who apply the building regulations and awareness campaigns raise society's consciousness to environmental problems and thus foster willingness to comply with building regulations.

Environmental resources analysed were energy, water, materials and waste. These resources were selected due to the impact that, in Portugal, construction and use of buildings has on their production and consumption, as described below:

1) Buildings account for 30% of total primary energy consumption and for 62% of power consumption. Therefore, the reduction in energy consumption and use of energy from renewable sources in the building sector are measures to reduce both the energy dependency of Portugal from foreign sources and the emission of GHG (Isolani, 2008).
2) The urban sector accounts for 9% of total water consumption (industry for 5% and agriculture for the remaining 86%), but represents 46% of the associated cost. In the urban sector, domestic consumption accounts for 45%, commercial consumption for 9% and public consumption for 6%. The remaining 40% are losses due to inefficiency of the system. As water is a limited, structural and strategic natural resource, to reduce consumption through efficient use and the minimization of waste, particularly in the urban sector, are measures with environmental and economic gains for the country (INAG, 2010).
3) It is estimated that the construction sector is responsible for more than 50% of waste generated. The flow of waste from construction and demolition has special features which hamper its management, in particular, the heterogeneous constitution with fractions of different sizes and different levels of dangerousness. In addition, construction activity presents itself some specifics, such as, it is geographically dispersed and the works have a temporary nature, which make it difficult to control and monitor the environmental performance of industry (PCS, 2011).

3 Plans and strategies

Portuguese national policies on environment and energy are closely articulated and both are integrated in the national strategy for sustainable development. These policies are formalized in a set of national strategies and plans for various areas. The main changes in the buildings regulatory system introduced to improve the environmental performance of buildings arise from guidelines and actions set in these strategies and plans. Therefore, in this section, we present a summary of the main strategies and plans that enclose guidelines and actions for buildings.

The "National Strategy for Adaptation to Climate Change"[175] sets guidelines to prepare Portugal for the challenges of climate change. At the level of urban planning, the protection of buildings against extreme climatic conditions is identified as a priority. The measures set out in the "National Programme for Climate Change"[176] for buildings focus on improving energy efficiency as a way to reduce GHG emissions.

The "National Strategy for Energy 2020"[177] aims to reduce dependence on foreign energy as well as to cut GHG emissions . The priorities set for buildings are to improve their energy efficiency and to increase the decentralized energy production from renewable sources. Urban regeneration is seen as an opportunity to improve the energy efficiency of the existing building stock. The "National Action Plan for Energy Efficiency"[178] sets actions to enforce the priorities set by the national strategy, including actions to increase energy efficiency and production from renewable sources in buildings. To promote the implementation of these actions, the action plan establishes the creation of incentive programs, tax benefits and awareness campaigns.

The "National Water Plan"[179] sets guidelines for integrated water management. Although specific guidelines for buildings are not included, some general actions aimed at raising public awareness about the environment and water and to promote users participation are set. The "National Programme for the Efficient Use of Water"[180] includes 50 actions applicable to the urban sector, but the 12 actions selected to be implemented in a first phase do not directly apply to buildings.

The "General System for Waste Management"[181] provides the framework for waste management and aims to ensure an adequate prevention, recycling and recovery. Specific plans are being enforced for managing specific types of waste, but no plan applies specifically to buildings. However, the "Solid Waste Strategic Plan"[182] sets actions for public awareness, for support of research and for certification of recycled products. The "National allocation plan of emissions"[183] limits GHG emissions from facilities producing some types of building materials used in buildings.

In September 2009, 118 municipalities and 21 parishes in Portugal had a Local Agenda 21 (GEA, 2011). The local agendas are an action strategy for sustainable development. Though resulting from the community participation, in general the local agendas apply at a local level most of the guidelines set out by national strategies for environment and energy. In this sense, the actions set out in local agendas, which apply to buildings, regard mainly energy.

In May 2011, 59 Portuguese municipalities had joined the "Covenant of Mayors" and 6 of these had submitted a sustainable energy "Action Plan" (CMO, 2011). The action plan outlines how a municipality intends to reach its CO_2 reduction target by 2020. Most actions are aimed at

175 Resolution of the Council of Ministers no. 24/2010. OJ (PT) no. 64, 1 April 2010.
176 Resolution of the Council of Ministers no. 1/2008. OJ (PT) no. 3, 4 January 2008.
177 Resolution of the Council of Ministers no. 29/2010. OJ (PT) no. 73, 15 April 2010.
178 Resolution of the Council of Ministers no. 80/2008. OJ (PT) 97, 20 May 2008.
179 Decree-Law no. 112/2002. OJ (PT) no. 90, 17 April 2002.
180 Ministerial Order no. 2339/2007. OJ (PT) no. 32, 14 February 2007.
181 Decree-Law no. 178/2006. OJ (PT) no. 171, 5 September 2006.
182 Ordinance no. 187/2007. OJ (PT) no. 30, 12 February 2007.
183 Resolution of the Council of Ministers no. 1/2008. OJ (PT) no. 3, 4 January 2008.

increasing energy efficiency and use of renewable energy sources. The actions that apply to buildings can be grouped into: renovating buildings, tax incentives, awareness campaigns, counselling services, awards and certification of performance (Cascais Energia, 2010; CMA & AGENEAL, 2010; Vieira et al., 2010). The action plans of Lisbon and Porto, the two major cities, were based on local energy matrixes and also include actions relating to water, materials and waste (Lisboa E-nova, 2008; AdEPorto, 2009).

4 Building regulations and control

In every European Union (EU) country there is a building regulatory system encompassing the building regulations and the building control system. Building regulations set minimum quality requirements to ensure that buildings are safe, healthy, energy-efficient and accessible to everyone who lives and works in and around them. Building control aims to guarantee the application and enforcement of these minimum requirements. In this section, we present a summary of the main building regulations with provisions on the environmental performance of buildings and an analysis of the relevant building control systems.

4.1 General building Code

In Portugal, there is no single Building Act that serves as a legal basis for building regulations and procedures, and defines duties and responsibilities of parties involved in construction. The "General Building Regulation" is the main national building regulation, but there are more than 45 national building regulations and other regulatory documents that focus on specific requirements. There are also local building regulations that complement national ones.

The "General Building Code"[184] has been in force since 1951 and, despite several amendments, no fundamental revision has been approved. This regulation sets out general provisions for building, regarding construction, health, safety and aesthetics. No demands concerning energy saving or environmental protection are included. The 2006 proposal to review the "General Building Code" included general requirements on energy saving and environmental protection. However, the proposal was not implemented.

4.2 Energy

The "Regulation of the Thermal Behaviour Characteristics in Buildings"[185] sets provisions so that: a) requirements of thermal comfort and ventilation, as well as hot water needs, can be met without excessive consumption of energy, and b) pathological situations in building components caused by either surface or internal condensation are minimized. This regulation applies to design of new residential buildings and office buildings without centralized climate control system systems. It also applies to major alterations of existing buildings (i.e., alterations that amount to more than a quarter of the value of an identical model building).

The "Regulation of Energy Systems and Air Conditioning of Buildings"[186] sets rules for designing office and residential buildings with centralized climate control systems, which, in

184 Decree-Law no. 38382. OJ (PT) no. 166, 7 August 1951.
185 Decree-Law no. 80/2006. OJ (PT) no. 67, 4 March 2006.
186 Decree-Law no. 79/2006. OJ (PT) no. 67, 4 March 2006.

addition to requirements related to the built envelope and the limitation of energy consumption, also covers the efficiency and maintenance of those systems.

A special management system has been set for facilities that have an intensive consumption of energy. Its aim is to promote energy efficiency and monitor energy consumption.[187]

4.3 Water

The "Regime of Design, Installation and Operation of Public and Building Systems of Water Distribution and Sewerage"[188] sets general principles to be met by these systems and aims to ensure their proper overall functioning, preserving the safety, public health and users convenience. The "General Regulation of Public and Building Systems of Water Distribution and Sewerage"[189], sets the technical standards to be met by the design, construction and operation of these systems, and their standards of hygiene and safety.

None of these regulations include provisions to promote the efficient use of water. On the contrary, the regulation prohibits the existence of distribution networks in dwellings of non-drinking water, which inhibits the use of rainwater and the reuse of domestic wastewater (Pedroso, 2009).

4.4 Types of materials and waste

Portuguese legislation on waste is highly complex and is frequently updated. The main legislation in force and applicable to buildings is the following:

1) The "Regime of Construction and Demolition Waste Management"[190] sets rules for the management of waste resulting from construction or demolition of buildings, including its prevention and reuse, as well as the collecting, transporting, storing, sorting, treatment, valorisation, recovery and disposal operations.
2) There are "Limitations on Marketing and Use of Dangerous Substances and Preparations"[191] that safeguard human health and the environment. Several materials used in buildings are covered by these limitations.
3) There are procedures for "Removal of Asbestos in Public Buildings and Facilities"[192] and rules for "Protection of workers from the risks of exposure to asbestos during work"[193].
4) There are rules for the disposal of used PCBs in order to ensure their complete destruction.[194] PCBs are present in some building materials (e.g. plastic inks, hydraulic fluids and climate control systems, adhesives and wood treatment products).
5) The "Trading System for Greenhouse Gas Emissions within the European Union"[195] limits GHG emissions of each facility for the 2008-2012 period. Some industrial

187 Decree-Law no. 71/2008. OJ (PT) no. 74, 15 April 2008.
188 Decree-Law no. 207/94. OJ (PT) no. 181, 6 August 1994.
189 Decree-Law no. 23/95. OJ (PT) no. 194, 23 August 1995. With amendments.
190 Decree-Law no. 46/2008. OJ (PT) no. 51, 12 March 2008.
191 Decree-Law no. 264/98. OJ (PT) no. 28, 9 February 2011.
192 Law no. 2/2011. OJ (PT) no. 190, 19 August 1998. With amendments.
193 Decree-Law no. 266/2007. OJ (PT) no. 141, 26 July 2007.
194 Decree-Law no. 277/99. OJ (PT) no. 170, 23 July 1999.
195 Decree-Law no. 233/2004. OJ (PT) no. 291, 14 December 2004. With amendments.

facilities that produce building materials are listed. These facilities belong to the following sectors: ferrous metals; cement; lime; glass; bricks, roof-tiles & accessories; and wall & floor tiles.

Complementary, to inform consumers, there are mandatory rules for the labelling of products that have an impact on energy consumption.[196] The labels and technical specifications provide information on the consumption of energy and other essential resources.

4.5 Bylaws

Local authorities can approve building regulations and set fees on construction works. These regulations contain additional provisions to national ones and deal with subjects of municipal competence and local traditions and uses. Some local building regulations set bylaws with requirements concerning energy saving and environmental protection (e.g., Lisboa, Almada and Cascais municipalities).

4.6 Building control

The "Regime of urbanization and construction"[197] sets the rules of public control over construction works in order to ensure the public interests. According to their category, construction works can either be exempted from building permit procedures or follow a building notice procedure or a regular procedure. Since it has been in force, this regime has been amended 10 times drawing on experience gained by its application to date.

In the sixth amendment, the compliance with the "Regime of Construction and Demolition Waste Management" became compulsory.[198] In the tenth amendment, the installation of photovoltaic solar panels, wind generators and solar heating panels for domestic hot water was exempt from building permit procedures, for simplification purpose. These construction works are not exempt in listed buildings.[199]

The "National System of Energy Certification and Indoor Air Quality in Buildings"[200] aims to: a) enforce the building regulations on energy performance, b) certify the energy performance and indoor air quality in buildings, and c) identify corrective action or performance improvements for buildings and their energy systems with regard to energy performance and indoor air quality. Within this system:

1) A central public agency qualifies and supervises private experts, and approves certificates issued by them.
2) Private experts declare the compliance of designs with the regulations for building permit purposes, assess and certify the energetic and indoor air quality performance before the use permit is granted, and analyse and certify the energetic and indoor air quality performance in periodical audits.

196 Decree-Law no. 63/2011. OJ (PT) no. 89, 9 May 2011.
Decree-Law no. 214/98. OJ (PT) no. 162, 16 July 1998.
197 Decree-Law no. 555/99. OJ (PT) no. 291, 16 December 1999. With amendments.
198 Law no. 60/2007. OJ (PT) no. 170, 4 September 2007.
199 Decree-Law no. 26/2010. OJ (PT) no. 62, 30 March 2010.
200 Decree-Law no. 78/2006. OJ (PT) 4 April.

3) The central government supervises the system.

Since 2007 more than 300,000 certificates of energetic and indoor air quality performance have been granted in the scope of the national system of energy certification.

The "Regulation of the Thermal Behaviour Characteristics in Buildings"[201], the "Regulation of Energy Systems and Air Conditioning of Buildings"[202] and the "National System of Energy Certification and Indoor Air Quality in Buildings"[203] partially transpose into the Portuguese legislation the European Directive on the Energy Performance of Buildings (EPBD) adopted in 2002.[204] Presently, these regulations and the system are under revision and will probably include the objectives set by the EPBD recast.[205]

5 Voluntary certification and labelling

Consumers are becoming more concerned about the environment. Therefore, they want to play an active role in the protection of the environment by choosing products that inflict less damage upon it. However, they are bewildered by and sometimes sceptical about the environmental claims made by manufacturers and retailers for their products. Eco-labels are 'brands' placed on certain products that help consumers to choose products, which have been recognised as less harmful to the environment. Eco-labels are voluntary schemes based on specific environmental criteria.

In several countries, specific eco-labels have been developed for buildings. Green building assessment and certification systems comprise a set of criteria, organized in categories, which assess different environmental aspects of buildings. Certification is granted, usually by levels, if certain performance thresholds are reached. Existing systems are voluntary since the belief is that construction sector adherence will be due to environmental commitment or to ensure buildings competitiveness and differentiation.

In this section, we present a summary of the certification and labelling systems available in Portugal for environmental performance of construction materials and buildings.

5.1 Eco-labels

Several eco-label systems are used in Portugal for construction products. The water efficiency of products that consume water (e.g. toilets, showers and taps) may be certified by the ANQIP system (ANQIP, 2011). The certification of solar thermal equipment by the Portuguese Quality System (Certified Product or Solar Keymark), is a necessary condition for State incentives being granted (ADENE et al., 2003-2011). There is the Portuguese system for certification of sustainable forest management, which is recognized by PEFC International (PEFC, 2010). Some products bear the EU Ecolabel, in particular products that fall into the following categories: hard

[201] Decree-Law no. 80/2006. OJ (PT) no. 67, 4 March 2006.

[202] Decree-Law no. 79/2006. OJ (PT) no. 67, 4 March 2006.

[203] Decree-Law no. 78/2006. OJ (PT) 4 April.

[204] Council Directive no. 2002/91/EC of 16 December 2002 on the energy performance of buildings OJ (EU) L 1/65 of 4 January 2003.

[205] Directive 2010/31/UE of the European Parliament and the Council of 19 May 2010 on the energy performance of buildings (recast). OJ (EU) L 153/13, of 18 June 2010.

floor coverings, heat pumps, paints & varnishes, and lightbulbs (Eco-label, 2002). Several products and construction materials sold in Portugal have marks awarded by international certification systems.

5.2 LiderA

"LiderA" is an assessment and acknowledgement system of buildings and built environment sustainability (LiderA, 2011). The system was originally developed in the framework of a Ph.D. in Environmental Engineering. The first version was presented in 2005 and the first certifications were issued in 2007. Based on experience gained with its implementation, a second version was presented in 2009.

The system can be used to assess and certify developments for different uses (e.g. residential, commercial, office and tourism) and applied at different phases, including planning, design, construction, operation and renewal. The evaluation is divided into 6 categories and 22 areas:

1) Site and integration: soil, natural ecosystems, and landscape and Heritage;
2) Resources: energy, water, materials and food production;
3) Environmental loadings: wastewater, atmospheric emissions, waste, noise emissions, and thermal and light pollution;
4) Environmental comfort: air quality, thermal comfort, and lighting and acoustics;
5) Socioeconomic experience: access for all, economic diversity, amenities and social interaction, control and participation, and life cycle costs;
6) Sustainable use: environmental management, and innovation.

Results of LiderA are presented in a seven level scale (A to G), in which level E is the common practice. There are also classes for developments that undertake structural improvements (A+ and A ++) or are regenerative (Class A+++). If the result is above level D, the building or built environment may be certified. Less than 20 developments have been recognized (design phase) or certified (work and operation phase) by LiderA until 2011, but they cover various types of developments: houses, apartment buildings, residential developments, resorts, schools, hotels, office buildings and commercial buildings. Buildings certified by LiderA are granted tax benefits or fee reductions, by some local authorities.

5.3 SBTool^{PT}

"SBTool^{PT}" is a system intended to assess and certify the sustainable performance of buildings and projects (SBTOOL-PT, 2011). It is based on the international system SBTool (Sustainable Building Tool) developed by iiSBE (International Initiative for the Sustainable Built Environment) in collaboration with a consortium of teams from over 20 countries (Europe, Asia and America). The SBTool^{PT} was adapted to Portuguese context by iiSBE Portugal in collaboration with University of Minho and Ecochoice.

The system can be used to assess different types of buildings (e.g. office, residential, or other). It is divided into 3 dimensions, which cover 9 categories and 30 parameters. The 3 dimensions are subdivided into the following categories:

1) Environmental dimension: climate change and outdoor air quality, biodiversity, energy, material use and solid waste, and use of water and wastewater;

2) Social dimension: comfort and health of occupants, accessibility, and awareness and education for sustainability;
3) Economic dimension: life-cycle costs of buildings.

The values of each parameter are converted into a scale with six steps from "E" (conventional practice) to "A+" (best practice). The combination of partial results is done by a weighted average of the values of each parameter. The results are presented on two levels: a profile with the performance of the solution in different categories and an overall score of sustainability. With the exception of two case studies, the information available about the system does not report its application to other developments.

5.4 DomusNatura

"DomusNatura" is a system intended to certify the sustainable performance of developments. It was developed by SGS Portugal and presented in 2008 (SGS SA, 1997-2011). This system aims to combine quality, environment and effective management of resources. The goal is to increase comfort and reduce running costs.

The DomusNatura includes a quality certification entitled DomusQual, which aims to monitor compliance with all legal requirements, regulations and the regulatory compliance and quality construction technique applicable to the project. DomusNature combines the quality factor of DomusQual with good environmental, social and economic performance. DomusNatura system is divided into 6 categories and 127 parameters, of which 21 belong to DomusQual. The 6 categories are:

1) sustainable location and safety;
2) rational use of water;
3) energy and air pollution;
4) materials and resources;
5) quality and comfort;
6) innovation and ecology.

Buildings that meet a certain environmental, social and economic performance are granted a certificate. The level of the certificate is determined according to scores achieved in various parameters. The information available indicates that this system has not been applied up to 2011.

5.5 BREEAM, LEED and Bilan Carbone

Some consulting firms on environmental sustainability are qualified or certified to implement the international environmental certification systems BREEAM, LEED and *Bilan Carbone*. According to available information, the application of these systems in Portugal is uncommon.

6 Incentive programs and tax benefits

In order to reduce consumption and improve environmental performance it is necessary to change the characteristics of the building stock, whether through interventions in the physical envelope of buildings or through the acquisition of more efficient equipment. These changes require a financial investment that it is important to encourage. Incentive programs and tax

benefits can be used for this purpose. In this section we present a summary of the main incentive and programs tax benefits used in Portugal to help improving the environmental performance of buildings.

There are several specific incentive programs to promote the efficient use of energy, to decentralize power production using renewable sources,[206] and to encourage the use of solar energy to heat water (ADENE et al., 2003-2011). Other programs pursue these objectives specifically in residential buildings (RE.NEW.ABLE et al., 2011), in buildings from small companies (QREN, 2010), and in non-profit private organizations (InAlentejo, 2010). Some general programs that give financial support to residential buildings renovation can also be used to finance construction works for improving the environmental performance of buildings.[207] Within these programs, subsidized loans or non-repayable funds are granted. Incentives for buildings renovation contribute, indirectly, to a reduction of materials consumption and waste production. If energy is produced by privates individuals, the public network will take the energy (up to a defined limit) at a guaranteed and advantageous sale price.[208]

There are funds to support projects that contribute to the efficient use of energy[209] and to the reduction of GHG emissions.[210] Funds are financed with state budget allocations and revenues from fees and fines on energy issues.

Tax reductions are granted for the purchase of properties with high energy efficiency (i.e. 10% increase in the tax deduction for costs with housing loans, if the house is awarded an energy class A or A+ by the national system of energy certification)[211] and of equipment to produce thermal and electric energy from renewable energy sources (i.e. VAT at an intermediate rate of 13%)[212]. To counterbalance the impact of energy inefficient light bulbs on the environment, there is an additional tax on these light bulbs.[213]

Some local authorities adopt measures similar to those identified at national level, including tax benefits (e.g., reduction in property tax and reduction in fees over construction works) and funds to support local projects (e.g., municipal energy efficiency fund).

7 Training, information and public awareness

To improve the environmental performance of buildings, it is not only necessary to adopt effective policies in terms of regulations and investment, but also to promote a change in

206 Decree-Law no. 363/2007. OJ (PT) no. 211, 2 November 2007. With amendments.
Decree-Law no. 34/2011. OJ (PT) no. 47, 8 March 2011.
207 Decree-Law no. 39/2001. OJ (PT) no. 34, 9 February 2001. With amendments.
Decree-Law no. 105/96. OJ (PT) no. 176, 31 July 1996. With amendments.
208 Order no. 1/MINIP/2011 of Directorate General for Energy and Geology (28 April 2011).
209 Decree-Law no. 50/2010. OJ (PT) no. 98, 20 May 2010.
Ordinance no. 26/2011. OJ (PT) no. 6, 10 January 2011.
210 Decree-Law no. 71/2006. OJ (PT) no. 60, 24 March 2006.
211 Decree-Law no. 442-A/88. OJ (PT) no. 277, 30 November 1988. With amendments (Law no. 55-A/2010. OJ (PT) no. 253, 31 December 2010).
212 Decree-Law no. 394-B/84.OJ (PT) no. 297, 26 December 1984. With amendments (Decree-Law no. 102/2008. OJ (PT) no. 118, 20 June 2008).
213 Decree-Law no. 108/2007. OJ (PT) no. 72, 12 April 2007.

consumer behaviour, increase the technical capacity of professionals and stimulate the update and progress of scientific knowledge. In this section, we present a summary of the main actions regarding support and information carried out in Portugal to help improving the environmental performance of buildings.

Public sector plays an active role by adopting measures to improve the environmental performance of buildings. For example, a "Strategy for the green public procurement"[214], a "Program for energy efficiency in public administration"[215] and a "Regime for public procurement of energy services"[216] have been approved.

There are training programs on sustainable construction for the different agents in the construction sector. For example, universities and professional associations organize postgraduate courses on sustainable construction for designers, training on building regulations concerning of energy performance of buildings is mandatory to experts qualified under the "National System of Energy Certification and Indoor Air Quality in Buildings", and there are training courses for installers of renewable energy and water use equipment.

Demonstration buildings have been built to show both the potential and the feasibility of new architectonic, technological and construction solutions, which improve the environmental performance of buildings (e.g. *Aveiro Domus*[217], *Solar XXI*[218]). The buildings are also used to study and monitor the performance of new systems and products.

Frequently, campaigns to raise public awareness for environmental challenges are conducted. The campaigns are promoted by central authorities, local authorities, service providers and non-governmental organizations (NGO's). Some consumer protection and nature conservation NGO's develop information and public awareness projects to encourage a more moderate consumption of resources and to demonstrate how to make daily consumption more efficient (e.g. *Ecocasa*[219], *Biosfera*[220]).

Some local authorities have counselling services for citizens on methods to reduce consumption on a daily basis and on construction works to improve the performance of buildings. Several simulation tools are available online that enable users to characterize their home and lifestyle, to assess the environmental impacts and to learn from the suggestions made by the system. Such tools are usually provided by NGOs (e.g. *DECO*[221], *Quercus*[222]) or service providers (e.g. *EDP*[223], *EPAL*[224]).

214 Resolution of the Council of Ministers no. 65/2007. OJ (PT) no. 87, 7 May 2007.
215 Resolution of the Council of Ministers no. 2/2011. OJ (PT) no. 8, 12 January 2011.
216 Decree-Law no. 29/2011. OJ (PT) no. 41, 28 February 2011.
217 http://www.aveirodomus.pt.
218 http://repositorio.lneg.pt/bitstream/10400.9/1322/1/BrochuraSolarXXI_Maio2010.pdf.
219 http://www.ecocasa.pt.
220 http://www.quercustv.org.
221 http://www.deco.proteste.pt/ambiente/s316081.htm.
222 http://www.ecocasa.pt/simuladores.php.
223 http://www.edp.pt/pt/particulares/bemvindoaedp/Pages/SimuladordePotenciaeConsumo.aspx.
224 http://www.epal.pt/epal/novosim.aspx.

Abundant technical documentation on sustainable construction adapted to the Portuguese context has been published. Some manuals on sustainable construction are geared towards technicians and others to consumers. To update knowledge of professionals, technical magazines are regularly published on sustainable construction as a whole or on specific aspects. On the Internet, some sites are dedicated solely to disseminate information on good practices in sustainable construction and rehabilitation. In addition, sustainable construction is an issue that arises repeatedly in the general technical documentation of the construction sector.

National Awards are granted to recognize buildings for their sustainability performance, and companies for their energy efficiency practices.

Meetings on sustainable construction are held frequently, and there are numerous research and development projects on sustainable construction.

8 Conclusions and discussion

8.1 Synthesis of results

8.1.1 Guidelines set by national and local strategies and plans

Strategies and plans set goals and actions for an adequate management of energy, water, materials and waste in the context of climate change and sustainable development. The actions established in national strategies and plans that apply to buildings are mainly focused on increasing energy efficiency and energy production from renewable sources. The strategies and plans also include measures aimed at raising awareness and mobilizing citizens to adopt a more responsible environmental behaviour, including moderating or reducing the consumption of water and energy and promoting recycling. Almost 40% of Portuguese municipalities have a Local Agenda 21 for sustainable development and 20% of them joined the "Covenant of Mayors". These figures reflect a growing commitment of local governments with the implementation of the EU and national policy for environment and energy. Although the commitment of municipalities is voluntary it is framed and encouraged by EU policies aimed to the local level.

8.1.2 Environmental provisions set in the regulatory framework

The "General Building Code" does not set the general requirements on energy saving and environmental protection. There was a positive development in building regulations on energy efficiency and indoor air quality. The national system of energy certification has contributed to a better compliance with energy regulations. Building regulations do not include provisions on efficient use of water. Several separate building regulations set provisions on use of dangerous substances, waste from construction or demolition and labelling of products that have an impact on energy consumption. No changes were introduced in the building regulations in order to meet the need to increase protection against extreme weather conditions. Most changes in the building regulations regarding energy and materials were due to the transposition of European directives into the Portuguese legislation.

8.1.3 Voluntary certification systems available for construction products and buildings

There are Portuguese eco-label certification systems for some products and materials (e.g. products that consume water, wooden products, and solar thermal equipment). The EU Ecolabel is also being used for other products. Several products and construction materials sold in Portugal have marks awarded by international certification systems.

There are three systems of green building assessment and certification especially adapted to the Portuguese context, but only one has had some minor applications. International systems of green building assessment and certification can also be used in Portugal, but their implementation is also insignificant. Therefore, adherence to date of the construction sector to green building assessment and certification systems is reduced. Even the tax benefits and fee reductions granted by local authorities seem to be insufficient to boost the application of these systems.

8.1.4 Incentive programs and tax benefits

Although all measures foreseen by plans and strategies were not implemented, there is a wide range of incentive programs to encourage rational use of energy in new and existing buildings. These programs cover up the main types of private buildings: residential, small companies, and non-profit private organizations. Renewal of public buildings is being supported by other programs. No incentive programs to promote a better use of water, materials and waste in buildings were identified. However, incentives for buildings renovation contribute indirectly to reduction in material consumption and waste production.

8.1.5 Training and awareness initiatives

There are many initiatives about sustainable construction in order to: ensure the training of professionals (postgraduate and professional courses), raise awareness among consumers (campaigns, counselling, demonstration buildings), produce and disseminate knowledge (research projects, meetings, books, magazines and sites), recognize best practices (awards), and lead change by example (public leadership programs).

8.2 Discussion

As described, in Portugal there is a set of initiatives to improve environmental performance of buildings. These initiatives pursue the objectives set by the policies on environment and energy and are coordinated in plans and strategies organized by resources (energy, water, materials & waste). The initiatives that have been carried out cover the main domains (Table 1): building regulations and control; certification and labelling; incentive programs and tax benefits; as well as training, information and public awareness.

The initiatives to improve environmental performance of buildings aim to: change the characteristics of the existing building stock, improve the performance level set for new buildings, and encourage more responsible environmental behaviours. Thus, some of these initiatives set mandatory command and control regulations (e.g. building regulations and control) but most of them are incentives for voluntary improvements (e.g. some certification and labelling schemes; incentive programs and tax benefits; as well as training, information and public awareness).

Table 12. Initiatives to improve environmental performance of buildings

	Energy	Water	Materials & waste
Plans and strategies	✓	✓	✓
Building regulations and control	✓	×	✓
Certification and labelling: Products	✓	✓	✓
Certification and labelling: Buildings	✓	✓	✓
Incentive programs and tax benefits	✓	×	×
Training, information and public awareness	✓	✓	✓

Energy is the resource on which more initiatives are focused. The enforcement of building regulations on energy performance is ensured by the participation of private experts who check designs compliance and carry out site inspections. Certificates and permits are still granted by central authorities.

Despite the numerous initiatives to improve environmental performance of buildings, questions arise about their actual effectiveness. Therefore, in future studies we intend to analyse the effectiveness and efficiency of these initiatives. Other developments will be the analysis of initiatives concerning the use of soil and the comparison of initiatives carried out in Portugal with the developments operated in other European countries.

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Comparison of building permit procedures in European Union countries

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Abstract:

Building regulations set minimum requirements for safe, healthy, energy-efficient and accessible buildings. To guarantee that these requirements are applied, a building control system is indispensable. The trend towards a common market for construction products and services justifies gaining a better insight into the building control systems in the European Union (EU). This paper presents a comparison of the building permit procedures adopted in the 27 EU countries. To collect the necessary information, a questionnaire on building regulatory systems was distributed to national experts in each country and the major legal documents were reviewed. The information was organized in thematic tables containing all the countries. The main conclusion is that the organization of a regular building permit procedure is similar in the EU countries. No major differences were found concerning the several steps it takes to get a building permit and to carry out a construction work: pre-consultation, possibility of phasing, submission demands, checks carried out and maximum procedure time for plan approval, possibility and moment to object to a building permit being issued, start of construction works, frequency and moment of site inspections, fees, and completion of construction works. The main differences concern detail aspects in several of these steps. There is one basic type of building permit procedure in countries from continental Europe. The United Kingdom countries are those presenting more deviations from the common pattern. These deviations aim to reduce the burden of administrative aspects, while ensuring good levels of compliance. In the last 10 to 15 years, the dominant trends identified in the building permit procedure were a decrease in the types of construction works submitted to building authorities' control during plan approval, and the reduction in the maximum building permit procedure times. Building authorities' control during the construction phase has remained unchanged. Altogether, there is a movement towards simpler and faster building permit procedures. For the near future, no major changes are expected in the building permit procedures.

Keywords:

building control system, building permit procedure, comparative study, European Union

1 Introduction

In every European country, there is a building regulatory system encompassing the building regulations and the building control system. Building regulations set minimum quality requirements to ensure that buildings are safe, healthy, energy-efficient and accessible to everyone who lives and works in and around them. Building control aims to guarantee the application and enforcement of these minimum requirements.

The general characteristics of the building control system in European countries are similar. Designs must be prepared and submitted to an authority that approves its compliance with zoning demands and building regulations. During construction, site inspections guarantee that the structure is built according to design and that it complies with the building regulations. Once construction is complete, a final check is conducted and a completion certificate or a use permit is issued.

However, there are many differences among countries regarding procedural aspects of building control. The purpose of this paper is to compare the building permit procedures in the European Union countries. The three research questions addressed are as follows: What are the main differences and similarities? What are the main types of building control systems? What are the main trends and developments?

Studying the building control systems adopted by EU countries is important for three main reasons. Differences among the building control systems of EU countries represent a barrier to the freedom of movement of services in the construction industry. In recent years, there has been a trend towards the gradual privatization of building control in the EU countries, but the extent and the way each country has implemented reforms varied. There are more specialized building regulations and less public resources available for their enforcement, and therefore, more efficient and effective building control systems are required.

The following section explains the research methodology and Section 3 presents the results of the comparative analysis. Section 4 describes and discusses the conclusions of the comparison.

2 Methodology

The research presented in this paper was conducted as part of a European comparative research project currently underway at OTB Research Institute for Housing, Urban and Mobility Studies (Meijer and Visscher, 2008). The project aims to describe and compare the building regulation systems of 34 European countries. The main subjects addressed are as follows: organization and formulation of technical building regulations, tasks and responsibilities of agents involved in building control, technical and administrative aspects of the building permit procedure and quality demands imposed on building control bodies.

The analytical framework of the research project was based on a previous study about building regulations in Europe (Meijer, Visscher and Sheridan, 2002). The development of the research

project was divided into two phases. In the first phase, the aim was to describe the building regulation systems of the European countries. Hence, to collect information, questionnaires were sent to national experts in each country. This information was complemented with the analysis of major legal documents. As a result, a draft of a monograph was written for each country. For some countries, the draft was revised by a second national expert. In the second phase of the project, the aim was to compare the building regulation systems of the various European countries in order to identify trends and developments. For this purpose, the information was organized in thematic tables that containing all the countries.

The questionnaire sent to national experts focused on three subjects:

1) The scope of technical building regulations that regulate the minimum quality level for buildings (e.g. subjects regulated, formulation of regulations, ministries responsible).
2) The building permit procedures: administrative procedures (e.g. categorization of construction works in relation to permit procedures, time limits, phasing of procedures, tasks and responsibilities of actors).
3) The quality demands on building control bodies (e.g. education of staff, working methods, traceability).

It is an elaborate questionnaire that addresses technical and procedural issues of the building regulatory system of each country. Therefore experts could skip questions if they were not able to answer then. But, in this case, questionnaires were sent to other experts that were able to provide information for the unanswered questions, until all the required information was gathered. To date, about 50 national experts answered the questionnaire or revised country monographs.

This paper presents results from the second phase of the research project. It is focused on the technical building regulations. The analysis is restricted to the 27 European Union countries. Due to the federal structures of Austria, Germany and Belgium, analyses of each of these countries focuses on a single state, province or region. With regard to the United Kingdom, information was collected for England & Wales, Northern Ireland and Scotland.

Within the second phase of the research project, the tasks and responsibilities assigned to both public and private parties enforcing the building control systems in EU countries, as well as the organization and formulation of technical building regulations in EU countries have already been compared. The results were presented in previous papers (Pedro, Meijer and Visscher, 2009 & 2010).

The conclusions presented in this paper are not definitive, as the necessary information has not yet been gathered and validated for all countries.

3 Comparative analysis

3.1 Types of procedures

According to their category, construction works can be exempted from or follow a building permit procedure, as described below:

1) Exemptions: construction works that have to meet the planning demands and the technical requirements but are exempt from the permit procedure.
2) Building notice: construction works that have to be notified to the building authority but can be carried out without a building permit.
3) Light procedure: construction works that require a building permit but compliance of building design with building regulations is only ensured for part of the technical requirements.
4) Regular procedure: construction works that require a building permit and compliance of building design with building regulations is ensured for all the technical requirements.
5) Regularization: construction works that have been built without the required building permit or contrary to the terms and conditions specified in the building permit, but may be legalised.

In all EU countries, there is a regular procedure and there are construction works exempt from permit procedure. Building notice and light procedure only exist in some countries. The following combinations of procedures were identified (Table 4):

1) Exemptions and regular procedure (e.g. Belgium, Cyprus, Hungary, Romania and Scotland).
2) Exemptions, building notice and regular procedure (e.g. Austria, Bulgaria, Czech Republic, France, Italy, Luxembourg, Malta, Portugal, Slovenia, Sweden, Northern Ireland and England & Wales).
3) Exemptions, light procedure and regular procedure (e.g. Germany, Lithuania, the Netherlands and Spain).
4) Exemptions, building notice, light procedure and regular procedure (e.g. Estonia, Ireland and Slovakia).

If we consider "building notice" and "light procedure" as an identical "simplified procedure", then the combination "exemptions", "simplified procedure" and "regular procedure" is the dominant approach in the EU countries. In some EU countries, there is a specific procedure for the regularization of construction works (e.g. Poland, Northern Ireland and England & Wales).

Table 4. Which types of permit procedures are defined?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK- Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Exemptions	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Building notice	■		■		■	■	■	■	■				■	■	■		■	■		■	■		■	■		■	■		■
Light procedure							■	■		■			■		■	■			■				■		■				
Regular procedure	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Regularization																				■							■		■
No information											■																		

In Germany, a type approval may be asked for structures built according to the same design at different places (e.g. prefabricated houses). This implies testing the structural stability as well as sound-, thermal-, damp- and fire-proofing, among other tests. Type approval by one federal state is recognized by all the others, so local building authorities are exempt to check, as part of the permit procedure, whether the structure meets the requirements relating to the type approval functions.

In England & Wales, type approval can be granted for all types of construction features that are subject to Building Regulations. It applies to "building types", which is suitable for complete building designs and for standard building modules repeated in different areas, and to "building systems", which is suitable for systems capable of producing a variety of different buildings using standard components and construction details. Type approval covers compliance with the Building Regulations. A design can be submitted for type approval by local building authorities, in conjunction with either a building notice (if applicable) or the regular procedure. Type approval can also be awarded by approved inspectors. Once the application has been passed, the type approved design is registered with the Local Authorities National Type Approval Confederation (LANTAC). This register enables the local authority building control officers to look up and check design approvals. Having a building type or a building system approved means that it can be used without the plan approval happening repetitively all over the country at each site. Only site specific details such as foundation and drainage need local approval.

During the last 10 to 15 years, in the majority of the EU countries, there has been an increase in the number of construction works exempt from control and an increase in the number of

construction works that shifted from a regular procedure to a light or building notice procedure (Table 5). In few countries, no developments were reported (e.g. Cyprus, Denmark, Estonia, Ireland and Romania) or developments were contrary to the general tendency (e.g. Bulgaria, France and Germany). For the near future, no changes are expected in this respect in the majority of the EU countries, but in some EU countries the previous developments are expected to continue.

Table 5. What were the developments regarding the categorization of construction works? What changes are expected in this respect?

	Past 10/15 years	*Near future*
No developments	*Cyprus, Denmark, Estonia, Ireland, Romania, Slovenia*	*Belgium, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Ireland, the Netherlands, Portugal, Romania, Sweden, Scotland, England & Wales*
Increasing number of construction works exempt from control	*Belgium, Czech Republic, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Slovakia, Sweden, Northern Ireland, Scotland, England & Wales*	*Czech Republic, Italy, Latvia, Lithuania, Slovakia, Northern Ireland*
Decreasing number of construction works exempt from control	*Bulgaria, France, Germany*	–
Increasing number of construction works that shift from a regular procedure to a light or building notice procedure	*Austria, Belgium, Czech Republic, Germany, Latvia, Lithuania, Portugal, Slovakia, Northern Ireland, England & Wales*	*Austria, Czech Republic, Latvia, Lithuania, Slovakia, Northern Ireland*
No information		*Finland, Greece, Hungary, Luxembourg, Malta, Spain*

3.2 Pre-consultation

During pre-consultation, an applicant for a building permit can address the building authority to discuss the intended construction work and ask for information about specific demands that should be taken into account when further developing the building design (e.g. possible use of the lot, allowable building lines, admissible heights, maximum building mass, admissible derogation from rules). Pre-consultation provides designers with thorough information to develop a building at a particular plot and may give developers the certainty that planning demands will remain unchanged during a certain period.

In almost all EU countries, pre-consultation is voluntarily (Table 6). It is regulated by law, takes place frequently, and the tasks and responsibilities of parties involved, the planning demands, as well as the aesthetics and technical requirements are usually discussed. Only in Bulgaria it is obligatory to ask for detailed planning information for certain types of construction works.

In some EU countries, local authorities are bond to agreements or information provided during pre-consultation (e.g. Belgium Cyprus, Hungary, Italy, Latvia, Portugal and Sweden). In other EU countries, information provided during pre-consultation is accurate and objective. Although advice and opinions about the merits of a proposal are given in good faith, they are not binding to the local authority or the applicant (e.g. Austria, Denmark, France, Malta, the Netherlands and England & Wales).

Usually, pre-consultation is requested to the building authority by the owner of a land parcel or a person authorized by him. However, in some EU countries, someone other than the owner may request a pre-consultation (e.g. Portugal). In such cases, the building authority notifies the owner and other persons with legal rights over the land parcel.

Table 6. What is the status of pre-consultation?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Voluntarily	■	■	□	■	■	■	■		■	■		■	■	■		■	■	■	■	■	■	■	■	■		■	■	■	■
Obligatory			□																										
No information								■			■				■										■				

3.3 Planning permit procedure

Control of planning demands (i.e. aspects linked to the use and location of construction works) and technical requirements of the building and the plot may be done in separate or combined procedures. If there is a separate procedure, a distinction between the planning permit and the building permit is usually made.

In approximately half of the EU countries, there is a combined permit procedure for planning demands and technical requirements (Table 7). In these countries, a planning permit is not required before applying for a building permit. Pre-consultation and phasing the procedures can be used to get detailed planning information and reach informal agreements.

In the other half of the EU countries, there is a separate permit procedure for planning demands and technical requirements. A planning permit is the basis for the development of a design, but it does not bind the building authority to grant a building permit, since it only states that designs presented at this phase are in compliance with the planning demands. The planning permit does not authorise the beginning of construction works.

In several countries, some particular situations were found:

1) Both a planning permit and a building permit are required, but for certain type of construction works it is possible to combine the permits into one administrative procedure (e.g. Czech Republic).
2) A planning permit and a building permit are only required for certain types of construction works (e.g. Hungary and Luxembourg).
3) The applicant can voluntarily apply for a planning permit using pre-consultation (e.g. Bulgaria and France).

Table 7. Are there separate procedures for a planning permit and a building permit?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Separate				■	■				□			□	■		■	■	□			■		■	■		■	■	■	■	■
Combined	■	■	■		□	■	■	■	■	■		□		■			□	■	■		■			■					
No information											■																		

3.4 Phasing

Phasing the building permit means the possibility to divide the building permit application into phases. This possibility can be particularly useful for complex construction works, since it avoids developing a fully worked out design before the preliminary design has been checked and approved.

In half of the EU countries, it is not possible to apply for a regular permit in several phases (Table 8). In these countries, the division between planning and building permit and a voluntary pre-consultation can be used to phase procedures. Another way to make up for the lack of phasing is the building authority requesting the applicant to send additional information or to carry out small modifications in the building design (e.g. France, Italy, Malta and Sweden). Additional documentation may be delivered within a certain period. This possibility avoids rejecting the application due to lack of documents or simple deficiencies in the design. In France, Romania, Slovenia and Sweden it is logical that phasing the building permit procedure is not foreseen since building authorities do not check technical requirements of a building permit application.

In the countries where phasing is possible, phases concern three different stages of design development:

1) Intended use of the lot, zoning aspects and layout of the building (preliminary design).

2) Technical requirements (technical design).
3) Detailed drawings to be used during construction (construction drawings).

Phase 1) does not apply to countries where there is a separate procedure for a planning permit and a building permit. Depending on the complexity of each particular building work, the building authority, the applicant, or both, can decide to combine phases.

Table 8. Is it possible to apply for a regular building permit in phases?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Yes	■		■		■		■	■					■		■		■		■		■		■		■		■	■	■
No		■		■		■			■	■		■		■				■		■		■		■		■			
No information											■					■														

In almost all EU countries there have been no developments regarding the phasing of the regular building permit procedure during the last 10 to 15 years (Table 9). Only in Czech Republic, Latvia, the Netherlands, Slovakia, Scotland there was an increase in the number of phases. For the near future, no changes are expected changes in this respect in the EU countries.

Table 9. What were the developments regarding the phasing of the regular building permit? What changes are expected in this respect?

	Past 10/15 years	*Near future*
No developments	*Belgium, Bulgaria, Cyprus, Denmark, France, Germany, Ireland, Italy, Luxembourg, Malta, Poland, Portugal, Romania, Slovenia, Sweden, Northern Ireland, England & Wales*	*Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, France, Germany, Ireland, Italy, Latvia, Luxembourg, Malta, Poland, Romania, the Netherlands, Portugal, Slovenia, Sweden, Northern Ireland, Scotland, England & Wales*
Increasing number of phases	*Czech Republic, Latvia, the Netherlands, Slovakia, Scotland*	*Slovakia*
No information		*Greece, Spain*

3.5 Submission

Submission demands determine the documentation that must submitted when an application for a building permit is made. In detail, they describe the documents required to process the application and assess the building design (e.g. drawings, specifications, photographs of existing situation, photomontage of proposal, structural calculations and declarations).

In all EU countries, there are statutory submission demands to apply for a building permit (Table 10).

Table 10. Are there statutory submission demands when applying for a building permit?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Yes	■	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■		■	■	■	■
No																													
No information											■	■	■												■				

According to data collected in 2008, general information about building regulations and permit procedures is available through the Internet in all EU countries. Codes, brochures and paper forms can also be downloaded from the Internet. In one third of the countries, electronic intake of a building permit application is already possible by some or all building authorities. Full electronic case handling of the building permit is possible or being implemented in some countries (e.g. Malta, the Netherlands, Portugal, Northern Ireland, Scotland and England & Wales).

3.6 Plan approval

During plan approval, the competent building authority scrutinises the application and consults with other authorities, if the applicant has not already done so. A design auditor may conduct an audit to provide a substantiated opinion regarding the extent to which the design conforms to planning demands and technical requirements. If opinions from other authorities and design auditors are favourable, and if the competent building authority is satisfied, a building permit is granted.

In almost all EU countries, during plan approval it is checked the compliance of the building design with submission, planning and aesthetic demands, as well as with technical requirements (Table 11). The following are exceptions to the rule:

1) In Denmark, the technical requirements that the local building authority is required to check depend on the technical complexity of the construction work (e.g. for single family houses only planning demands are checked).
2) In France, the compliance with technical requirements is checked for buildings open to the public and very high buildings, and these checks are limited to fire safety and access for disabled people requirements.
3) In Portugal, only technical requirements regarding space standards are checked. The compliance of the building design with relevant building regulations is attested to by liability declarations of designers.

4) In Slovenia and Sweden, plan approval does not cover the technical requirements of the design.

In some EU countries, it is acknowledged that the level of control depends on several aspects, such as the complexity of construction and the reliability of private actors involved in the application (e.g. the Netherlands).

Table 11. What is checked during the plan approval phase?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Submission demands			■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■			■
Zoning demands			■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■	■	■			■
Aesthetic demands				■	■	□	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■		■			■
Technical requirements			■	■	■	□	■	■	□	■				■	■	■	■	■	■	■	□	■	■		■				■
No information	■	■									■	■	■							■							■	■	

In several EU countries, it is explicit that building permit may contain conditions that must be carried out before or during the construction phase (e.g. Cyprus, Germany, Italy, Luxembourg, Malta, Slovakia, Scotland and England & Wales), such as:

1) Submitting some drawings and calculations at a later phase.
2) Notifying the local authority of the various stages of the construction work in order to ensure the opportunity to carry out site inspections as it sees fit.
3) Taking measurements in the completed building to demonstrate compliance with the building regulations.
4) Settling that the building must be connected to the services (i.e. water, drainage, electricity and gas) at the expense of the owner.

In some countries it is also stated that dispensation from the requirements of the building regulations may be granted (e.g. Cyprus, Denmark, Germany, Latvia, the Netherlands and Portugal). For instance, in cases of alteration, renovation or conversion of existing building, provisions on design and layout may be relaxed if the authorities are satisfied that the construction work cannot otherwise be carried out without extensive alterations to the building.

This ability to grant dispensations is used for cases where the regulations for the construction of works (usually adapted to new buildings) are considered too severe. The exemptions have to be justified by economic, architectural or other reasons.

3.7 Beginning of construction works

In almost all EU countries, construction works can start after the building permit has been granted by the building authorities (Table 12). The following are exceptions to this rule:

1) In Bulgaria and Denmark, construction works may start after granting the building permit. Exceptionally, to allow an early start of the construction, the local authority may grant a partial building permit or special authorization. In this case, the following stages of design are approved as construction progresses, but always before implementing the respective construction work.
2) In Italy, Latvia and Portugal, the situation is identical to 1) but the only early construction works allowed are demolition or excavation and peripheral contention of the soil until the level of the lower floor.
3) In Finland, the piling of a building's foundations may be carried out before the construction work begins in accordance with the piling plans submitted to the local building authority. Construction works are considered to have commenced when the casting of foundations or the installation of the construction elements of the foundation begins.
4) In Northern Ireland and England & Wales, according to the procedure operated by local authorities, the construction work on site may start soon after application, but to receive the full benefit and protection from the regular procedure it is advisable to start the construction works after the notice of approval is received. If the applicant commences a construction work prior to plan approval, he proceeds entirely at his own risk.
5) In England & Wales, according to the procedure operated by approved inspectors, the work may start as soon as the initial notice is accepted by the local authority, subject to any arrangements agreed with the approved inspector.

Table 12. When may construction works start?

	Austria	Belgium	Bulgaria	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK - Northern Ireland	UK - Scotland	UK - England & Wales
After submission of the application								▱																			■		■
After granting of a partial permit			□			▱								▱	▱						▱								
After granting permit	■		■	■	■	■	■	■	■	■				■	■	■		■	■	■	■	■	■	■		■	▱	■	▱
No information		■									■	■	■				■	■							■				

In several EU countries, the applicant, the contractor or the building surveyor must notify the building authority of his intention to start the construction work (e.g. Denmark, Estonia, France, Germany, Ireland, Sweden and Northern Ireland). Usually, the notification must state who is responsible for the construction work (building surveyor) and who is executing it (contractor). In Malta a notification of start-up is only required for medium and large construction works. In Luxembourg, before the construction work begins the topographic services of the local authority must set the alignment of the construction. If the work is interrupted for a long period, a notification must also be presented.

In all EU countries, a building permit expires if construction work is not started within a certain period or is not completed within a certain time from the date the permit was granted. An application to extend the period to start or to complete the construction work can be submitted to the building authority. Beyond a certain limit, a new building permit must be applied for.

3.8 Site inspections

To ensure that the construction work is carried out in compliance with the approved building plans, the building permit and the building regulations, inspections on the building site are conducted by public or private parties (or a combination).

In about half of the EU countries, a building surveyor, the designer or both carry out site inspections and decide on which phases they are required. Usually, a control plan is agreed with the developer. Building authorities carry out site random inspections to supervise construction works (e.g. Belgium, Cyprus, Estonia, France, Portugal and Romania) or choose key stages of construction works to control them (e.g. Bulgaria, Czech Republic, Denmark, Hungary, Italy, Lithuania and Malta).

In the other half of the EU countries, building authorities are responsible for controlling construction works and decide the level of inspection they intend to carry out. The extent and type of control by the building authorities usually depends on the difficulty of each construction work and on the expertise of private bodies that take part. The following possibilities were identified:

1) Building authorities assign the control of construction to private parties and agree on a control plan (e.g. Finland, Germany and Sweden).
2) Building authorities select key stages to inspect construction works and may undertake any other inspections as deemed necessary (e.g. the Netherlands, Northern Ireland and England & Wales).
3) Building authorities carry out random site inspections (e.g. Poland).

In all EU countries, public building inspectors, from building authorities, have right of access to building sites and are entitled to carry out inspections. They can examine construction works and can request explanations and documents. During site inspections, all parts of the construction work can be inspected. Usually, for each examination the public building inspector provides a report. If construction works take place without a building permit or do not comply with the approved design, they can be suspended until the relevant local authority takes a decision regarding demolition or continuation. Should this happen, the developer may be also sanctioned to pay an administrative fine and the relevant indemnities for damages caused.

In most EU countries, major and minor design changes are possible during construction work. Changes that do not concern zoning demands, prescriptions of the building permit or the building's use are minor and can be declared at the end of construction work. For substantial variations, a formal procedure is required before proceeding with construction work.

In several EU countries, a construction log-book to record daily progress of the construction work is maintained. This book must be accessible at the construction site to public building inspectors.

3.9 Completion

Once the construction work has been completed, the building authorities are usually notified (i.e. completion notification). Several documents may be required for completion, such as, the building design with the works actually carried out; reports of site inspections; the construction log book; and liability declarations by the contractor, building surveyor or designer. In these declarations, signatories attest that the construction work has been carried out in accordance with the approved design and, where applicable, changes comply with the applicable legal and regulatory requirements.

In about half of the EU countries, a final site inspection, conducted by the building authorities and other authorities, is required (e.g. Bulgaria, Cyprus, Czech, Republic Finland, Hungary, Luxembourg, Romania and Spain) (Table 13). The purpose of the final site inspection is to verify whether construction works actually carried out comply with the building regulations, the approved building design and the building permit.

In the other half, the building authorities rely on declarations by the private bodies that conducted the building work or the site inspections and they do not perform a final site inspection (e.g. Austria, Denmark, Ireland, Portugal, Slovenia and Sweden). Even if not required, the building authorities may decide to carry out a site inspection. It usually happens when there are deficiencies in the documentation delivered or doubts about the reliability of the agents involved in the construction work.

Table 13. Is a final site inspection conducted by building authorities required?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Required			■	■	■			■	□			■					■					■			■				
Not required	■					■			□				■								■			■		■			
No information		■					■			■	■			■	■	■		■	■	■			■				■	■	■

The exception to this division is France, where a final site inspection is only required for buildings open to the public (e.g. hotels, hospitals, housing for the elderly, theatres and shopping centres) and very high buildings (i.e. residential buildings higher than 50 m and all other buildings higher than 28 m).

If satisfied with the final site inspection or with the documentation, which attests that the construction work was carried out in accordance with the approved design, the building authorities may issue or approve a document certifying that the construction work was successfully completed (i.e. a completion certificate) or that it can be used for the intended purpose (i.e. a use permit). In almost all EU countries, it is mandatory to obtain a completion certificate or a use permit after the construction is completed (Table 14). The following are exceptions to this rule:

1) In Belgium, France, the Netherlands and Poland a use permit has to be issued before buildings open to the public can be taken into use.
2) In Ireland, contractors are responsible for issuing the completion certificate at request of the builder/owner.
3) In England & Wales there are two possibilities. In the procedure operated by local building authorities, the applicant may request a completion certificate, provided that the request is submitted with the initial application for plan approval. In the procedure operated by approved inspectors, when the work is completed, the approved inspector must issue a final certificate to the local authority that may reject it.

Table 14. Is a completion certificate or a use permit issued after the construction is completed?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Statutory obligatory	■		■	■		■	■	■		■		■		■		■	■				■	■	■	■	■	■	■	■	□
For certain types of construction works		■							■										■	■									
Only at request of contractor or owner													■																□
No information					■						■				■			■											

In almost all EU countries, a building can be taken into use after a use permit or a completion certificate is granted (Table 15). There are some exceptions to this rule:

1) In Austria, the building may be taken into use after a notification of completion has been submitted to the municipal authority.
2) In Denmark, buildings may not be taken into use without a use permit, but small buildings (e.g. single-family houses) are exempt.
3) In France, buildings may be taken into use after notice of the contractor that the construction work is completed, but for buildings open to the public and very high buildings a use permit has to be issued before it can be taken into use.
4) In the Netherlands, a use permit is not required, but buildings open to the public may only be taken into use after a use permit is issued.
5) In Poland, buildings may be taken into use after the building authority is notified of the completion of the work, but in certain cases a use permit must be obtained.

Table 15. When can a building be taken into use?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
After notification of contractor									▱																				
After notification to building authorities	■																			▱									
After use permit or completion cert.			■	■	■	▱	■	■	▱	■		■		■					▱	▱	■	■	■	■	■	■		■	
No limitations		■				▱													▱											
No information											■		■		■	■	■	■									■		■

3.10 Fees

In all EU countries, the applicant has to pay a fee to obtain a building permit. However, there is a wide range of variety concerning how the value of fee is determined (Table 16). The following combinations of criteria were identified:

1) Construction cost (e.g. Denmark, France, Italy, Romania, Slovenia and Spain).
2) Construction cost, floor area and type of construction (e.g. Latvia and Lithuania).
3) Cubic meters of construction (e.g. Luxembourg).
4) Floor area and building use (e.g. Austria and Bulgaria).
5) Fixed fee per building use (e.g. Czech Republic, Finland and Poland).
6) Fixed fee plus an additional per floor area (e.g. Estonia).
7) Fixed fee plus an additional per construction cost (e.g. the Netherlands).
8) Fixed fee or floor area, depending on building use (e.g. Ireland).
9) Fixed fee or construction cost, depending on floor area and building use (e.g. Northern Ireland).
10) Fixed fee plus an additional per duration of construction works and floor area, depending on building use (e.g. Portugal).

Beyond the building permit fee, other fees may be required. There is also a wide range of variety in the EU countries weather fees are required for pre-consultation, submitting an application, site inspections or obtaining the use permits. Furthermore, in some EU countries, there is an additional fee if the building is located in an area without an approved land development plan or if construction works to provide urban services must be carried out (e.g. Portugal and Sweden).

One aspect is identical in almost all EU countries: no building permit is granted and no construction work can be carried out, unless and until the appropriate fee or contribution has been paid.

Table 16. How are fees determined?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Construction cost				■		■			■					■	■	■			■			■		■	■		■		
Floor area	■		■				■						■		■	■					■						■		■
Building use	■		■		■			■					■		■	■		■		■	■						■		■
Fixed fee					■		■	■					■						■	■							■		■
Other criteria				■													■	■			■								
No information		■								■	■	■											■			■		■	

3.11 Procedure times

In the majority of the EU countries there are fixed procedure times in which the permit has to be issued (Table 17). The building authorities may extend the maximum procedure time for special situations (e.g. listed buildings, buildings located outside the development boundary of a local plan, complex buildings and major cities) in several countries (e.g. Czech Republic, France, Italy, France, Malta, Portugal and England & Wales). In other countries the maximum procedure time may be shorter if designs are certified by a design auditor (e.g. Bulgaria) or if the procedure is operated by approved inspectors (e.g. England & Wales).

For most of these countries, the maximum procedure time ranges from 8 to 12 weeks. Some countries are exceptions to this rule, as follows:

1) In Austria, maximum procedure times vary by state.
2) In Bulgaria, maximum procedure time is shorter if designs are certified by a design auditor.
3) In Estonia and Lithuania, maximum procedure times are short (due to phasing all times might not have been added).

4) In Italy and, particularly, in Portugal, maximum procedure times are long, which is a common reason for complaint (one should take into consideration that these are combined procedures) (vd. 3.3).
5) In Malta, maximum procedure time is extended if buildings are located outside the development boundary of a local plan.
6) In England & Wales, according to the procedure operated by local building authorities, the maximum procedure time is short, which is probably due to the separation between planning and building permit.
7) In England & Wales, according to the procedure operated by approved inspectors, the only statutory delays are created by the periods allowed for local authorities to reject the initial notice and the plan certificate.

In the remaining EU countries, no maximum times have been set. The justification for this option is that the time taken can vary considerably depending on the complexity of the construction work, the quality of the application and the use of design auditors.

Table 17. What are the maximum procedure times in which the permit has to be issued?

	Austria	*Belgium*	*Bulgaria*	*Cyprus*	*Czech Republic*	*Denmark*	*Estonia*	*Finland*	*France*	*Germany*	*Greece*	*Hungary*	*Ireland*	*Italy*	*Latvia*	*Lithuania*	*Luxembourg*	*Malta*	*Netherlands*	*Poland*	*Portugal*	*Romania*	*Slovakia*	*Slovenia*	*Spain*	*Sweden*	*UK - Northern Ireland*	*UK - Scotland*	*UK - England & Wales*
Time is set (in weeks)	*8 to 24*	*11*	*6 or 11*		*4 or 8*		*3 or 6*		*8 or 12*	*8*		*8*	*12*	*10 or 18*		*3*		*12 or 26*	*12*	*9*	*25 or 31*	*8*		*8*	*8*		*8*		*2 or 8*
Time is not set				■		■									■		■						■			■			
No information								■			■																	■	

There is not a pattern as to what happens if deadlines are not met (Table 18). The following approaches are adopted in different EU countries:

1) The building permit is automatically granted (e.g. Germany, Lithuania, Romania and Spain).
2) The building permit is automatically refused (e.g. Belgium, Italy, Northern Ireland and Scotland).
3) The applicant can appeal to a higher authority (e.g. Austria, Portugal and Slovenia).
4) The applicant has to wait for the decision (e.g. Czech Republic).
5) The applicant can claim the dispensation (e.g. Ireland).

Table 18. What happens when deadlines are not met?
(maximum procedure time is not set in shaded countries – vd. Table 14)

	Austria	Belgium	Bulgaria	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK - Northern Ireland	UK - Scotland	UK - England & Wales
Permit granted									■	■						■						■			■				
Permit refused		■												■													■	■	
Other	■				■				□				■								■			■					
No information			■				■	■			■	■						■	■	■									■

In France, if the applicant does not receive a response within the maximum procedure time, then the application for the building permit has been approved (i.e. tacit approval). However, in some cases (e.g. building located in a conservation area or a natural park, building subjected to public survey) the applicant cannot assume a tacit approval.

During the last 10 to 15 years, the maximum procedure times have been shortened in several EU countries (e.g. Bulgaria, Czech Republic, France, Germany, Ireland, Lithuania, Portugal and Slovenia). For the near future, no further changes are expected in this respect in most EU countries, with the exceptions of Czech Republic and Lithuania where the procedure times may be extended due to more complicated procedures. When compared with other EU countries, Czech Republic and Lithuania countries have shorter procedure times.

3.12 Objections

In some EU countries, neighbours and other parties have the legal right to object to a building permit or to a planning permit being granted to a construction work. In other EU countries, third parties do not have an automatic right to object, but can provide the building authorities with information that they feel may have a material effect on the outcome of the application. Objections and information must be based on an objective impairment of legal rights or on an infringement of the planning instruments or building regulations. The building authorities take objections and information into consideration for the final deliberation.

In almost all EU countries, objections and information can be presented to the building authorities during the plan approval phase or before the final permit has been issued. In France

the objections must be presented within 2 months after the day when the notice that the building permit was granted is displayed on the property.

To inform third parties, in some EU countries it is mandatory to inform neighbours about an intended construction work (e.g. Belgium and Finland) or to make public the application to a building permit by suitable means (e.g. Italy, Malta, Portugal). In England & Wales, neighbours must only be notified if the construction work is close to or directly affecting the boundary or party wall of a premise. Complementary, in some EU countries a copy of any application for a building permit is available for inspection by the public at the building authorities (e.g. Malta and Portugal) and major construction works may be subjected to a hearing period (e.g. Portugal).

4 Conclusions and discussion

4.1 Main differences and similarities

The organization of a regular building permit procedure is similar in EU countries. The usual procedure includes the following steps:

1) During a voluntary pre-consultation, applicants can discuss with the building authorities planning demands, aesthetics and technical requirements.
2) Phasing the building permit procedure is possible to avoid developing a fully worked out design before the preliminary design has been checked.
3) Statutory submission demands determine the documentation to submit with an application; information about building regulations and permit procedures is available through the Internet.
4) During plan approval, the compliance of the building design with submission, planning and aesthetic demands, as well as with technical requirements is checked; plan approval usually takes 8 to 12 weeks.
5) Neighbours and other parties can raise objections to a building permit being granted during the plan approval phase or before the final permit has been issued.
6) Construction works can begin after the building permit has been granted by the building authorities, but there are strategies to allow an early start of the construction; total or part of the building permit fees must be paid before construction works can be carried out.
7) Building authorities must be notified before construction works start; the building permit expires if construction work is not started within a certain period or is not completed within a certain period since the date it was granted.
8) Site inspections are carried out to ensure the compliance of construction works with the approved building design, the building permit and the building regulations.
9) During construction, minor design changes are possible and can be declared at the end of construction work; for substantial variations a formal procedure is required before proceeding with construction work.
10) Public building inspectors are entitled to carry out inspections and if construction works take place without a building permit or do not comply with the approved design, they can be suspended.
11) Once construction is complete, a final site inspection is conducted and documentation that attest the compliance with the building design is submitted to building authorities.

12) If satisfied, building authorities issue a completion certificate or a use permit; the building can be taken into use after a use permit or a completion certificate is granted.

However, there are several differences between countries concerning detail aspects of the building permit procedure. The following differences were identified:

1) Agreements and information provided during pre-consultation are only binding to building authorities in some countries.
2) There are different levels of implementation of electronic case handling of the building permit.
3) Permit procedures for planning demands and technical requirements may be separated or combined.
4) Phasing the permit procedure is only statutory available in some countries; different strategies are used to divide the building permit procedure in phases.
5) The right to object to a building permit being granted is only laid down by law in some countries.
6) Different criteria are used to allow an early start of construction works.
7) The value of the building permit fee is determined by different criteria.
8) In addition to the building permit fee, other fees may or may not be required.
9) When maximum procedure times are not met by the building authorities different consequences can result.
10) A completion certificate or a use permit issued may not be required when the construction is finished.

4.2 Main types

As described above, the organization of the regular building permit procedure is similar in the different EU countries. No substantial differences were found in continental Europe countries.

The United Kingdom countries, and particularly England & Wales, are those that present more deviations from the common pattern. The following distinctive characteristics were identified:

1) There is a specific type approval procedure.
2) Planning permit and building permit are separated, and there is also the possibility to phase the building permit procedure.
3) Full electronic case handling of the building permit is already available.
4) The applicant can choose to have plan approval and site inspections conducted by either building authorities or approved inspectors.
5) Construction works may start soon after submission of the application, not having to wait for plan approval.
6) Maximum procedure times are shorter than the average.

All these characteristics have in common the aim of reducing the burden of administrative aspects, while ensuring good levels of compliance.

4.3 Trends and developments

In the last 10 to 15 years, the dominant trends identified in the building permit procedure were a decrease in the types of construction works submitted to building authorities control during plan

approval, and a reduction of building permit maximum procedure times. Building authorities' control during the construction phase remains unchanged. Altogether, there is a movement towards simpler and faster building permit procedures.

For the near future, no major changes are expected in the building permit procedures.

4.4 Lessons to be learned

The analysis provided a global picture of the building permit procedure of the EU countries. The results can be useful for situating the procedure of each country within the EU panorama, assessing the main trends and developments and guiding strategic choices on possible improvements in each country.

A comparative analysis of the EU countries regarding organization and formulation of technical building regulations, tasks and responsibilities in the building control systems and building permit procedure has been accomplished. To complete this comparative study of the regulatory systems of EU countries, an analysis focusing on the quality demands of public and private building-control bodies is still required. Furthermore, the analysis of regulatory systems should proceed with studies about the performance of each type of system in terms of adequacy, efficiency and effectiveness.

In an overall analysis, many differences were identified in the building permit procedure of the EU countries. These differences constitute a barrier to the free circulation of people and services. Additional uniformity among building permit procedure would contribute to the establishment and functioning of a single market for services in the construction industry, in which designers, developers and builders are no longer limited to working in national markets.

5 Acknowledgements

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Constructing Corporate Social Responsibility: Encouraging CSR through Legislation and Regulation

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Abstract:

This paper reports on the results of a series of interviews with industry leaders in the Australian construction industry, which explored industry perceptions of Corporate Social Responsibility (CSR), along with some of the barriers and facilitators for its adoption in the industry. The Australian construction industry has been accused of being "socially irresponsible" and some have argued that, compared with other industries, the building and construction industry is lagging behind in embracing the new paradigms of environmental sustainability (Fraser 2007). As such, the Australian construction industry is well-positioned to provide an interesting case study of the issues associated with instigating change in relation to CSR. This paper discusses the findings of this pilot research project, with a particular focus on implications for improving CSR in small to medium sized enterprises (SMEs) in the construction industry and what role (if any) can be played by legislation and regulation. The results suggest that a combination of harder legislative measures and softer approaches designed to build on the informal approaches of SMEs, would be appropriate to encourage the development of CSR in the industry.

Keywords:

Australia, construction, Corporate Social Responsibility (CSR), legislation, Small to Medium Sized Enterprises (SMEs)

1 Introduction

This paper reflects on the results of a preliminary research project, conducted at the University of South Australia, on CSR in the Australian construction industry. The project was designed to gauge the current level of understanding of CSR in the construction industry and explore how it was being applied (if at all) in SMEs in the Australian Construction Industry.

The paper begins by describing the background in which this research took place, with particular reference to the current status of CSR in the Australian construction industry. The authors then outline the methodology and results of the research, before embarking on a discussion of the implications of these results. The paper explores how CSR is understood in the industry and

more generally in the research literature in this field. We then discuss the implications of the research findings in terms of the implementation of CSR in the Australian construction industry and what role (if any) can be played by regulation and legislation in encouraging its uptake.

The results suggest that a combination of measures and approaches would be appropriate to encourage the development of CSR in the industry. Such measures might include the introduction of mandatory reporting mechanisms and standards, an industry-wide code of ethics, and business incentives, along with other means of soft-regulation. Attention should also be paid to the clarification and simplification of existing legislation to improve compliance and further encourage CSR in the industry. These measures would be enhanced by informal initiatives designed to capitalise on the preference for informal CSR practices, which may be better suited to an environment populated by SMEs. Such initiatives might include improved education around the concept of CSR, a focus on the role of small business champions for CSR and mechanisms for networking and exchange of information between firms. Further research may assist in determining the best form for such initiatives to take and which are more likely to succeed, as well as enabling a more nuanced understanding of how the applicability and effectiveness of such measures is likely to vary across the states and territories, industry sectors and different size businesses.

2 Literature Review

CSR has proven notoriously difficult to define with multiple understandings of the concept existing in the literature. However, in the context of construction, CSR can be defined as "the commitment to integrate socially responsible values and concerns of stakeholders into their operations in a manner that fulfils and exceeds current legal and commercial expectations" (Constructing Excellence 2004). While acknowledging that CSR is about more than legislation and regulation, this definition clearly indicates that they have a role to play in encouraging CSR in the industry. This paper seeks to explore how this role is currently being played in the Australian context, along with making some suggestions for future improvements.

As argued previously, (Chiveralls et al. 2011) the Australian construction industry has a poor reputation in terms of CSR. A recent study by Lingard et al. (2009: 378) concluded that the Australian construction industry is "fraudulent", "corrupt" and "socially irresponsible", With an average of 49 workers having been killed on Australian construction sites each year since 1997, construction is Australia's third most dangerous industry (Fraser 2007). The Industry has been the subject of two controversial Royal Commissions (Gyles et al. 1992; Cole 2003). The final report of the Cole Royal Commission claimed that the industry was characterised by a pervasive "culture of lawlessness" (Cole 2003). However, this Commission has since been dismissed by some as an anti-union "political stunt" designed to boost the popularity of the then Liberal National Coalition Government (Lingard et al. 2009: 367). Nevertheless, the findings have clearly had an impact on perceptions of the industry, with the industry often being described by outsiders and in the media, as being populated by a bunch of "cowboys", with no regard for the law (e.g. Bainbridge 2010). As part of the gendered mythology of the industry, it is likely that this image obscures as much as it exposes, as in reality the industry is neither the cowboy hero nor the villain (Miller, 2004).

However, there is evidence that that the construction industry may be more socially responsible than it is generally given credence for and, at the very least, is beginning to make improvements in its commitments to CSR. For example, a recent report by the Australian Centre for Corporate Social Responsibility (ACCSR) found that the property development/construction industry recorded a slightly above average CSR budget relative to other industries (ACCSR 2011). It remains uncertain how these figures apply to SMEs and whether they are an accurate reflection of practice on the ground. Nevertheless, the report indicates a growing concern in the industry to improve its CSR performance. It is clear that the performance of the construction industry is crucial in addressing the economic, social and environmental sustainability of Australian cities. This is particularly the case as the pace of urbanisation, resource depletion and pollution increases. The construction industry produces physical infrastructure that alters our natural and built environment and helps to determine the nature, function and appearance of our cities, towns and regional areas, along with contributing to the formation of communities (Robinson et al. 2006; Myers 2005). In the process, it consumes materials and resources, changes the natural and built landscapes, emits pollutants, and impacts on the lives of communities both inside and outside of its structures (van Wyk & Chege 2004).

The industry has the potential to be a significant contributor to sustainability as a major driver of activity in the Australian economy. The building and construction industry made up 6.4 per cent of Australia's gross domestic product in the years 2005-06 with total activity during this period valued at $95.8 billion dollars, an increase of 13 per cent over the previous year (Zillante 2007). The construction industry also provides employment that underpins social and economic sustainability. In 2006-07, the industry employed 917,600 workers (4.7 per cent higher than the previous year), which represented approximately 8.7 per cent of all employed persons in Australia (ABS 2008). The majority of construction industry employment during this period was in construction trade services (633,500 people or 69 per cent), which includes those engaged in earthmoving, concreting, bricklaying, roofing, plumbing, electrical, carpentry, painting, glazing and landscaping (ibid). However, the above figures are likely to be impacted by the recent contractions in the global economy caused by the global financial crisis. In order to harness its full potential, the industry will need to adapt in order to face new challenges, including addressing the matter of CSR and sustainability.

The performance of the construction industry in terms of CSR and sustainability also has significant implications in terms of environmental impacts as this sector consumes large quantities of energy derived from fossil fuels (Zuo & Zillante 2008). A study by Pricewaterhouse Coopers (2008) estimated that the construction industry accounts for half of all resource usage and up to 40 per cent of energy consumption. This energy is consumed during the whole life cycle, including the construction phase, the operation phase and during the process used to manufacture building materials (Pullen et al. 2006). Other related environmental issues include the reduction of CO2 emissions, minimizing of construction and demolition waste, and prevention of indoor air pollution (Alnaser & Flanagan 2007).

Due to the significance of the industry's impacts in terms of economic, social and environmental sustainability, there is a considerable need for quality research which explores the barriers and drivers towards the implementation of CSR in the industry across these three dimensions and beyond. We encourage academics of various disciplines to take up this research agenda with some urgency. While a number of studies have already been conducted on CSR in Australia (e.g.

Quazi & O'Brien 2000; Anderson & Landau 2006), few studies have been undertaken to investigate CSR in the construction industry, especially in the Australian context. The majority of these studies focus on ethical behaviour within the built environment (e.g. Bowen et al. 2007; Liu et al. 2004; Suen et al. 2007). While not based on empirical research, there are also other studies which explore CSR from a construction management perspective (e.g. Barry 2003; Barthorpe et al. 2004; Rameezdeen 2007; Wilkinson et al. 2004). While Murray and Dainty (2009) provide a useful overview of the CSR concept in relation to the construction industry, their work is not prescriptive and with the exception of Lingard et al.'s (2009) chapter, is not focused on the specific context of the Australian industry.

As we have argued elsewhere (Chiveralls et al 2011), the structure of the construction industry differentiates it from other industries which may have already progressed down the CSR route. The existing knowledge of CSR in the construction industry mainly comes from studies of large enterprises, many of which have taken action to address social and environmental issues (see Bovis Lend Lease n.d.; Colliers International 2008; Stockland 2008; Jones et al. 2006; Douglas et al. 2006; Petrovic-Lazarevic 2008) However, due to its use of the subcontracting approach, the Australian construction industry is overwhelmingly made up of small to medium sized firms. These SMEs contribute most of the industry's output and account for 99 per cent of the total number of enterprises (RCBCI 2002). As identified by Cole (2003) 36 per cent of all people employed in construction work for subcontractors and of these 94 per cent employ fewer than five employees. Therefore, any overall performance improvement of the industry is significantly influenced by the performance of SMEs and their subcontractors (Sexton & Barrett 2003). Considering the key role SMEs play in the construction industry, it is imperative to investigate how SMEs can be better engaged in the CSR implementation process. This research addresses a significant gap in the literature in exploring current CSR practices in SMEs in the Australian construction industry, and whether these could be improved through legislation and regulation.

3 Research Methodology

This paper reports on the results of a pilot study of CSR in SMEs in the South Australian construction industry. As outlined elsewhere (Chiveralls, 2011) the pilot study involved an extensive literature review, along with the conduct and analysis of 10 semi-structured interviews on CSR with the directors or senior members (as senior as it was possible to arrange) of private sector building construction companies in the South Australian Construction Industry, within suburban and metropolitan Adelaide, which could be considered to be SMEs. While there is no clear definition of SMEs globally, it is generally acknowledged that SMEs employ less than 250 staff (Egbu et al. 2005). Six of the companies interviewed employed less than 50 employees (four of which employed 20 or less at 1, 2, 11 and 20 respectively), two employed between 50 and 100 and two between 150 and 250 employees in SA. However, it is noteworthy that while the rest of the companies operated primarily in SA, the three companies with the highest number of employees in SA, had recently expanded and commenced interstate operations and as a result had more than 250 employees Australia wide (at around 260, 300 and 600 respectively). As such, the team debated over whether they should be included in the sample as SMEs. However, as they employed less than 250 employees in SA and their inclusion provided an opportunity to explore how the expansion of SMEs may impact on their approach to CSR, we determined they should remain in the sample.

This pilot study will be used to gather support for a much larger research project, which we plan to conduct to expand on the limitations of this research. In the future we hope to expand this research across Australia, to enable us to gain a wider picture of experiences in the industry across the nation and explore differences between the states. As this study was subject to limited coverage (located primarily within SA) and duration, findings are preliminary only.

Participants were recruited through snowballing, beginning with contacts from companies known to the School of Natural and Built Environments at the University of South Australia. Participants were contacted via email, provided with an information sheet and consent form about the project and asked if they would be willing to participate in an interview of around one hour's duration at their place of work.

Interviews consisted of around 10 questions on CSR covering topics such as: participants' understanding of CSR; major social impacts of the construction industry; relevance (if any) of CSR for their company, CSR initiatives adopted by their company; effectiveness of initiatives; and barriers, successes and drivers to implementing CSR for SMEs in the South Australian construction industry.

Interviews were noted, transcribed and analysed using the qualitative data analysis program NVivo® to highlight common themes and insights from the interview data. A qualitative approach to the research seemed appropriate, given the limited scope and duration of the project and our desire to explore in-depth the current understandings of industry leaders. While a full analysis of these results is beyond the scope of this paper, the results and discussion presented below focus on the implications of our findings in terms of barriers and facilitators to the implementation of CSR in the Australian Construction Industry and what role (if any) can be played industry regulation and legislation.

4 Findings and Discussion

4.1 Understanding CSR in the Australian Construction Industry

One of the main aims of this preliminary research project was to explore how CSR was currently understood by senior members of SMEs in the industry. As discussed previously (Chiveralls 2011), the results of our preliminary research project suggested that a lack of knowledge and awareness of the concept is one of the main barriers to the adoption of CSR by SMEs in the industry. These results reinforce the findings of the ACCSR (2007) which identified a general lack of awareness of CSR within the organization as one of the main barriers to CSR success. Without exception, every person interviewed expressed some level of confusion over the meaning of the term CSR. When being asked about what CSR meant to them or how they understood the concept, interviewees replied with variations of "I really don't", "I'm not sure", "Well I haven't given it a lot of thought I can tell you" or "I was hoping you might tell me". One participant remarked that when they see the abbreviation CSR they don't think of Corporate Social Responsibility but of a company called CSR Building Materials. Another commented:

> After 30 years experience at all levels in my industry, really any thoughts about corporate social responsibility...up until this point in time have never really entered into my head.

Despite obvious levels of uncertainty and an apparent lack of knowledge about the concept, most interviewees seemed eager to discuss the concept and interested to hear about how it might apply to them and the everyday practice of their businesses. Through discussion of examples of CSR initiatives in the companies they worked for and how these related to the wider social impacts of the industry, much of the initial trepidation in discussing the concept was overcome, revealing a more nuanced and complex understanding of the concept than first imagined. On reflecting on the meaning of the term, interviewees provided a wide range of responses, commensurate with the variety of definitions and theoretical understandings of the concept. Participants also described a wide variety of initiatives and practices as falling under the banner of CSR and all participants were able to describe at least one practice in their organisation that they could relate back to CSR. These responses and initiatives will be analysed and discussed in detail in future papers. As discussed in previous papers, our results clearly suggest that a lack of understanding of CSR is contributing to a fragmented and ad-hoc approach to its implementation in SMEs in the Australian construction industry (Chiveralls et al. 2011). However, in this paper, we focus our analysis of research results on the barriers and drivers to the implementation of CSR and what role (if any) can be played by legislation and regulation.

4.2 Improving CSR in the Australian Construction Industry through Formal Regulation

The current state of regulation of CSR in the Australian construction industry can best be described as a state of soft regulation. This approach has accordance with dominant perspectives which view CSR as a primarily voluntary endeavour that should not be allowed to interfere with the other objectives of business (Green 2009). Soft regulation approaches include the establishment of voluntary standards of behaviour and encouragement for voluntary action, for example through social standards such as accountability 8000, the European Corporate Sustainability Framework and the International Standards Organisation's ISO2600 standard on social responsibility published in November of 2010. As pointed out by Lingard et al. (2009), a formal framework for CSR in Australia has been published in the form of Standard AS800302003 (Standards Australia 2003b). The standard forms part of a suite of Australian standards relating to corporate governance, which also includes standards on corporate fraud, corruption control and whistle-blower protection programmes, and is designed to provide guidance for organisations to establish, implement and manage CSR programmes. While the standard references Australian Standard AS8306-1998, which outlines principles for effective compliance programmes to promote compliance with laws and regulations, application of the standard remains voluntary and is unlikely to be widespread in the industry (Lingard et al. 2009).

This contention was supported by our preliminary research findings in that only one of the SMEs involved in the study (the largest in the sample) had an official policy document which mentioned the term and none had official policies dedicated to CSR. A couple of interviewees described CSR practices in the organisation with reference to official policies in other areas (like Occupational Health and Safety [OH&S] and the Environment). For example, one participant stated that he didn't see a need to have Australian standards on CSR because it was already covered by areas like Quality, the Environment and OH&S, which all had Australian Standards which their company utilised. However, the companies that fell into this category were the largest companies in the sample, and most interviewees who expressed support for CSR, tended to describe it as a kind of informal "business culture". Jenkins (2006) also found that SME were

more likely to be characterised by relationships established on a more informal trusting basis and characterised by more personal intuitive engagement. It may be this informal nature which makes SMEs more resistant to regulation and "less inclined to use formal instruments (such as codes of conduct) to foster ethical behaviour within the organisation" (Jenkins, 2006: 243). Accordingly, interviewees seemed resistant to the regulation of CSR, particularly through legislation. In fact, interviewees had a clear preference for CSR to exist as an informal, unwritten practice. There was a general sentiment that the industry was already overregulated. Interviewees expressed fears that legislating CSR would threaten the economic survival of their companies, by restricting their ability to vary participation in CSR according to affordability and viability, as determined by their current financial capacity and stage of business development.

However, interviewee comments with regard to the cause of past improvements in the industry revealed contradictions in their attitudes toward the legislation of CSR. The Australian construction industry has shown that it is capable of significant change, having made improvements across a number of areas in recent years. For example, in the area of OH&S, many construction companies now place a high importance on safety (Bovis Lend Lease n.d.; Mohamed 2002; Fraser 2007). In recent years, further change has been embraced to avoid adversarial relationships and a poor contractual culture, which has resulted in improvements with regard to the effectiveness and competitiveness of the industry (Zuo 2008; RCBCI 2002). Interviewees clearly indicated that they thought legislation and regulation played a key role in motivating these shifts. For example, one interviewee commented, that these changes had resulted from an "Australia-wide politically driven process" which had been "enacted through Parliament" as a "factor of government". He stated that people were unlikely to implement change unless it became a governance matter but that once legislation was in place "people run with it". Similarly, another participant commented that a lot of the changes that have happened in the industry occurred because "they've been driven by government and social processes". He stated, "...once it's been enacted we have been able to respond." He explained that because of the competitive nature of the industry, which has very small profit margins, "the only way you will get those kind of changes is through policy – so they are required to incorporate it". However, when asked if he thought there was a similar role for government in legislating CSR, the same participant replied, "No, definitely not. It's [CSR is] what you want to do."

Despite the reticence expressed by interviewees, there is a clear role for legislation in improving CSR performance. While Lingard et al. (2009: 378) state that change will only come about through "general cultural and societal moral and ethical change", they rely on a laissez faire definition of CSR, understanding CSR as a voluntary act (2009: 351). Such a "soft" definition of CSR is at odds with their dismal picture of CSR in the Australian construction industry and one might question how successful voluntary adoption would be in this milieu. If the industry is so behind in CSR practices, it would seem that the informal, voluntary approach to CSR is not working, and that government regulated standards are required. Lingard et al. (2009) could go further in their recommendation that all construction firms, public and private, should adopt the Australian Standard on Fraud and Corruption Control, and recommend regulated, mandatory adoption of CSR standards (Standards Australia 2003c). While none of the companies involved in our research project had official policies on CSR, the fact that a couple of the interviewees stated that they could demonstrate formal compliance with CSR principles by reference to other Australian Standards, suggests that the adoption of the Australian Standard on CSR is far from impossible.

Even without the introduction of mandatory standards on CSR, it could be encouraged indirectly through alteration to planning and regulatory requirements in specific areas. For example, the current National Construction Code (ABCB 2011) does not encourage the use of recycled building materials. One suggested policy mechanism to encourage reduction in volumes of construction and demolition waste is the increase of landfill taxes and introduction of reuse subsidies. Another may be the mandated introduction of sorting bins for recycling on construction sites, perhaps backed by government funding or provision. The drive for legislative change is supported by the findings of a study by Zillante and Zuo (2008), which assessed the awareness of small construction firms of waste management systems. The study concluded that there is not enough pressure on firms to create behavioural change. While in the past, legal commitments have mainly been allocated to contractors, research suggests that compulsory measures are necessary to ensure that all project stakeholders play an active role (Tam et al. 2010).

However, there is also an urgent need to tighten and simplify existing legislation and regulation in order to improve compliance and enable improvements in CSR. For example, in 2004, the Australian Government introduced a mandatory regulation for all new homes across the country to have an energy rating of a minimum of three to four stars. Six years later, this compulsory rating has been raised to a minimum of five stars with Victoria, Queensland, South Australia and the ACT having already moved to a six-star rating (Western Australia is due to follow suit next year). However, the star ratings have been found to be potentially misleading, with wide variations in their measurement and results and no research or regulation having been developed to prove that they're accurate (ABC, 2011). Similar difficulties have been reported in relation to establishing compliance with regulation for recycled materials (e.g. Tam 2009). Without uniform enforcement of specific codes, specifications, standards and guidelines, it is likely to be difficult for businesses to see investment in recycled materials (including purchasing necessary equipment, planning, checking compliance and convincing clients) as worthwhile (ibid).

A lack of uniform standards and reporting frameworks raises serious issues for accountability and CSR across the industry. The issues discussed above are just two examples of this. Without strict reporting requirements or regulations, there remains a risk that CSR will amount to little more than a marketing tactic or a corporate exercise in "white- or green-washing" (Finger & Kilcoyne 1997; Crowther 2002; Barth & Wolff 2009). These views were also supported by interviewees, who expressed concerns that CSR should be measured/monitored and that people should not be able to make claims about CSR without being able to "prove it".

Interviewees also saw the introduction of targeted business incentives as an effective mechanism for improving CSR in the industry. For example one interviewee remarked:

> The only way smaller size companies are going to do it is if there was a reward for doing it...If big business and government put in rewards for companies to meet some goals then it can happen.

Interviewees frequently stated that government tenders are now looking to see what businesses are prepared to do in terms of CSR and community engagement. For example, one interviewee stated that if the tender was for a project in an area with a large Indigenous population it would help if the company could demonstrate how the project would help contribute to Indigenous well-being or that the company was committed to improving Indigenous well-being in other

ways. As one interviewee commented, “track record helps” with this process if you are able to demonstrate that you have done this in the past and it is a part of normal business practice rather than just a response to the requirements of the tender. However, at this stage most interviewees argued that this component of government tendering was “not a deal breaker” but was likely to “value-add” to the tender and “give you an edge”.

The Australian Government has also introduced business incentives which indirectly encourage CSR in the industry. For example, the Federal Government established the Australian Government Building and Construction OH&S Accreditation Scheme which is administered by the Office of the Federal Safety Commissioner. The scheme requires that all construction contractors engaged on public sector construction projects have satisfactory levels of OH&S performance and management processes and establishes strict accreditation requirements for all head contractors engaged on government agency contracts (Lingard et al. 2009). While the scheme creates a strong business incentive for the implementation of CSR in relation to OH&S, the dominance of the private sector restricts the impacts of such schemes on the industry as a whole. For example in 2002-2003 the reported income of construction business in Australia was $140.9 billion, of which only 11 per cent was accounted for by federal state and local government organisation, with the householders and other organisations accounting for 82 per cent of this income (Lingard et al. 2009).

In order for such schemes to have a dramatic impact on CSR performance in the industry, they would need to be extended to the private sector. The increase and introduction of further levies for landfill and subsidies for the use of recycled materials is just one example of how government could introduce business incentives which encourage the improvement of CSR across the industry (Tam 2009). Consumer demand is also likely to play a significant role in determining levels of CSR adoption by companies in the industry. Thus, efforts aimed at cultural change must focus not only on the industry, but also on clients and the general public. For example, evidence suggests that negative perceptions and lack of information regarding reused products from a client’s perspective tend to hinder its use in the construction industry (da Rocha and Sattler 2009). Accordingly, education, training and the provision of accurate information and adequate support structures are key elements in enabling improvements in CSR in the industry.

4.3 Informal Mechanisms to Improve CSR in the Australian Construction Industry

The legislative measures discussed above would clearly be enhanced by initiatives which seek to build on the informal approach to CSR adopted by SMEs and capitalise on the CSR “business cultures” they have already developed. For example, the main drivers to CSR identified by interviewees were proprietor motivation and business culture. These findings support those of the ACCSR (2007) which identified lack of management support as another major obstacle to CSR success. For example, one participant commented that SMEs need someone in their organisation that “has a heart for the community” and that this “has to be genuine or it won’t work”. These findings are supported Jenkins’ (2006) argument about the importance of proprietor motivation in driving CSR. In his study of “Small Business Champions” in the UK, Jenkins (2006: 251) argued that:

> In order for CSR to work in a company, it must have an internal champion; top-level management commitment is crucial to its success.

As in Jenkins' study, we found that in all of the companies interviewed, the senior partner or owner-manager were seen as directly responsible for directing CSR principles and "moulding the company culture in their own beliefs" (ibid). For example, one interviewee remarked that the "value system starts at the top" and permeates down the businesses with managers and senior managers "to make sure CSR is part of the culture and the value system." Similarly, interviewees also mentioned the importance of getting 'buy-in' from the employees. One manager stated "I couldn't do it if I didn't have others around me that cared also". Various strategies were discussed to increase employee attachment to CSR, including involving them in CSR decisions and targeting initiatives of immediate interest to employees. Effective CSR strategies should seek to involve and motivate owner-managers and encourage them to integrate CSR into their "business culture" as part of "the way we do business". As argued by Jenkins (2006:253):

> SMEs can also exert pressure themselves through the supply chain by championing CSR and encouraging suppliers and customers to adopt socially and environmentally responsible behaviour.

Initiatives to improve CSR performance in the industry also need to take into account the specific barriers and pressures faced by SMEs. Our research found that the major barrier to CSR identified by interviewees was cost in terms of time and money. These findings again support those of the ACCSR (2007) which identified limited financial and human resources as the final major barrier to CSR success. Interview responses confirmed Lingard et al.'s (2009) contention that the focus of SMEs "is often on business survival", and that these smaller companies are unlikely to dedicate the required time and energy into the development of such policies and practices. However, while SMEs are unlikely to have the resources to provide leadership in this area, interviewees frequently acknowledged a willingness to work closely with training and professional bodies to make necessary improvements.

Similarly, there was a clear sense in the interviews that many interviewees saw CSR responsibilities as being more appropriately dealt with by others in the building and construction procurement chain. One participant stated that by the time a building project came down to them, all the important decisions had usually already been made by others involved in the process including: clients, architects, and engineers. As such there was a feeling that the extent to which SMEs and construction companies in general could engage in CSR was "very limited by the other people working on the project." For example, dealing with subcontractors or others involved in the process was the next most commonly identified barrier to CSR identified by interviewees. As one interviewee stated industry structure was a big issue in:

> the way that it sort of sub-contracts most things out these days – in the old days I would provide my own labour that I employed – in the old days it would have been a lot easier to control your impact on corporate social responsibility because you have more control over your resources - but these days it all gets watered down – a builder has so few resources on any job these days that he can't guarantee that...

There is a clear role here for professional organisations and training bodies to assist in promoting a more co-ordinated and unified approach to CSR in the industry. The major employer associations and groups in the Australian construction industry include: the Australian Constructors Association (ACA); Master Builders of Australia Inc. (MBA); Civil Contractors Federation (CCF); Housing Industry Association Limited (HIA); and Australian Industry Group

(AIG) (Lingard et al. 2009). Membership varies from large companies to single person providers and across diverse sectors including housing, commercial building and civil engineering projects (ibid). While Lingard et al. (ibid) identified the fragmented nature of the industry, as reflected in the diversity of professional associations, as a barrier to CSR these same factors also mean that professional associations and bodies have a wide reach in the industry. The establishment of an industry wide code of ethics, incorporating CSR principles, which could be promoted through all professional and training organisations in the industry, would go a long way towards addressing many of the issues with CSR, which result from the fragmentation of the industry. Professional organisations and training bodies also play a key networking role which could be leveraged to promote CSR. Through professional bodies companies could share examples of CSR initiatives and policies they have developed, a process which could be encouraged through the hosting of CSR awards nights. Education and training in relation to CSR is a key issue within the industry, as demonstrated by the lack of knowledge in relation to the topic and one interviewee's comments that they had never attended a lecture or seminar on CSR. One participant suggested that CSR should be one of the subjects taught at University as part of the Built Environment degrees and there is definite scope for them to be included in the seminar series' of professional groups and organisations.

It would also be prudent to involve trade unions in the development, monitoring and implementation of such a code. The Australian Council of Trade Unions (ACTU) consists of 46 affiliated unions representing 1.8 million workers (Cole 2003 cited in Lingard et al. 2009). The Construction, Forestry, Mining and Energy Union (CFMEU) is the largest and most active in the construction industry. Others include the Communications, Electrical, Electronic, Energy, Information, Postal, Plumbing and Allied Services Union of Australia (CEPU); the Australian Worker's Union (AWU) and the Australian Manufacturers Workers Union (AMWU). As pointed out by Lingard et al. (2009), unions have historically played a strong role in advancing CSR in the industry. Unions played a key role during the 'green bans' of the 1970s, when construction workers refused to work on constructions sites which involved the demolition of heritage sites for high-rise developments. Areas saved during the 'green bans' include the Rocks, Centennial Park and the Botanic Gardens in Sydney. Unions have already demonstrated their potential to play a major role in contributing to improvement of CSR adoption in the industry by ensuring there is employee "buy-in", and encouraging compliance with legislation as well as the adoption of informal CSR practices.

5 Conclusion and Further Research

This paper has reported on a preliminary research project which explored how CSR was understood by industry leaders in SMEs in the Australian industry. Our results prompted us to suggest that a combination of measures and approaches would be appropriate to encourage the development of CSR in the industry. Despite an obvious preference among interviewees for CSR to remain as a kind of voluntary and informal "business culture", our research suggests that there is a clear role to be played by regulation and legislation in encouraging the improvement of CSR in the industry. Such measures might include the introduction of mandatory reporting mechanisms and standards, an industry-wide code of ethics, and various business incentives, along with other means of soft-regulation. There is also evidence to suggest that there is a need to clarify and simplify existing legislation to improve compliance and further encourage CSR in

the industry. However, our research suggests that such measures would be enhanced by the introduction of more informal initiatives designed to capitalise on the preference for informal CSR practices among SMEs in the industry. Such initiatives might include: improved education around the concept of CSR and a focus on the role of small business champions, along with mechanisms for networking and exchange of information between firms through professional bodies, unions and training organisations.

Further research may assist in determining the best form for such initiatives to take and which are more likely to succeed, as well as enable a more nuanced understanding of how the applicability and effectiveness of such measures is likely to vary across industry sectors and different size businesses. Future studies on CSR in the Australian construction industry could investigate the differences between the Australian states and territories as there are clear differences in legislative approaches and outcomes in terms of CSR. Research should also seek to provide benchmarks to compare CSR practices and performance across the industry. We recommend the development of a model to assist policymakers and contractors make "socially responsible" decisions and enable the monitoring of the implementation of CSR in the industry. We invite scholars who have an interest in CSR in the construction industry to join us in furthering this research agenda and contributing towards a more economically, environmentally and socially sustainable industry.

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Airtightness of Dwellings in Ireland: Design, Workmanship and Control

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Abstract:

The residential sector accounts for 25% of Ireland's total energy consumption, of which 60% is used for space heating. As thermal insulation standards increase, building air tightness is playing an increasing role in both building energy performance and indoor environmental quality. This paper reports on the results of air tightness testing carried out on a small number of dwellings. The paper highlights the paucity of dwelling airtightness data for Ireland. The results are compared to past studies and compliance with the existing standards. While the number of houses tested is small they are broadly representative of urban dwellings in Ireland. The study indicates a misconception that newer buildings are more airtight than older buildings. The paper concludes that good design, attention to detail and rigorous controls throughout construction is vital to delivering air-tight dwellings.

Keywords:

airtightness, measurements, standards, workmanship

1 Introduction

Twenty five percent of Ireland's total energy consumption is accounted for by the residential sector, 60% being uses for space heating (SEI, 2008). In recent years, improving fabric insulation standards, mechanical efficiencies and a greater understanding of energy use in buildings has augmented the importance of airtightness to building energy performance. Technical Guidance Document Part L (2008) - Conservation of Fuel and Energy (Dwellings) refers to Envelope Air Permeability testing of new dwellings, setting a 'reasonable upper limit for air permeability' of $10m^3/hr/m^2$ at 50Pascals (DEHLG, 2007). This limit is not onerous when compared to standards in other countries, as shown in Table 1 and the increasingly popular PassivHaus standard requiring an n50 of 0.6 air changes per house (ach) (Hodgson and Establishment, 2008). There is

a general awareness of the importance of airtightness and Ireland, but inertia to change has left the concept of air-tight dwellings in the doldrums.

Table 1. Airtightness Standards
(Sourced: Pan, 2010)

	Max air permeability ($m^3/hr/m^2$ at 50Pa)	Max air change rate (ach at 50 Pa)
Ireland	10	
Netherlands		6
Switzerland		3.6
Germany		1.8 - 3.6
Denmark		2.8
Estonian		3
Finland		1

Internationally, dwelling airtightness characteristics have been well researched (see (Sherman, 1987; Stephen, 2000; Pan, 2010), and in particular in the USA where over 70,000 fan pressurisation measurements have been collected and analysed, comparing air tightness in terms of age, size, and construction type (Chan *et al.*, 2005).

However, there is a paucity of real data relating to the airtightness characteristics of existing dwellings in Ireland. There is a common perception that newer dwelling airtightness is better than for older buildings, however, in Ireland due to the lack of empirical data this cannot be confirmed.

The paper reports on airtightness test results for two sets of houses; 1) 7 single family dwellings completed in early 2008, during Ireland's building boom, 2) 4 single family dwellings constructed in the 1980's; two of the houses have been retrofitted.

2 Dwelling Typology

This study focuses on the quantitative data gathered from 11 occupied single family residential semi-detached houses. All dwellings were of similar construction type; each had two-storeys, three bedrooms and load bearing external cavity walls and was naturally ventilated. Ground floors were slab-on-grade with suspended timber first floors. The attic space was of typical cold roof construction with insulation between ceiling joists. The average floor area and volume of the studied houses was $80m^2$ and $217m^3$, respectively. Ventilation was provided by passive wall vents designed with closable hit-and-miss or permanently open louvered vent grilles in each room.

2.1 2008 Dwellings

The 2008 dwellings were part of a development of over 60 dwellings. The buildings had brick outer leaf and block inner leaf wall of 100mm cavity wall construction with full fill bonded bead

insulation, 200mm of attic insulation, gas fired central heating and double glazing. Mechanical extractor fans were fitted in bathrooms. The houses typically have a draught lobby to the front and WC to the rear of the building.

2.2 1980's Dwellings

These identical dwellings were part of a large development. The dwellings which had not retrofitting carried out were typical of houses constructed prior to the implementation of minimum insulation standards in Ireland. The buildings had 100mm masonry cavity walls, with no insulation provided at construction, single glazed windows and no central heating. Nominal 100mm fibre attic insulation placed between the joists had degraded over time, providing little insulation value.

The retrofitted dwelling were identical to the as built dwellings but were retrofitted with double glazed windows and doors, 100mm bonded-bead cavity wall insulation, 200mm glass fibre insulation between and across joists in the attic, and gas fired central heating.

3 Test Procedure

In accordance with the requirements of Part L of the building regulations, the air tightness testing was carried out in accordance with the Air Tightness Testing and Measurement Association (ATTMA) Technical Standard, which is based on EN 13829:2000 "Thermal performance of buildings: determination of air permeability of buildings: fan pressurisation method. The test determines the air flow rate required to maintain a pressure differential of 50 Pascal between the inside and outside of the building envelope. External doors and windows were closed, chimneys and flues sealed, trickle vents, smoke vents and all passive ventilation systems closed but not artificially sealed and internal doors open throughout testing.

A Retrotec Q46 Automated Blower-Door was used to carry out the testing. Pressure and flow rate were controlled using a laptop, connected to a DM-2A Automatic Micro-manometer, which controlled the fan. In addition to the DM-2 the test this software continuously logged a number of parameters including fan flow, test pressure and the area measurements. Prior to testing, dwellings were surveyed and the internal envelope area (A_E) and volume (V) accurately calculated. Software presented the air permeability characteristics in two ways:

1) Air Leakage Index - measured as the volume of air passing through each square metre of building envelope in one hour ($m^3/hr/m^2$);
2) Air Leakage Rate - Air flow rate at a reference envelope pressure difference by the gross internal volume of the dwelling. Unit: air changes per hour (ach)

Both pressurisation and depressurisation were carried out on each house. This takes account for the potential 'value effect' where components may be pushed open during pressurisation and closed down tightly generating a seal during depressurisation. The average of both tests is taken as the air permeability of the house. In addition to the blower-door testing a survey and smoke pencil test was carried out on each dwelling.

4 Test Results

The results of the blower door tests are presented in Table 2. The mean air leakage index of the 2008 dwellings ranged from 6.02 – 13.34 $m^3/hr/m^2$, with a mean of 10.4$m^3/hr/m^2$. Figure 1 graphically demonstrates that 5 from 7 exceeded the Part L 'reasonable upper limit' of 10$m^3/hr/m^2$. The average air leakage index for the two retrofitted dwelling was 5.55 m^3/hr/m2, and 12.53$m^3/hr/m^2$ for the as built dwellings. This suggests that retrofitting dwellings can reduce air-permeability of dwellings by over 50%. It may be suggested that cavity wall insulation has a two-fold benefit, a) improving thermal properties of the dwelling and b) sealing the array of cracks and penetrations through the masonry building envelope. Comparing all results the 2008 dataset was not as good as expected and does not correlate well with Pan (2010) and Chan *et al.* (2005) who found evidence suggesting that airtightness of newer dwellings has increased compared with older dwellings.

Table 2. Dwelling characteristics and test results

Dwelling	Year of Construction	Retrofit	Envelope Area m^2 (A_E)	Internal Volume m^3 (V)	Ave Air Changes @ 50Pa (ACH)	Ave. Air perm @ 50Pa ($m^3/hr/m^2$)
A	2008	No	246	224	6.65	6.02
B	2008	No	246	224	9.02	8.60
C	2008	No	246	224	11.58	10.72
D	2008	No	246	224	11.44	10.90
E	2008	No	246	224	11.84	11.36
F	2008	No	246	224	12.19	11.69
G	2008	No	250	221	13.99	13.34
H	1986	Yes	215	205	5.39	5.14
I	1980	Yes	215	205	6.31	5.96
J	1981	No	215	205	11.66	10.64
K	1981	No	215	205	14.9	14.42

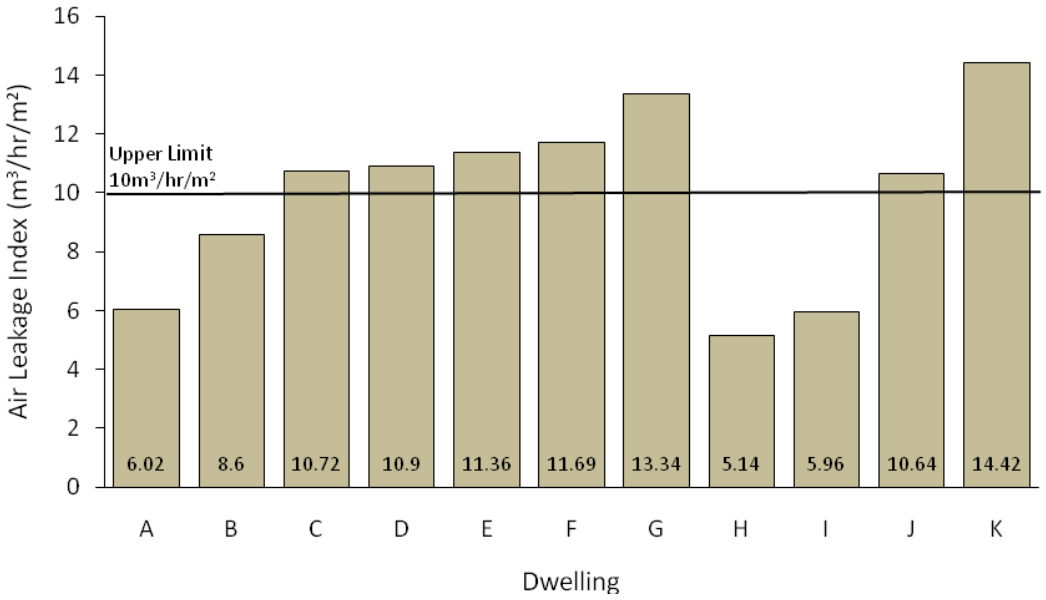

Figure 1. Air Leakage rate comparison with Part L 'reasonable upper limit'

Smoke pencil test observations correlated well with previous research (Sherman and Chan, 2003; Jaggs and Scivyer, 2006) uncovering an array of different leakage paths. Typical leakage locations were junctions between floor and wall at 1st floor level, gaps around attic hatch, letterbox, and leakage through and around windows and doors, penetrations in envelope for plumbing and electrical installations such as light switches and sockets, fire alarms and around waste pipes.

In addition to common leakage paths to all dwelling, the following critical leakage pathways were identified in the 2008 dwellings:

a) Service ducts concealing the soil vent and waste pipes, located inside the building envelope extending from the ground floor, into the attic space. The duct also concealed the pipes from the toilet and sink in the bathroom. Joints to internal walls were not sealed and thus provided longitudinal leakage pathways into the attic space.
b) Windows were not sealed correctly to the window openings and in many cases the draught seal was partly detached from the frame, or completely missing.
c) Many of the wall vent covers were not sealed correctly to the walls, thus leakage pathways remain when vent were closed.

This supports Johnston *et al.* (2004) and Kalamees (2007), findings that workmanship and supervision had a large affect on building airtightness. From the results can clearly be deduced that good design, detailing, specification of materials and construction practice are of fundamental importance when constructing new houses.

5 Conclusions

The field study provides a valuable data set of air tightness measurements for 11 new and 1980's single family dwellings. The outcome of the survey that is summarised below highlights the importance of workmanship and construction detailing in order to achieve the air tightness standards set in current Irish Building Regulations. The field measurements indicate that in the case of retrofitted properties there is a direct link between retrofitting and air tightness.

The key findings are summarised as follows:

The air-permeability of the seven dwellings constructed in 2008 was not as good as expected, with five dwellings exceeding the Part L 'reasonable upper limit' of 10/m^3/hr/m^2 at 50 Pascal. Surveys attributed the high leakage rates poor design and construction of the internal service duct concealing the soil vent and waste pipes. Draft stripping was partially detached from window frames and in some cases was completely missing. Windows were installed such that leakage paths remained between the window frame and external walls.

The results indicate that retrofitting older dwellings can have a significant impact on airtightness. The two retrofitted houses were in excess of 50% more airtight than the two dwellings that had not been altered. The average air leakage index for retrofitted dwellings was 5.55 m^3/hr/m^2, far below the 10m^3/hr/m^2 target.

Comparing the 2008 and 1980's dwellings results show that new dwellings cannot automatically assumed to be more airtight that older dwellings.

Over the past number of years building regulations have improved and best practice documentation produced, however, in practice there is a lack of will amongst building professionals to adopt new practices to improve dwelling airtightness. To overcome this problem designers and builders must be educated about the importance of building airtightness and trained in best practice approaches for both new and existing dwellings. Workmanship must also be closely controlled with airtightness testing undertaken during and post construction. This paper highlights the lack of practical research in airtightness for new and retrofitted dwellings in Ireland. The study should provoke policy makers to enhance the control requirements of on-site workmanship, and designers to be vigilant about the effect particular details can have on airtightness.

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Exploring the Compliance of the Fire Safety Order 2005 amongst Micro and Small Organisations in England and Wales

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Abstract:
Fire safety in buildings can not be underestimated given the grave losses associated with fire incidences. Legislation has been a useful means of ensuring fire safety in buildings, and in England and Wales, the recent introduction of the Regulatory Reform Fire Safety Order (FSO) 2005 has been mentioned to be a positive progression in fire safety standards. However, since its enactment, compliance with the legislation especially among micro and small organisations continues to trail behind expectation. Given that micro and small organisations constitute an enormous proportion of UK organisations and the success of legislation depends on compliance, it is essential to investigate the reasons behind this low compliance. This research thus sought to explore the potential *reasons* for this situation by the use of qualitative interviews conducted with key duty-holders of the legislation: the enforcing authority; responsible persons; and competent persons. The study reveals that low awareness of the FSO in micro and small organisations is at the heart of the low compliance. Also the lack of a recognised formal qualification system for competent persons makes it difficult for responsible persons to appoint competent persons. Beyond this, micro and small organisations prefer to conduct in-house fire risk assessments despite the danger of the lack of understanding of construction materials and technical issues of Fire Safety by responsible persons. This preference is due to the financial burden of engaging a competent person. Furthermore, reduced contact between businesses/building owners and the fire service under the FSO could also be undermining its compliance. Although it can be argued that the FSO is fairly new and as such it requires time to be fully grasped by organisations, the insight provided by this study is useful in the early identification of potentially problematic areas for early redressing.

Keywords:
fire safety, interview, legislation

1 Introduction

With the widely acknowledged catastrophic effects of fire outbreaks in buildings (e.g. loss of lives and property), over the years, it has been found necessary to have measures that would prevent fire outbreaks in buildings and measures that would mitigate their adverse effects. Notably among the measures are fire safety regulations or legislative instruments, and in England and Wales, the recent consolidation of an assortment of previous fire safety legislation into one

regime that is far more accessible has been hailed as a positive stride in fire safety standards (Alalouff, 2006). This recent legislative instrument, known as the Regulatory Reform Fire Safety Order 2005 (FSO 2005), which came into force in England and Wales in 2006 is considered the most significant overhaul of fire safety legislation for seventy years (Alalouff, 2006).

The FSO 2005 radicalised the fire safety legislation by removing the fire certificate scheme, which was introduced under its repealed predecessor, the Fire Precautions Act 1971. The Reform removed the system of fire certification by the Fire Service, and introduced the notion of self certification or a self regulated assessment system to be conducted by building owners or employers themselves. Under the FSO 2005, owners or managers of any non domestic premises in England and Wales are therefore mandated to undertake, review and update a suitable and sufficient fire risk assessment and take proactive steps to ensure the safety of those on or in the vicinity of the property.

Three years after its coming into force a government review of the FSO 2005 indicates that compliance of the FSO 2005 among micro and small businesses continues to trail behind expectation (see Communities and Local Government, 2009). Micro and small businesses play a key role in the UK economy implying that the success of the FSO 2005 will greatly require their input. This study thus sought to investigate the factors responsible for the trailing compliance of the FSO 2005 among micro and small businesses. In the sections that follow, a review of fire safety legislation in the UK is presented to set the premise for the investigation. This is followed by the research methodology adopted for the study. Subsequently, the findings are presented and discussed followed by concluding remarks.

2 Literature Review: Fire Safety Legislation

The very first indications of UK fire safety standards can be traced back as early as the 12th Century when the Mayor of London laid restrictions on construction materials to prevent the rapid spread of fire through the city. The first tangible piece of enacted legislation, however, was the Fire Prevention (Metropolis) Act 1774. The Act classified building types and stipulated minimum standards in respect to thickness of external and party walls. Importantly, the Act also placed requirements on building owners to provide adequate means of escape; a principle still at the forefront of fire safety standards today (FireNet International, 2009). The 19th Century witnessed a number of further legislative developments for specific building types. The series of new Acts reflected Central Government's understanding that different properties and the activities that were conducted within them carried unique fire safety considerations and that these should be covered by individual Acts rather than generic regulations. During the 19th Century, the Government introduced sector specific regulations including the Theatres Act 1843 and the Factory and Workshop Act 1885 (amended 1891).

Positively, the Government's commitment to improving fire safety standards in workplaces and public buildings gained significant momentum through the 20th Century with a key progression being the enactment of the Fire Precautions Act 1971; the fundamental aspect of which was the fire certificate system. As required by the Fire Precautions Act 1971, the Fire Service would conduct periodic inspections of premises providing a service, and subject to compliance, the premises would receive a fire certificate. Cox (2008) supports the Fire Precautions Act 1971 stating that fire certificates were an effective way in achieving compliance as the responsibility

lay with experienced fire service personnel who can be considered experts in the field. At the close of the century, the Government passed the Fire Precautions (Workplace) Regulations 1997 (as amended 1999) which placed additional obligations on employers. The requirement for the fire certificate remained under the new Act, but above and beyond this, employers had additional legal duty including: conducting a suitable and sufficient fire risk assessment which is monitored, reviewed and revised as appropriate; informing staff of any known risks; making staff aware of an emergency plan; and providing mandatory training to new employees as well as periodic training for existing employees.

Fire safety legislation through the centuries naturally developed in a fragmented fashion; primarily as the result of serious fires or recognised "near misses" (Edwards, 2006). The natural result of such progression was a cacophony of polices, statutory requirements and guidance dispersed across multiple Acts and Regulations which obviously had compliance implications. Again the fire certification introduced by the Fire Precautions Act 1971 and retained under the Fire Precautions (Workplace) Regulations 1997 received criticism. For instance, Hill and Webster (2006) explained that the process of applying for a fire certificate could take up to two years, potentially leaving a property at risk. In addition, Baker (2009) admits that although the certificate was a useful point of reference, building owners and employers often hid behind it and conducted no proactive monitoring or reviewing once it had been awarded. Whilst the fire certificate recorded building compliance, it was therefore only a snapshot in time and did not take into account how the property was being used on a day to day basis.

In 2006, the above criticisms of the fire legislative regime yielded the advent of the FSO 2005 which consolidated the previous fire safety legislation into one regime and also removed the fire certification scheme. The FSO 2005 introduced three key elements: the responsible person; the enforcing body; and the competent person. Under the FSO 2005, the "responsible person" is the person responsible for ensuring fire safety standards are met and this is the employer or a person that is in control of the premises i.e. building owner, occupier or landlord. The responsible person is required to undertake a self certification process through periodic risk assessments (including the frequent monitoring and reviewing of such) as well as comprehensive record keeping. The Fire and Rescue Service fulfils the role of the "enforcing body" and they are required to undertake periodic inspections of premises governed by the FSO 2005 to ensure that responsible persons are fulfilling their duty. By removing the previous fire certificate system, the Order has passed the full responsibility, and ultimate accountability, on to the responsible person and the Fire and Rescue Service are now responsible for visiting sites to ensure that the Order is being observed. The Fire and Rescue Service have the power to: issue an enforcement notice whereby the Fire and Rescue Service clearly stipulates the breaches and a timeframe for rectifying them; issue a prohibition notice to restrict/prevent use of the property until the necessary improvements have been undertaken; and to bring prosecutions in the criminal courts.

Under the FSO 2005, where a property is particularly complex in terms of construction or hazardous in terms of use; or where the responsible person has limited fire safety experience and/or knowledge, it shall be necessary for the responsible person to appoint a third party consultant to assist with the fire risk assessment. This third party is the "competent person", having sufficient training and experience or knowledge and other qualities to enable him to conduct a suitable and sufficient assessment of the premises. The introduction of the FSO 2005 was however not accompanied by the provision of a Government register of accredited fire risk

assessors, a situation which could result in inadequate consultancies producing substandard assessments which would ultimately leave the responsible person liable. Under the previous legislation, the competent person was effectively the Fire and Rescue Service.

In spite of the FSO 2005 being hailed for the changes it has introduced to fire safety (cf. Alalouff, 2006; and Communities and Local Government, 2009), a report by Communities and Local Government (2009) indicates low compliance among micro and small organisations, and implicates low awareness of the FSO 2005 among micro and small organisations as being responsible. Undoubtedly, this finding is important to efforts geared towards entrenching the impact of the reform. However, beyond the issue of low awareness there could be other undermining factors or challenges drawing back compliance of the FSO among micro and small businesses. Micro and small businesses play a key role in the UK economy accounting for about 99% of UK private businesses and 48% of UK private sector employment (cf. Department for Business Innovation and Skills, 2009). Clearly the success of the FSO 2005 thus requires their input. It is therefore imperative to explore further any challenges that could be undermining compliance of the Reform among micro and small businesses. Indeed doing this will provide further opportunity for the early identification of problematic areas for early redressing. With this background, this study sought to investigate potential issues responsible for the trailing compliance of the FSO 2005 among micro and small businesses with the key research question being: *why* is there low compliance of the FSO among micro and small businesses. To answer the posed research question, the following methodology was adopted.

3 Research Methodology

This research had an exploratory and interpretive focus as it sought to investigate the "*why*" surrounding a phenomenon which in this case is the low compliance of the FSO among micro and small businesses. Such a focus favours the use of a qualitative inquiry as qualitative inquiries are suitable for obtaining meaning and as such are appropriate for answering questions relating to *"why"* and *"how"* (cf. Fellows and Lui, 2008). In view of this, qualitative interviews (in the form of semi-structured interviews) were conducted with the three key duty-holders under the FSO: responsible person, competent person and enforcing body.

As there are no organised records/database of particularly responsible persons and competent persons, purposive sampling was used to obtain participants constituting the three target groups. All the participant's organisation were based in the West Midland Region of the UK. For both the responsible persons and competent persons categories, 4 participants each were interviewed and one participant for the enforcing body category. In total 9 participants were therefore interviewed. The interviewees were asked a series of questions relating to the significance of the FSO to fire safety, and also challenges in complying with the FSO among micro and small businesses.

The interviews were audio-taped. For the analysis of the interviews, the recorded interviews were transcribed. The transcripts were analysed systematically through iterative re-reading and coding of the transcripts which enabled the attainment of a profound understanding of each interviewee's view point and hence the extraction of issues relating to the low compliance of the FSO among micro and small businesses (cf. Choudhry and Fang, 2008; Creswell, 2009).

4 Findings and Discussion

Table 1 provides a brief profile of the participants showing their role and experience. Taken together, the Table shows that the participants were in a good position to provide remarks that would yield an understanding of the subject being investigated.

5 Significance of the FSO

There was a general acknowledgement by the participants that the introduction of the FSO was a useful stride in fire safety standards. A theme, which was consistent in all interviews was that the previous legislation invited businesses to rely heavily on their fire certificates. The fire certificate was essentially only a snap shot in time and often businesses did not see any further need for proactive monitoring or undertaking their own regular risk assessments. This was even confirmed by the interviewed responsible persons as none of them had undertaken a fire risk assessment of their premises before the overhaul of the legislation.

> *"It [fire certificate] was a tick in the audit box, stored in a file and fire safety was given no further thought."* - C4

> *"[Previously] They've [Businesses] got a bit of paper [fire certificate] saying that the property is safe but there was no proactive approach which is what this [Fire Safety Order] is designed to do."*- C3

A further point highlighted by the participants was that the overhaul was necessary as it brought together a great deal of previous "fragmented" legislation, creating one single point of reference. As indicated by the Communities and Local Government (2006), in a bid to reduce death, injury and damage caused by fire, it intended to make the law easier to follow and to comply with. The general consensus revealed by this study is that the FSO has been effective in doing this.

Table 1: Profile of Participants

Enforcing Body Representative		
Participant	Role/Position	Experience
E1	Representative of Enforcing Body	35 years working for the Fire Service and now as an assessor at a Local Authority. Retains contacts and relationship with the Fire Service.
Competent Persons		
Participant	Role/Position	Experience
C1	Chartered Building Surveyor	5 years on a wide range of properties, types and sizes.
C2	CDM Coordinator	5 years small, low risk premises only
C3	Graduate Building Surveyor	3 Years on small/medium sized properties of low/medium risk.
C4	Graduate Building Surveyor	4 years on small/medium sized properties of low/medium risks.
Responsible Persons		
Participant	Type of Organisation & Size	Role/Position
R1	Doctors Surgery *Small organisation	Reception Manager
R2	Public House *Small organisation	Owner
R3	Rugby Club *Micro organisation	Chairman of the Recreational Trust
R4	Electrical Contracting Firm * Small organisation	Managing Director and also Landlord of multi-occupied premises

* Micro organisation has ≤ 9 employees. Small enterprise has ≤ 49 employees

Another view shared by most of the respondents was that by creating the role of responsible persons, and ultimately a single point of accountability, people were encouraged to pay more attention to the legislation. One participant explained that the fear of prosecution prompts him to take the role seriously.

> *"As I said, I think it crystallises exactly how you should be doing things. And because you know there is a burden of responsibility on everyone I think it makes you more aware. It does make you more aware."* - R1
> *"I think it scares people. We live in a blame/claim culture and I think that the legislation has created that one point of blame in the responsible person. In a way, I hope it scares people into fulfilling their obligations. I know it would have that effect on me if I was in that position."* - C4
>
> *"I am the owner and I always feel the buck stops at me. It is a burden but a burden that comes with being your own boss and being responsible for staff and customers."* - R2

Overall, regarding the significance of the FSO this study like the Communities and Local Government (2009) report indicates that introducing the FSO was a useful overhaul of fire

legislation. However, despite this view, one participant (i.e. E1) viewed the Fire Precautions Act 1971 as having performed an effective role in raising fire safety standards and that the FSO is essentially about maintaining those high standards as opposed to vastly improving them.

6 Challenges with compliance of FSO among micro and small businesses

As identified from the interviews, the issues undermining compliance of the FSO among micro and small businesses are as illustrated in Figure 1.

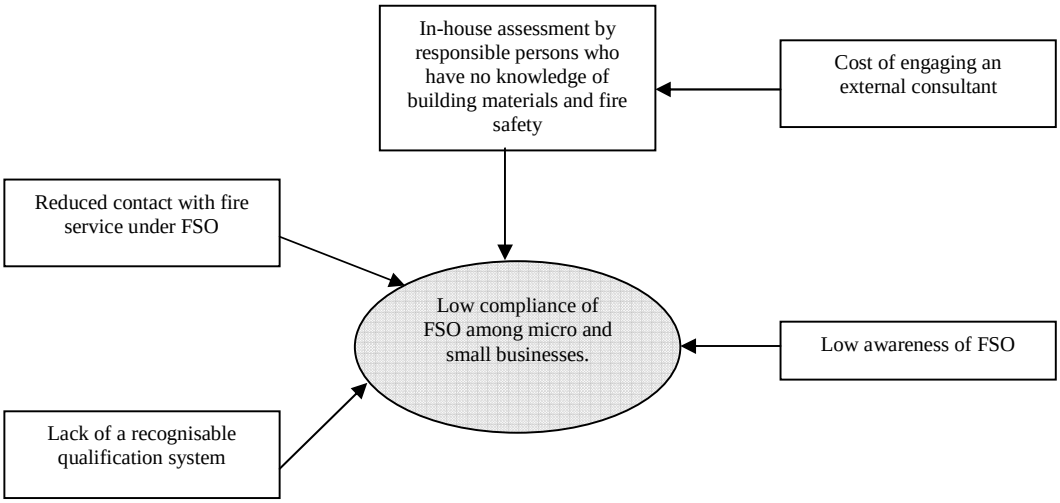

Figure 1: Issues undermining compliance of FSO among micro and small businesses

6.1 Low awareness

Although all the interviewed responsible persons are aware of the FSO, the participants were of the view that there is low awareness of the FSO among micro and small organisations, particularly in terms of full understanding of their legal duties and the implications of non-compliance. This finding thus corroborates the Local Government (2009) report which similarly identified low awareness of the FSO among micro and small organisations as being behind the trailing compliance of the FSO among micro and small organisations. Comments by the interviewed competent persons and enforcing body representative pointed to inadequate government publicity of the FSO.

> *"I don't think it [FSO] has been well communicated. I have not seen any adverts, TV or radio. That's not to say that is hasn't been advertised but I haven't seen it. I am only aware of it because of the line of work I'm in: working in construction."- C1*

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6.2 Lack of background knowledge of building materials and fire safety by responsible persons

A common view held by the interviewed competent persons was that majority of micro and small organisations are conducting in-house fire risk assessment and that often the responsible

persons assessing their own premises do not have the background knowledge of construction materials and the technical issues of fire safety and thus potentially leading to substandard assessments. The financial burden of consultancy fees was mentioned as being the reason for many micro and small businesses not using competent persons/consultants.
Although the competent persons acknowledged the government guidance documents on the FSO as being useful, they considered it as not being absolute and having several grey areas which may prove difficult for a lay person to make a good judgement if they are not experienced in undertaking assessments. However, contrary to the views of the interviewed competent persons, three of the responsible persons felt that with the assistance of the government guidance documents, they were competent enough to complete the fire risk assessment themselves. Not surprising, these three responsible persons indicated that they had conducted the risk assessment themselves instead of appointing a third party consultant.

> *"…..they [responsible persons] might be using the guidance document for the theoretical approach but do not have good background knowledge of building material i.e. compartments, fire resisting construction or perhaps material that would aid the rapid spread of fire." – C4*

6.3 Lack of a recognised formal qualification system for competent persons.

The introduction of the FSO was not accompanied by a formal qualification system for competent persons and this lack was identified as making appointment of competent persons difficult for responsible persons as responsible persons can not be certain that the competent persons they appoint have sufficient training, experience and knowledge of fire risk assessment. This has consequences for compliance of the FSO (not just for micro and small organisations but also for larger organisations) as there could be substandard assessment for organisations who choose to appoint external assessors. A common view held by the participants was thus the need for the establishment of an independent recognisable qualification for all assessors and an amendment of the FSO to stipulate the qualification as a legal requirement.

> *"Good fire safety practices can mean the difference between life and death so it is pretty essential that the people assessing those practices are competent to do it. And how do you know they are unless they have been formally assessed by an independent body? I also think it would help responsible persons select an assessor. I wouldn't be surprised if responsible persons are getting sub standards assessments without knowing it." – C4*

6.4 Reduced contact with the Fire Service.

Some of the participants, opined that contact between the fire service and mirco and small organisations will be reduced under the FSO as the fire service will be unable to inspect all properties. Two out of four interviewed responsible persons had received a visit from the fire Service since the introduction of the FSO. It was expressed that reducing the fire service's contact with micro and small organisation was dangerous and could lower fire safety standards.

7 Conclusions and Recommendations

Despites the general acceptance of the FSO as a useful stride in fire safety, its compliance among micro and small businesses has been a challenge as compliance among this category trails behind expectation. Contributing to earlier studies on the FSO, this study has buttressed earlier findings

and also yielded further insight into the low compliance of the FSO among micro and small businesses. These have implications for the success of the FSO and as such early consideration should be given to formulating policies and devising measures to address the reasons for the low compliance.

Concerning the issue of awareness, further publicity efforts targeting micro and small organisations at the local level (e.g. councils) would be useful. The publicity could take the form of open days or seminars at local fire service stations. The publicity could also take the form of periodic newsletters (advisably electronic to minimise cost) sent by local fire services to businesses within their locality. In order to assist responsible persons who wish to undertake in-house assessment, these seminars could be made to compliment government guidance documents by also serving the purpose of providing responsible persons with some rudimentary knowledge of building materials and fire risk assessments. The e-newsletters could also be a useful means by which local fire services could disseminate information on recent fires within the locality, the exact causes and advice on preventing similar incidents.

Regarding the lack of a government recognised certification scheme for competent persons, it will be useful if such a mandatory scheme is provided. However, this should be preceded by stakeholder discussions to delineate the operational details of the scheme. Obviously, given the large number of micro and small businesses it will be difficult for the fire services to visit all micro and small businesses. However, the inspection of such businesses, particularly those with premises of high risk could be given greater priority. More importantly micro and small businesses should be encouraged to contact their local fire services for any assistance and advice they may need in complying with their legal obligation under the FSO.

Admittedly, the FSO is fairly new and may take some while to be fully grasped by micro and small organisations. This however does not remove the need to take early steps to enable the entrenchment of the benefits of FSO. There still remains room for improvement and it is hoped that the findings of this inquiry and the recommendations together with previous reports on the FSO would be useful in contributing to safer premises amongst micro and small organisations.

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Exploring the Compliance of the Fire Safety Order 2005 amongst Micro and Small Organisations in England and Wales

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Abstract:
Fire safety in buildings can not be underestimated given the grave losses associated with fire incidences. Legislation has been a useful means of ensuring fire safety in buildings, and in England and Wales, the recent introduction of the Regulatory Reform Fire Safety Order (FSO) 2005 has been mentioned to be a positive progression in fire safety standards. However, since its enactment, compliance with the legislation especially among micro and small organisations continues to trail behind expectation. Given that micro and small organisations constitute an enormous proportion of UK organisations and the success of legislation depends on compliance, it is essential to investigate the reasons behind this low compliance. This research thus sought to explore the potential *reasons* for this situation by the use of qualitative interviews conducted with key duty-holders of the legislation: the enforcing authority; responsible persons; and competent persons. The study reveals that low awareness of the FSO in micro and small organisations is at the heart of the low compliance. Also the lack of a recognised formal qualification system for competent persons makes it difficult for responsible persons to appoint competent persons. Beyond this, micro and small organisations prefer to conduct in-house fire risk assessments despite the danger of the lack of understanding of construction materials and technical issues of Fire Safety by responsible persons. This preference is due to the financial burden of engaging a competent person. Furthermore, reduced contact between businesses/building owners and the fire service under the FSO could also be undermining its compliance. Although it can be argued that the FSO is fairly new and as such it requires time to be fully grasped by organisations, the insight provided by this study is useful in the early identification of potentially problematic areas for early redressing.

Keywords:
fire safety, interview, legislation

1 Introduction

With the widely acknowledged catastrophic effects of fire outbreaks in buildings (e.g. loss of lives and property), over the years, it has been found necessary to have measures that would prevent fire outbreaks in buildings and measures that would mitigate their adverse effects. Notably among the measures are fire safety regulations or legislative instruments, and in England and Wales, the recent consolidation of an assortment of previous fire safety legislation into one

regime that is far more accessible has been hailed as a positive stride in fire safety standards (Alalouff, 2006). This recent legislative instrument, known as the Regulatory Reform Fire Safety Order 2005 (FSO 2005), which came into force in England and Wales in 2006 is considered the most significant overhaul of fire safety legislation for seventy years (Alalouff, 2006).

The FSO 2005 radicalised the fire safety legislation by removing the fire certificate scheme, which was introduced under its repealed predecessor, the Fire Precautions Act 1971. The Reform removed the system of fire certification by the Fire Service, and introduced the notion of self certification or a self regulated assessment system to be conducted by building owners or employers themselves. Under the FSO 2005, owners or managers of any non domestic premises in England and Wales are therefore mandated to undertake, review and update a suitable and sufficient fire risk assessment and take proactive steps to ensure the safety of those on or in the vicinity of the property.

Three years after its coming into force a government review of the FSO 2005 indicates that compliance of the FSO 2005 among micro and small businesses continues to trail behind expectation (see Communities and Local Government, 2009). Micro and small businesses play a key role in the UK economy implying that the success of the FSO 2005 will greatly require their input. This study thus sought to investigate the factors responsible for the trailing compliance of the FSO 2005 among micro and small businesses. In the sections that follow, a review of fire safety legislation in the UK is presented to set the premise for the investigation. This is followed by the research methodology adopted for the study. Subsequently, the findings are presented and discussed followed by concluding remarks.

2 Literature Review: Fire Safety Legislation

The very first indications of UK fire safety standards can be traced back as early as the 12th Century when the Mayor of London laid restrictions on construction materials to prevent the rapid spread of fire through the city. The first tangible piece of enacted legislation, however, was the Fire Prevention (Metropolis) Act 1774. The Act classified building types and stipulated minimum standards in respect to thickness of external and party walls. Importantly, the Act also placed requirements on building owners to provide adequate means of escape; a principle still at the forefront of fire safety standards today (FireNet International, 2009). The 19th Century witnessed a number of further legislative developments for specific building types. The series of new Acts reflected Central Government's understanding that different properties and the activities that were conducted within them carried unique fire safety considerations and that these should be covered by individual Acts rather than generic regulations. During the 19th Century, the Government introduced sector specific regulations including the Theatres Act 1843 and the Factory and Workshop Act 1885 (amended 1891).

Positively, the Government's commitment to improving fire safety standards in workplaces and public buildings gained significant momentum through the 20th Century with a key progression being the enactment of the Fire Precautions Act 1971; the fundamental aspect of which was the fire certificate system. As required by the Fire Precautions Act 1971, the Fire Service would conduct periodic inspections of premises providing a service, and subject to compliance, the premises would receive a fire certificate. Cox (2008) supports the Fire Precautions Act 1971 stating that fire certificates were an effective way in achieving compliance as the responsibility

lay with experienced fire service personnel who can be considered experts in the field. At the close of the century, the Government passed the Fire Precautions (Workplace) Regulations 1997 (as amended 1999) which placed additional obligations on employers. The requirement for the fire certificate remained under the new Act, but above and beyond this, employers had additional legal duty including: conducting a suitable and sufficient fire risk assessment which is monitored, reviewed and revised as appropriate; informing staff of any known risks; making staff aware of an emergency plan; and providing mandatory training to new employees as well as periodic training for existing employees.

Fire safety legislation through the centuries naturally developed in a fragmented fashion; primarily as the result of serious fires or recognised "near misses" (Edwards, 2006). The natural result of such progression was a cacophony of polices, statutory requirements and guidance dispersed across multiple Acts and Regulations which obviously had compliance implications. Again the fire certification introduced by the Fire Precautions Act 1971 and retained under the Fire Precautions (Workplace) Regulations 1997 received criticism. For instance, Hill and Webster (2006) explained that the process of applying for a fire certificate could take up to two years, potentially leaving a property at risk. In addition, Baker (2009) admits that although the certificate was a useful point of reference, building owners and employers often hid behind it and conducted no proactive monitoring or reviewing once it had been awarded. Whilst the fire certificate recorded building compliance, it was therefore only a snapshot in time and did not take into account how the property was being used on a day to day basis.

In 2006, the above criticisms of the fire legislative regime yielded the advent of the FSO 2005 which consolidated the previous fire safety legislation into one regime and also removed the fire certification scheme. The FSO 2005 introduced three key elements: the responsible person; the enforcing body; and the competent person. Under the FSO 2005, the "responsible person" is the person responsible for ensuring fire safety standards are met and this is the employer or a person that is in control of the premises i.e. building owner, occupier or landlord. The responsible person is required to undertake a self certification process through periodic risk assessments (including the frequent monitoring and reviewing of such) as well as comprehensive record keeping. The Fire and Rescue Service fulfils the role of the "enforcing body" and they are required to undertake periodic inspections of premises governed by the FSO 2005 to ensure that responsible persons are fulfilling their duty. By removing the previous fire certificate system, the Order has passed the full responsibility, and ultimate accountability, on to the responsible person and the Fire and Rescue Service are now responsible for visiting sites to ensure that the Order is being observed. The Fire and Rescue Service have the power to: issue an enforcement notice whereby the Fire and Rescue Service clearly stipulates the breaches and a timeframe for rectifying them; issue a prohibition notice to restrict/prevent use of the property until the necessary improvements have been undertaken; and to bring prosecutions in the criminal courts.

Under the FSO 2005, where a property is particularly complex in terms of construction or hazardous in terms of use; or where the responsible person has limited fire safety experience and/or knowledge, it shall be necessary for the responsible person to appoint a third party consultant to assist with the fire risk assessment. This third party is the "competent person", having sufficient training and experience or knowledge and other qualities to enable him to conduct a suitable and sufficient assessment of the premises. The introduction of the FSO 2005 was however not accompanied by the provision of a Government register of accredited fire risk

assessors, a situation which could result in inadequate consultancies producing substandard assessments which would ultimately leave the responsible person liable. Under the previous legislation, the competent person was effectively the Fire and Rescue Service.

In spite of the FSO 2005 being hailed for the changes it has introduced to fire safety (cf. Alalouff, 2006; and Communities and Local Government, 2009), a report by Communities and Local Government (2009) indicates low compliance among micro and small organisations, and implicates low awareness of the FSO 2005 among micro and small organisations as being responsible. Undoubtedly, this finding is important to efforts geared towards entrenching the impact of the reform. However, beyond the issue of low awareness there could be other undermining factors or challenges drawing back compliance of the FSO among micro and small businesses. Micro and small businesses play a key role in the UK economy accounting for about 99% of UK private businesses and 48% of UK private sector employment (cf. Department for Business Innovation and Skills, 2009). Clearly the success of the FSO 2005 thus requires their input. It is therefore imperative to explore further any challenges that could be undermining compliance of the Reform among micro and small businesses. Indeed doing this will provide further opportunity for the early identification of problematic areas for early redressing. With this background, this study sought to investigate potential issues responsible for the trailing compliance of the FSO 2005 among micro and small businesses with the key research question being: *why* is there low compliance of the FSO among micro and small businesses. To answer the posed research question, the following methodology was adopted.

3 Research Methodology

This research had an exploratory and interpretive focus as it sought to investigate the "*why*" surrounding a phenomenon which in this case is the low compliance of the FSO among micro and small businesses. Such a focus favours the use of a qualitative inquiry as qualitative inquiries are suitable for obtaining meaning and as such are appropriate for answering questions relating to *"why"* and *"how"* (cf. Fellows and Lui, 2008). In view of this, qualitative interviews (in the form of semi-structured interviews) were conducted with the three key duty-holders under the FSO: responsible person, competent person and enforcing body.

As there are no organised records/database of particularly responsible persons and competent persons, purposive sampling was used to obtain participants constituting the three target groups. All the participant's organisation were based in the West Midland Region of the UK. For both the responsible persons and competent persons categories, 4 participants each were interviewed and one participant for the enforcing body category. In total 9 participants were therefore interviewed. The interviewees were asked a series of questions relating to the significance of the FSO to fire safety, and also challenges in complying with the FSO among micro and small businesses.

The interviews were audio-taped. For the analysis of the interviews, the recorded interviews were transcribed. The transcripts were analysed systematically through iterative re-reading and coding of the transcripts which enabled the attainment of a profound understanding of each interviewee's view point and hence the extraction of issues relating to the low compliance of the FSO among micro and small businesses (cf. Choudhry and Fang, 2008; Creswell, 2009).

4 Findings and Discussion

Table 1 provides a brief profile of the participants showing their role and experience. Taken together, the Table shows that the participants were in a good position to provide remarks that would yield an understanding of the subject being investigated.

4.1 Significance of the FSO

There was a general acknowledgement by the participants that the introduction of the FSO was a useful stride in fire safety standards. A theme, which was consistent in all interviews was that the previous legislation invited businesses to rely heavily on their fire certificates. The fire certificate was essentially only a snap shot in time and often businesses did not see any further need for proactive monitoring or undertaking their own regular risk assessments. This was even confirmed by the interviewed responsible persons as none of them had undertaken a fire risk assessment of their premises before the overhaul of the legislation.

> *"It [fire certificate] was a tick in the audit box, stored in a file and fire safety was given no further thought."* - C4

> *"[Previously] They've [Businesses] got a bit of paper [fire certificate] saying that the property is safe but there was no proactive approach which is what this [Fire Safety Order] is designed to do."*- C3

A further point highlighted by the participants was that the overhaul was necessary as it brought together a great deal of previous "fragmented" legislation, creating one single point of reference. As indicated by the Communities and Local Government (2006), in a bid to reduce death, injury and damage caused by fire, it intended to make the law easier to follow and to comply with. The general consensus revealed by this study is that the FSO has been effective in doing this.

Table 1: Profile of Participants

Enforcing Body Representative		
Participant	Role/Position	Experience
E1	Representative of Enforcing Body	35 years working for the Fire Service and now as an assessor at a Local Authority. Retains contacts and relationship with the Fire Service.
Competent Persons		
Participant	Role/Position	Experience
C1	Chartered Building Surveyor	5 years on a wide range of properties, types and sizes.
C2	CDM Coordinator	5 years small, low risk premises only
C3	Graduate Building Surveyor	3 Years on small/medium sized properties of low/medium risk.
C4	Graduate Building Surveyor	4 years on small/medium sized properties of low/medium risks.
Responsible Persons		
Participant	Type of Organisation & Size	Role/Position
R1	Doctors Surgery *Small organisation	Reception Manager
R2	Public House *Small organisation	Owner
R3	Rugby Club *Micro organisation	Chairman of the Recreational Trust
R4	Electrical Contracting Firm * Small organisation	Managing Director and also Landlord of multi-occupied premises

* Micro organisation has ≤ 9 employees. Small enterprise has ≤ 49 employees

Another view shared by most of the respondents was that by creating the role of responsible persons, and ultimately a single point of accountability, people were encouraged to pay more attention to the legislation. One participant explained that the fear of prosecution prompts him to take the role seriously.

> *"As I said, I think it crystallises exactly how you should be doing things. And because you know there is a burden of responsibility on everyone I think it makes you more aware. It does make you more aware."* - R1
> *"I think it scares people. We live in a blame/claim culture and I think that the legislation has created that one point of blame in the responsible person. In a way, I hope it scares people into fulfilling their obligations. I know it would have that effect on me if I was in that position."* - C4

> *"I am the owner and I always feel the buck stops at me. It is a burden but a burden that comes with being your own boss and being responsible for staff and customers."* - R2

Overall, regarding the significance of the FSO this study like the Communities and Local Government (2009) report indicates that introducing the FSO was a useful overhaul of fire

legislation. However, despite this view, one participant (i.e. E1) viewed the Fire Precautions Act 1971 as having performed an effective role in raising fire safety standards and that the FSO is essentially about maintaining those high standards as opposed to vastly improving them.

4.2 Challenges with compliance of FSO among micro and small businesses

As identified from the interviews, the issues undermining compliance of the FSO among micro and small businesses are as illustrated in Figure 1.

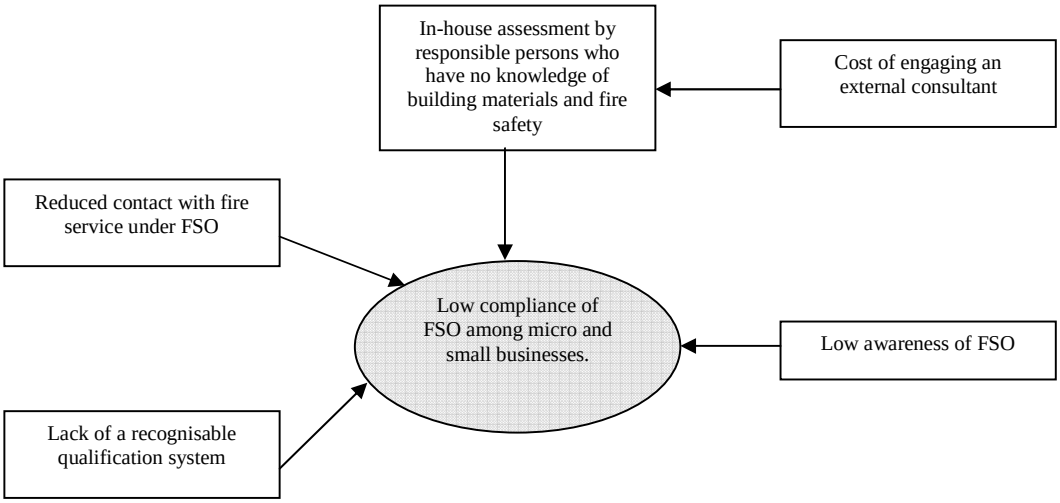

Figure 1: Issues undermining compliance of FSO among micro and small businesses

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Although all the interviewed responsible persons are aware of the FSO, the participants were of the view that there is low awareness of the FSO among micro and small organisations, particularly in terms of full understanding of their legal duties and the implications of non-compliance. This finding thus corroborates the Local Government (2009) report which similarly identified low awareness of the FSO among micro and small organisations as being behind the trailing compliance of the FSO among micro and small organisations. Comments by the interviewed competent persons and enforcing body representative pointed to inadequate government publicity of the FSO.

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Building technology

Using an Analytics Engine to Understand the Design and Construction of Domestic Buildings

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Abstract:

Understanding domestic building technology is fundamental to the learning and teaching of building and construction. Like any subject dealing with technology and process, domestic construction makes most sense when it can directly be experienced by the learner. One possibility is to develop the rich visual and behavioural modelling capabilities of advanced video game engines such as Crytek CryENGINE®2. This game engine has been modified to perform as an analytics engine specific to the design and construction of domestic buildings. The system is currently being developed and trialled as a learning and teaching resource with a large cohort of undergraduate construction management students. Users are required to source a variety of tools within the game environment which they use to analyse a range of domestic building representations. The analytics are used to investigate specific design and construction options and diagnose deliberate design faults or building regulation breaches incorporated into the models. Results of this project identify the key perspectives necessary to scope such a project; the critical aspects around which development of such a resource needs to articulate; and considers the separate evaluation processes required for the game development, the learning and teaching outcome and the project itself.

Keywords:

analytics, domestic construction, educational technology, video game engines

1 Introduction

Two recent reviews of undergraduate education in Australia identified that construction technology constitutes more than 20% of the first year architecture degree (Ostwald and Williams, 2008:126) and 25% of the building degree curriculum content (Williams *et al*., 2009:20). Understanding construction technology remains a significant part of the core skills and competence requirements for all relevant professional accrediting bodies in building and construction (see for example, RICS, 2009). In the UK, construction is a key concept in The Quality Assurance Agency for Higher Education subject knowledge benchmark statements for construction, property and surveying (QAAHE, 2008:4). In Australia, the integration of

construction technology is identified explicitly as a Threshold Learning Outcome in the current Learning and Teaching Academic Standards project specific to building and construction (Newton and Goldsmith, 2011:5).

Traditionally, a significant component of construction technology curriculum has been delivered through exposure to work-based learning, project-based assessment drawn from contemporary industry practice and site visits to building projects currently under construction. The purpose of these forms of curriculum is to enable students to observe the process and technology of construction work in action. However, as class sizes increase, occupational health and safety regulations are tightened, potential site locations become more distant and the temporal nature of construction means there is only ever a minimal window of opportunity to witness particular aspects of technology, it has become increasingly infeasible to provide direct student exposure to the broad practices of construction technology in a realistic setting (Mills *et al*, 2006). Equivalent difficulties face all vocational education programs in the built environment, where the practice situation involves dangerous and/or expensive process/technology contexts.

In such situations, the potential of replacing direct student exposure with a virtual simulation is apparent. In construction technology education, for instance, a number of previous initiatives have utilised a mix of Computer-Aided Design (CAD), QuickTime VR, video and multimedia as virtual substitutes for actual site visits (Horne and Thompson, 2008; Ellis *et al.*, 2006). Such initiatives certainly provide useful illustrations of the technical knowledge required, including (though generally indirectly) illustrations of relevant technical skills such as the scheduling of construction work tasks, project team management, and analysis of design defects. However, where knowledge-based learning generally can quite readily be demonstrated and assessed through written and oral tests, skill-based learning (competence) requires the student to practice and demonstrate actual activities in authentic situations.

Competence is fundamentally about the assessment of an individual's capacity to perform certain professional tasks in given situations in a particular way (Cowan *et al*., 2007). Currently neither actual nor virtual site visits are, of themselves, sufficiently interactive for competence-based learning outcomes then to be demonstrated by the student or directly assessed by the teacher. The question of how students might practice and demonstrate competence in core discipline-specific skills (such as construction technology), particularly where such skills are best exercised in a difficult practice setting (such as a construction site), is yet to be resolved adequately.

A classic approach to competence assessment in architecture is the design studio, in engineering it is typically the testing lab, and in other fields such as medicine it is the clinical placement. In building and construction technology one equivalent approach has been to create a form of, so-called, 'constructionarium' (Ahearn *et al*., 2005). A constructionarium is a controlled site setting where students under supervision work in teams to produce construction outcomes that range from building discrete brick walls, to short-span bridges and even simple buildings. Students experience, practice and can demonstrate (ie. be assessed on) the technical, process and managerial aspects of these construction activities. However, whilst they provide excellent learning experiences, the significant material and organisational costs associated with such projects renders them entirely impractical to apply across the curriculum more broadly and/or to large student cohorts.

One possibility is to replicate the constructionarium approach on a smaller scale and have students construct, say, 1:10 scale-models of buildings or their components (see, for example, Forsythe, 2009). Figure 1a illustrates one example of how first year students can use model building to demonstrate their competence in construction technology. It employs relatively sophisticated model-building skills to represent the technical and relational construction technologies of a typical domestic construction in Australia.

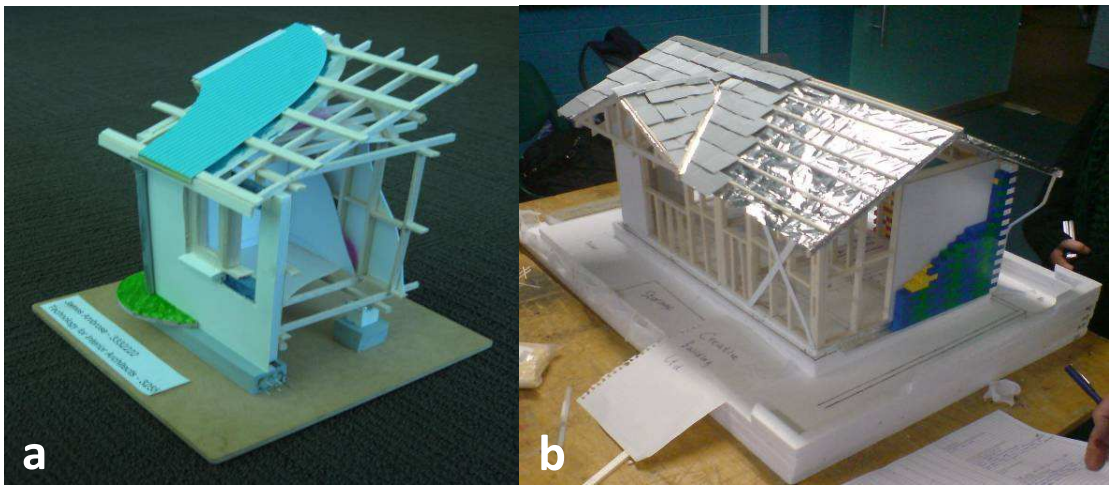

Figure 1a. A student 1:10 scale model outcome for a typical domestic construction exercise
Figure 1b. Another 1:10 scale model outcome that represents less sophisticated modelling skills

The use of such models is certainly a more viable exercise than actual site work, but its utility as a teaching method often depends as much on the model-building skills of the student as it does on their technical competence in construction technology. For example, Figure 1b illustrates another example of first year use of model building to demonstrate competence in construction technology. In this case the quality of the model building is far less sophisticated. It uses crude material representations (such as lego-bricks) that make it more difficult to demonstrate and assess the technical understanding of construction. This quality of modelling also makes it impractical to use the model as any basis for an analysis of the design and construction choices being made, through consideration of wind-loading/bracing, minimum spacing of rafters, effective timber jointing details, etc.

The aim of this paper is to articulate a current project to design, develop and evaluate the use of virtual reality technology to replicate the controlled site-setting and actual-scale nature of a constructionarium exercise, but with the same viability advantages that physical modelling has over actual site work. A key objective of the project is to deliver a level of immersion and interactivity in/with the virtual reality system that is sufficient to enable core construction technology skills (for example, the scheduling of work or the analysis of design/construction defects) to be demonstrated and assessed effectively and directly through the use of the system.

2 Why Choose Serious Video Games?

The most sophisticated interactive virtual reality simulation environments with practical application to teaching and learning are to be found in video games. Video games use high performance graphics engines to render moving photo-realistic scenes in real-time and 3D along with the potential for associated surround-sound audio and tactile feedback to a user who controls the action with a variety of input devices. Figure 2 demonstrates the visual quality achievable in the Crytek CryENGINE®3 game.

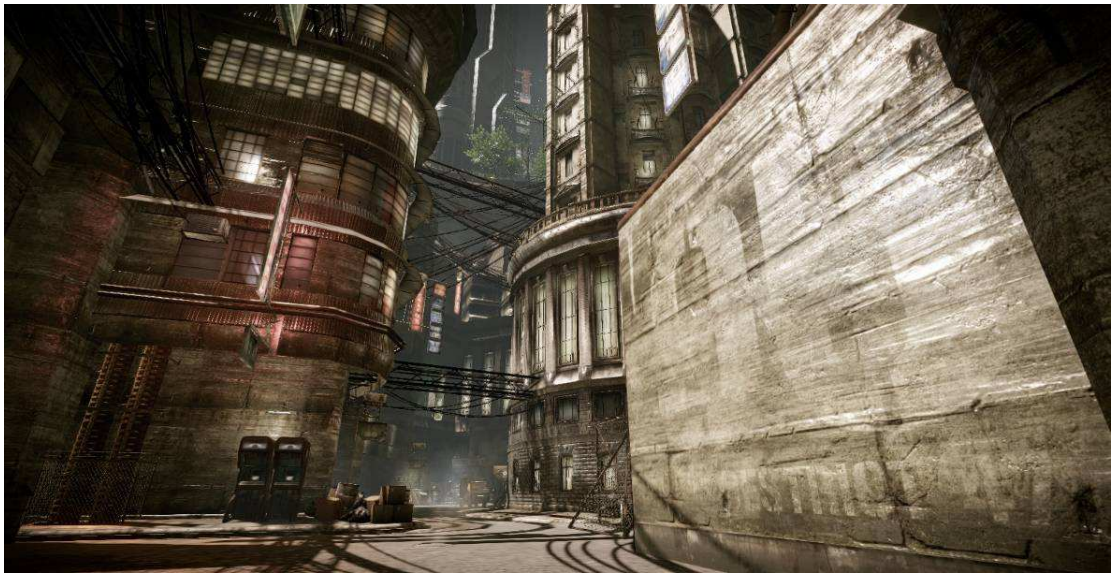

Figure 2. Real-time Scene Rendering in CryENGINE®3 (Wu, 2010:15)

The 'action' is in fact variously controlled not only through input devices, but also by the particular rules and properties 'coded' into the video game by the developer. Such coded rules and properties are now extremely sophisticated, and many incorporate models of real-world mechanical behaviours ('physics engines') that simulate physical properties such as mass, gravity, velocity, volume, etc. in exceptional detail. Objects in such games can variously be opened, pushed, bent, lifted, broken and/or be used to trigger a myriad of other actions. Artificial intelligence and social dynamics are also now being modelled and incorporated into video games to simulate agency and group behaviour in different game 'actors'.

What is particularly timely about the potential development of video games for learning and teaching, is the recent development in video game technology that has resulted in the 'game engines' themselves (the kernel of coding used to drive a collection of actual game implementations) being made available on an open-source basis. Even the most powerful game engines are now relatively cheap to acquire for teaching and learning purposes, are intentionally configured to allow third party modifications to be created and embedded seamlessly into the game engine, and are increasingly supported online by a significant and committed community of users and developers (referred to as 'modders').

Several examples of ‘serious video games’ (a serious video game is one designed for a primary purpose other than pure entertainment, such as for learning and teaching) have now been developed as modifications to game engines across a range of game genres. For example, ‘vehicle simulation engines’ have been used to train and test vehicle operators from fighter pilots to crane drivers (Rouvinen *et al.*, 2005); ‘strategy game engines’ are variously used for teamwork and project management training; ‘business simulation games’ model economic and manufacturing environments. The current research project has focussed on a specific genre of video game known as a ‘first person shooter’ (FPS) game. FPS games are characterised by the use of an avatar which allows the user to see and be seen as a person would conventionally occupy a space (ie. bound to one's own body). Other game genres take a more abstract form of engagement (such as command-driven controls) or tend to focus more on the interactions and communications across a social network (such as in Second Life) rather than exercising specific technical competences.

3 The Concept of an Analytics Engine

Analytics involves the use of computer technology to access, transform, store, analyse and monitor information extracted from a variety of typically very large databases. For a study of the design and construction of a domestic house, for example, the analytics might involve mining, harvesting, analysing and visualising a representative range of data relevant to the particular instance of domestic house under review. Analytics seeks to extract and/or generate data relevant to a particular decision at a particular point in time in a particular location. Data such as building construction materials, statutory planning instruments, building codes, construction costs, design details, etc. The shear scope and size of existing data sets, both public and private, that might relate to any given construction project is already a matter for concern (Rumor *et al*., 2008).

It is already possible to store and access a range of relevant data through Building Information Modelling (BIM) (see, for example, Eastman *et al*., 2008). However, such information typically has to be pre-loaded into a model and the visualisation options available are then limited significantly by the CAD system itself. There are currency issues with any pre-loaded information and BIM is simply unable to make extensive use of the many and varied ‘live’ digital data streams increasingly available from video cameras, monitoring stations, laser scanning, geographic positioning systems, augmented reality and a multitude of web-enabled feeds. Last year alone, digital information grew to 988 exabytes. To be effective, any analytics must incorporate the same range of data sources otherwise available to the decision-maker, which includes data well beyond the capability of current BIM systems.

Our concept for an analytics engine is one where the full range of potential data sources can be accessed, interrogated and visualised in real-time. In that sense, an analytics engine for the design and construction of domestic houses would enable the user to completely construct and/or dismantle any instance of house in any site setting, to measure any physical property (from distance between rafters to the bending moments exerted in wall bracing due to wind forces), to inspect any design detail (including automatic sections), to reference current building regulations relevant to a particular situation, local authority planning legislation, weather records, etc., etc. – any source of information that might be of interest and relevance to the user.

The Crytek CryENGINE®2 game engine used for this research has all of that functionality potential. It is already the benchmark for graphical performance, with near-photorealism in indoor and wide-open outdoor environments and extra-ordinary real-time special effects. This graphics capability is generally considered in terms of the visual realism it promotes, but it also means that no part of the interaction needs to be pre-recorded (canned). Every scene is freshly generated and able to be generated in whatever form a particular set of context variables dictate, in full stereoscopic 3D if required, on the full complement of graphics devices (even, now, down to the iPhone®). In addition, the game engine is able to interface with a range of Application Programme Interfaces (API's) including the multitude of live data feeds. This means it is now possible to modify every property, behaviour and minutiae represented in a video game based on user controls, calculations that result from user input and external data feeds. This might include the introduction of random events such as construction delays to simulated outcomes, dynamically changing details based on changes to building codes and/or explicitly modelling uncertainty using visual techniques such as blurring.

The critical question for this research is: How might such an analytics engine concept be implemented using the Crytek CryENGINE®2 game engine, for the particular purpose of supporting the learning and teaching of domestic building design and construction?

4 A Prototype Video Game-Based Analytics Engine to Understand the Design and Construction of Domestic Buildings

The design and development of any serious video game needs to be evaluated not just as a game but as a learning technology. This requires the standard design and production process for video games to be broadened to include consideration of the learning context – within what Luckin (2008:449) terms a "learner centric ecology of resources". New serious video game initiatives are beginning to temper just such an explicit and specific overarching design and evaluation framework (de Freitas and Jarvis, 2006). This framework takes the more general form of a structured and rigorous consideration of the context (including the resources available to deliver, access and support the game), learner specifics (including learner attributes and preferences), representation (the form or mode in which the content of the game is made manifest to the user – explicitly, implicitly, vicariously, etc.), and pedagogy (the theory and practice models that frame the learning activities) within which a learning technology is to be deployed.

A formal process of human factor analysis using focus groups and task analysis has been undertaken, along with an analysis of the learning needs of current students. For instance, the learning needs were assessed by reviewing the performance of several hundred students in their end-of-year examinations, to identify those topics where students were having problems and the typical mistakes they were making specific to construction technology. A small reference group of users has been established to trial prototype systems and evaluate various implementations. Formal evaluation of the current prototype is being conducted using a control group of students having no exposure to the video game, where the placebo is standard revision and tutorial support.

The prototype game implementation simulates the addition of each element of the construction process, from site excavation through to roofing. It is a multi-user environment where individual

avatars are able to wander around and over the construction work, examining design details and following construction processes.

For example, Figure 3 is a screen grab showing two students interacting with the reinforcement and formwork just prior to pouring the slab. They can see how the work has been prepared, measure the distance between reinforcement saddles, test the capacity of the steel reinforcement under foot, check waste-pipe penetrations through the slab against best-practice guides, etc.

Figure 3. Screen Grab of Prototype Video Game Just Prior to Pouring the Slab.

As Figure 4a illustrates, the user is able to interact with the construction at any point, including when temporary bracing is still in place and as particular details between, say, bricks and timber and concrete are finished. Please note, the domestic construction used in this exercise is identical to the one used for the model-building exercise shown in Figure 1b. A building no larger than a standard garage has been used for this exercise overs several years in order to limit the size of the models students must produce. It is only when seen at relative life-size that the unnatural proportions of the dwelling becomes obvious. At any stage the user is able to interact with the model and demolish parts of it to expose design and construction details. The extent of the demolition is dependent on the natural physics of whether the user employs, say, just their body-weight, a sledge-hammer or a truck. Users are also able to check the sizes and spacing of timber members against building codes, analyse the implications of loads on different structural configurations, check construction steps against project programmes, etc.

One particular tool is illustrated in Figure 4b, where a section through another, more complex timber construction has been instigated by the user. The building is then slid apart across the line of the section and the ends of any affected members highlighted in red. This facility can then be used to check an actual (model) construction against a designed section detail provided in a set of

drawings. The exercise requires students to interpret and compare both the actual as-built and the design drawings. It can be used to demonstrate and test a students' competency in reading technical drawings and interpreting an as-built construction.

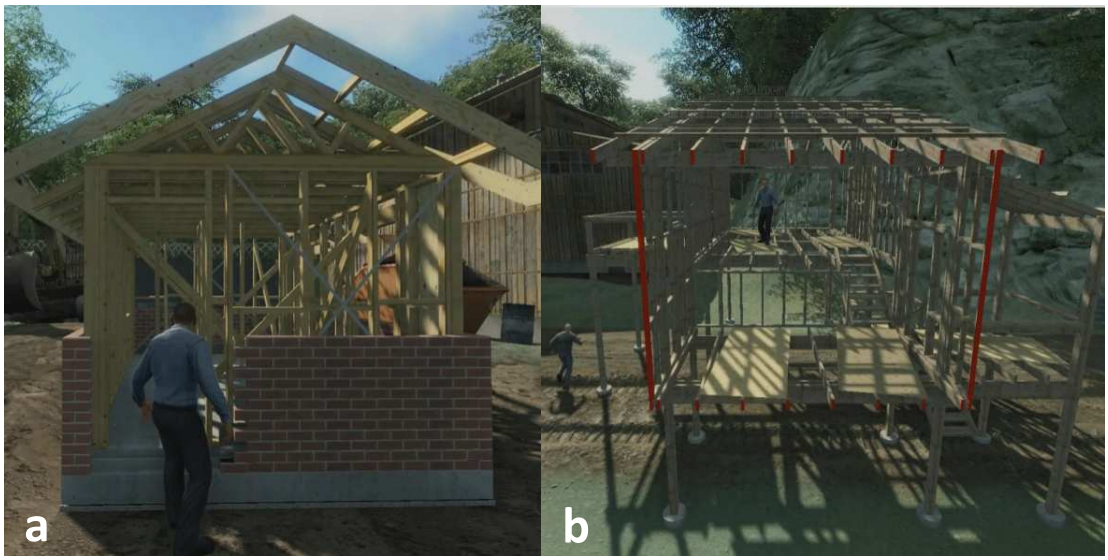

Figure 4a. Screen Grab of Prototype Video Game Just Prior to Removal of Temporary Bracing.
Figure 4b. Screen Grab of Prototype Video Game Showing Use of the Section Tool.

The current prototype can also be used to test a students' understanding of related issues, such as safe work practices, material storage and handling considerations, site security, environmental protection, wet-weather hazards, noise pollution, etc.

5 Research Methodology

The key strategy for this project is to harness a formalised and integrated approach to the design and production of learning and teaching technologies. The scoping of the project has been built around 4 discrete perspectives: the professional bodies that already operate competence-based standards in the building industry are involved to ensure that the mode and level of competence is appropriate to industry expectations; teaching institutions that offer courses in domestic construction are involved to determine the common threshold concepts that broadly need to be included within such a domestic construction technology subject; the key stakeholders in benchmarking national academic standards are involved to establish the broader context for an outcomes-based approach to assessment; and direct engagement with other professional learning contexts is included to determine the general scalability and alignment of this teaching and learning approach across the education sector.

The development of the video game has proceeded around 5 critical aspects: an integrated design and evaluation framework for learning and teaching technology development (including a variety of specific processes and methodologies), supported by a Steering Group of expert practitioners; extensive experience in the application of serious video game technology to building and construction education; detailed CAD models already developed to support the domestic

construction technology subject; previous experience in the design and use of role-play and scale-model building; and the commercial interactive multimedia development expertise of our project team and reference group specific to teaching and learning applications.

The game development will be evaluated in terms of both the technology and the learning and teaching. In terms of the technology, the system is being evaluated by a range of users including a formalised user/testing/development group comprising students and academics. Prototype versions are being made openly available with the offer of direct support to any institution that wishes to participate in the trials. The development of installation and training notes to support the game has been included in the project funding. There will be two distinct development cycles over a 24 month period, each of which coincides with the teaching session in which the domestic construction subject is delivered. At this point we are about to conclude the first cycle. The project reference group includes external, commercial serious game developers who will undertake their own technical review of the system.

The learning and teaching outcome will be evaluated using case study and quantitative analysis. The case study will involve questionnaires and interviews with student, staff and industry participants. This aspect of the evaluation will draw directly from the notion of an ecology of resources used as a design and evaluation framework for education technology (see, for example, Luckin, 2010). The quantitative analysis will monitor the performance of students in the end-of-session examinations for the domestic construction subject. The past performance of several hundred students will be used to benchmark the performance of those students who use the game and those students who do not. Past performance has been analysed to identify those aspects of the curriculum where students perform poorly in the examination, and the typical mistakes they are making. A self-nominating group of current students has now been exposed to different combinations of issues through the game evaluation process, and the performance of those students will be tracked through to their examination performance. The comparative performance of each student between their mid-year assessment task and the final examination will also be compared across the user group and the control group (those students who have no exposure to the game). All participants will remain anonymous to the course lecturer and assessor.

The project itself will include two external reviews by an expert in the design and development of new technology applications in higher education teaching and learning. The external review will capture the experiences and perceptions of the relevant students, academic staff, support staff, professional bodies, government agencies and project team and complement the internal and on-going project design and development reviews.

6 Context and Discussion

The particular opportunity offered by serious video games to situate learning within an authentic professional context aligns this project directly with the development of professional knowledge and competence. Any framework that promotes and improves our understanding of the sociocultural context of and for professional practice will contribute to the broader consideration of learning as a situated activity (Wenger, 1998). Of course situated cognition is not without its critics (Vosniadou, 2007), and an approach that is exclusively sociocultural would undoubtedly ignore key cognitive aspects of learning and teaching. The focus of this project is on competence-based learning and assessment. It presumes that knowledge-based learning is a

necessary precursor to skill-based learning. So, whilst we might never reach a definitive expression of competence in sociocultural terms alone, it seems equally inconceivable that competence is something that can ignore human dispositions and social constructs (Hager and Holland, 2006). The growing significance of competence in higher education requires that more urgent attention be given to how we might teach and assess skill-based learning in that sector. That is what this project primarily seeks to do.

In seeking to evaluate the efficacy of serious video games in a learning and teaching context, we must also guard against complacency in the face of seemingly ever increasing sophistication (and 'reality') in the simulation technologies available. Virtual reality technology is impressive, but it is patently not 'reality'. The 'experience' of a construction site and the practice and demonstration of construction technology competences in a virtual environment does not equate in every respect to the same experiences and demonstrations on an actual construction site. The entailments of a virtual versus a real situation are both positive (the virtual situation can be controlled, is available, scalable, specific, etc.) and negative (the virtual situation is abstract, simplified, sanitised, etc.). This project will examine the strengths and weaknesses of serious video games as a replacement for actual construction project experience and physical model building/simulation.

In a similar vein, any learning performance improvement that might emerge from the trial of the video game must be qualified against the spike in enthusiasm, resources and the sheer novelty value of any innovation introduced into the classroom. The proof of any benefit as a learning and teaching technology will only come from a longitudinal study across large and heterogeneous student groups. However, critical to such an examination is that the implementation of the learning tool (the video game) is as representative of the technical potential as is practical at that time. Collection of longitudinal evidence has now commenced, but the more immediate goal of this project is to design and develop a viable implementation/example of video game technology with which to drive such a study. The current focus therefore is on integrating and testing the overarching design and evaluation framework derived from Luckin (2008) and de Freitas and Jarvis (2006).

7 Conclusion and Further Research

Understanding construction technology is fundamental to the study of building and construction. It demands knowledge, skills and capabilities that are becoming increasingly problematic to deliver using traditional means. The potential of virtual reality in such a situation is apparent. Video game technologies have developed to the point where the most powerful and graphically advanced game engines are themselves now openly available and specifically configured to be modified by users. The possibility of adopting serious video game technology to directly support teaching and learning in construction technology is now a very real and practical one.

The broad concept developed in this paper is for an application of video game technology in the role of an analytics engine: where the full range of relevant data sources pertaining to a particular instance of domestic construction can be accessed, interrogated and visualised automatically. A prototype video game-based analytics engine has been developed using the Crytek CryENGINE®2 specific to teaching and learning domestic construction. That prototype has been described and its potential considered. A critical issue is the design and evaluation framework

being adopted to ensure the technology is developed and incorporated as part of a learner centric ecology of resources. The research methodology is specifically framed to challenge and inform that design and evaluation framework.

This paper highlights the four discrete perspectives necessary to scope such a project (professional bodies, teaching institutions, national academic standards agencies and cross-sector learning contexts). It identifies the critical aspects around which development of such a resource needs to articulate (an integrated design and development framework, steering group of expert practitioners, serious video game experience, detailed digital models, experience in role-play and other forms of simulation and commercial interactive multimedia expertise). Separate evaluation processes are also considered for the game development, learning and teaching outcome and the project itself.

The need for some qualification of the claims and achievements of any such project is recognised, until such time as a broad-base of evidence over time has been achieved. In consequence, the paper takes a conservative stance on the potential of the technology and the current prototype game. Ultimately, however, the vision is for a video game where students will be able to demonstrate the full range of technical competence expected of them (mapping the construction process, planning the sequence of tasks, selecting a viable configuration of materials and design options, ensuring compliance with relevant building codes and regulations, coordinating the construction activities, teamwork, etc.).

8 Acknowledgement

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Identifying Cost Savings for the UK Building Industry through Cloud Computing and BIM Software

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Abstract:

Productivity growth is probably the single most important indicator of an economy's health. In the UK construction industry the majority of waste is generated throughout the lifecycle of a building mainly due to limited accessibility to existing information. The use of Information Communication Technology (ICT) has proven instrumental in creating productivity gains within global markets, for example, through reduced transaction costs, scalability, and fast, reliable information flows, enhanced online collaboration tools and new ways to market goods and services. This paper will identify how future services such as, cloud computing and Build Information Modeling (BIM), can enable cost savings to the building industry by contributing to an increase in productivity through using open standards. The paper also identifies a working progress methodology section that has evolved from the results of the survey techniques used to date, based on cloud computing and BIM. The final section of the paper, uses two case studies to emphasize the potential cost savings benefits for the UK construction industry in implementing cloud computing and BIM.

Keywords:

cloud computing, construction, building information modeling, open standards, interoperability.

1 Introduction

Widespread deployment and use of interoperable technology applications, also called BIM has been identified by National Institute of Standards and Technology in the U.S. as a key activity for advancing construction efficiency and improving quality, timeliness, cost-effectiveness, and sustainability of construction projects (Huang *et al*, 2009). Goodrum and Haas (2002) identified those activities that have experienced a significant change in equipment and material technology benefit from greater productivity improvements. Teicholz (2004) believes the reasons for the decline in labour productivity are lack of R&D spending, fragmentation within the industry, and declining real wage rates. Teicholz also notes that despite the fact that there has been a significant adoption of new ICT by the construction industry over the past 35 years, these applications tend not to be integrated with other systems and therefore do not permit improved collaboration by the project team.

Alshawi (2007) identified that isolated investment in ICT may satisfy a particular downstream business process, but its overall contribution to the business may not be significant. Alshawi attributes this problem to the business-pull and technology-push paradigms where organisations respond to the needs of the marketplace through the deployment of relevant ICT, whereas the latter provides organizations with new technology-based business opportunities that can lead to new innovations. Hecht (2008) relates much of the waste that is generated throughout the life-cycle of a building to the result of people not having access to information that others have created. Hecht emphasises that insufficient information results in waste, and waste costs money, whether the waste comes from change order requests during construction, engineering errors, manual re-entry of data, redundant data collection, unnecessary meetings, mistakes in component dimensions or quantities, or over design to allow for uncertainty. All such waste translates into wasted natural resources. McGraw Hill Construction (2007) associated the concerns about productivity by owners and industry groups with the level of waste resulting from a lack of interoperability and that the industry generally perceives lack of interoperability as an impediment to improving productivity.

This paper will highlight the benefits of increasing productivity through implementing cloud computing and BIM. The paper identifies the structure of a working progress methodology, which is based on several survey techniques in investigating how to apply an integrated process based on exchanging information through using the vehicles of cloud computing and BIM. In further justifying the need to investigate cloud computing and BIM, the paper highlights two selected case studies to emphasize the cost saving benefits of using such vehicles in the construction industry.

2 Interoperable Design Solutions

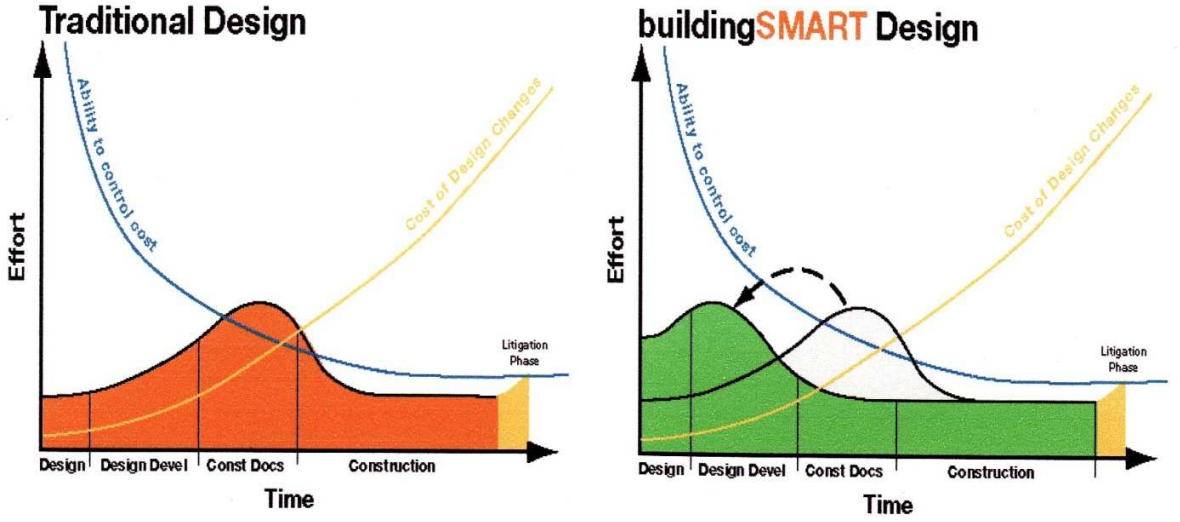
2.1 Interoperability

Gallaher *et al.* (2004) identified that interoperability issues occur creating a fragmented business process and organisational structure. It is estimated that the cost of inadequate interoperability in the U.S capital facilities industry is $15.8 billion per year. In 2002, the value of capital facilities set in place in the U.S. was $374 billion. The magnitude of this figure suggests that even small improvements in efficiency potentially represent significant economic benefits. In recognising

that ICT has the potential to revolutionise the construction industry and streamline historically fragmented operations, Gallaher *et al.* states that tools, such as computer-aided drafting technologies, 3-D modelling technologies and a host of Internet and standards-based design and project collaboration technologies can reduce the fragmented nature of the industry. However, the problems associated with not being able to manage and communicate electronic product and project data between collaborating firms and within individual companies are compounded by the fact that a large number of small companies have not adopted advanced ICT.

Eastman *et al.* (2008) recognised that no single computer application can support all of the tasks associated with building design and production. Interoperability was highlighted by Eastman *et al.* because it depicts the need to pass data between applications, allowing multiple types of experts and applications to contribute to the work at hand. McGraw Hill Construction (2007) defined interoperability in a generic sense, as the ability to manage and communicate electronic product and project data among collaborating firms. Beyond the technological aspect, it is the ability to implement and manage collaborative relationships among members of cross-disciplinary build teams, that enables integrated project execution. In relation to project life-cycle, McGraw Hill identifies that the traditional method generally focuses its greatest amount of effort during the construction documentation phase, in contrast to the integrated approach, whereas the team members work closely together during the design phase, resulting in a greater ability to save costs before the construction process commences. In reference to this idea, McGraw Hill acknowledges that, in order to reap the full benefits of BIM's ability to promote integrated project delivery, build team members will increasingly need to have interoperable solutions. Figure 1 shows BIM's ability to control costs by reducing the cost of design from construction documents to the early design stage.

Figure 1. Earlier Decision Making through BIM Improves Ability to Control Costs (Source: McGraw Hill, 2007)



2.2 BIM and Open Standards

Smith and Tardif (2009) viewed interoperability as a foundational technology for greater efficiency and productivity in the building industry, similar to the Universal Product Code system, which is used for greater efficiency and productivity in the consumer product industry. However, Smith and Tardif also acknowledge that although interoperability is important, it is

only one of the many challenges facing the industry. Smith and Tardif identified buildingSMART Alliance, formally International Alliance for Interoperability, a council for the National Institute of Building Sciences, as a major industry standard body whose early project 'open-standard data format' otherwise known as Industry Foundation Classes (IFC) was deigned to facilitate interoperability by fostering the use of standardisation that is useable and accessible to all disciplines. Bew and Underwood (2009) credited BIM's evolution to early product modeling, such as the Standard for the Exchange of Product model (STEP). Bew and Underwood acknowledged that in 1983 IFC-STEP emerged to define product modeling as the long term ambition to improve the communication of engineering information (including manufacturing, ship building and construction) and to enable integration through the co-ordination of open standards for data exchange and sharing.

Smith (2007) underlined that the concept of BIM is to build a building virtually, prior to building it physically, in order to work out problems, and simulate and analyse potential impacts. Smith stressed that in reality all the information for a building already exists electronically and that this is the catalyst which makes implementing BIM a possibility. Waste will be minimised on-site and products will be delivered when needed, more components will be built and pre-assembled off site in controlled environments. The completed model will be the main source for planning and executing changes throughout the life of the facility; it will be tested and updated to validate compliance with the original design intent and energy usage. Hecht (2008) emphasised that the "I" in BIM is not about automating paper-based processes but about synchronising information across applications to speed up workflows and enable decision support, data bases, and purpose-driven content sharing. Hecht is of the opinion that in order to address the business issues confronting the global building industry, any vendor's BIM needs to interoperate across the internet with a wide range of other software solutions, providing a reliable basis for tracking and making decisions during the building's life-cycle.

2.3 Cloud Computing

Armburst *et al.* (2009) defined cloud computing, as both the applications delivered as a service over the internet and the hardware and systems software in data centres that provide those services. Onuma (2010) recognises that the internet moves in real-time and that computer devices, coupled with cloud-based tools, should make information more accessible to users. In a BIM context, Onuma acknowledges that traditionally exporting a file from application A, and then importing the file into application B, was the industry norm for sharing data between applications. However, it resulted in creating multiple copies of data. The identified solution is 'Service Oriented Architecture' where data can remain on application A and be used or modified by application B (or other applications). For Onuma this approach allows the user to access pertinent BIM data enabling BIM model views to be shared in small BIM data chunks. Kurtalj (2011) defined Mashups as a way to integrate into a common system various products and services. For example, adding Google Map with buildings scattered around the world, it is possible when clicking on the building, for a pop-up with a Building Management Systems (BMS) on that particular building to be accessed. The Mashup concept is highlighted by Kurtalj in relation to Building Automated Systems (BAS) for integrating data points and services from various networks into the same classes/objects infrastructure usable through the cloud model. Instead of translating the data from one protocol to another they can all be processed in the same script, as well as returning the data results back to the very network in its native language (plug-

ins). BAS and BMS can greatly improve the energy conservation of building operating and maintenance especially by implementing a centralised heterogeneous network 'cloud.' By exchanging information from interoperable energy consumption applications with 5D estimating BIM via the internet, the potential exists for predicting early building performance costs which would produce alternative economical designs.

3 Research Methodology (Triangulation of Data)

The formation of the research methodology has evolved from a 2009 cloud computing survey questionnaire, which was based on drivers, barriers and benefits of cloud computing in construction. The majority of the 90 respondents questioned in the survey were in aware of the benefits and upon further analysis BIM, accountancy, and project management applications were identified as the most beneficial services to be implemented as a cloud-based collaboration system (Hore, *et al*, 2010). In lieu of the cloud survey results, the opinions within a focus group comprising of 10 vendors in the Irish construction market-place were analysed on such topics as; security concerns relating to cloud computing, the potential development of a hybrid cloud for the group, and the issue of not being able to recode software that was not cloud compatible. The concept of implementing a cloud network was supported by the group. However a significant number of vendors had concerns for disaster recovery.

In review of the results extracted from the survey questionnaire and the focus group; a Delphi questionnaire was designed. The 16 international experts that were interviewed were chosen based on their knowledge or usage of construction informatics. The questions related to such topics as; the potential for developing a cloud service based on combining three identified applications of BIM, accountancy, and project management. The overall results indicated that the construction industry must become more like manufacturing, as there needs to be standard deliverables. The experts also acknowledged that the key to an integrated BIM process is based on a common database such as, a 'cloud platform.' The experts' main concerns included security, vendor reliability and recovering data. The issue of whether accountancy and project management applications were the most appropriate for the collaboration service was inconclusive. However, BIM was recognised as being beneficial due to its ability to provide higher quality of information resulting in faster business decisions (Redmond *et al*, 2011)

The next round of the Delphi questionnaire will exam the same 16 international experts based on the categories identified from the previous surveys; main survey, focus group, and the initial Delphi questionnaire. The final stage of the primary research will be the semi-structured interviews. It is envisioned that a 'Cloud BIM' service will be recognised by interviewing 'experts' directly based on the categories identified from the data collated from the Delphi questionnaire. This type of methodology is referred to as 'cross method triangulation,' which refers to the use of two or more methods in a single piece of research (Hurmerinta-Peltomaki and Nummela, 2004). The applied approach to developing questions for this research is based on a theory known as 'Grounded theory' which essentially identifies and categories elements in order to explore their connections (Sayre, 2001). Figure 2 demonstrates graphically the sequence of questioning and relates each aspect with its associated path, such as the main survey questionnaire being referred to as a linear approach connected with developing theoretical propositions. The three stages, comprising focus groups, Delphi questionnaires, and semi-

structured interviews, are all associated with applying logic in practice, following a more qualitative subjectivist approach. It is anticipated that all topics will be categorized, refined and revisited through each of the stages in order to define the fastest and cheapest method of exchanging information through a cloud platform using BIM applications based on open standards.

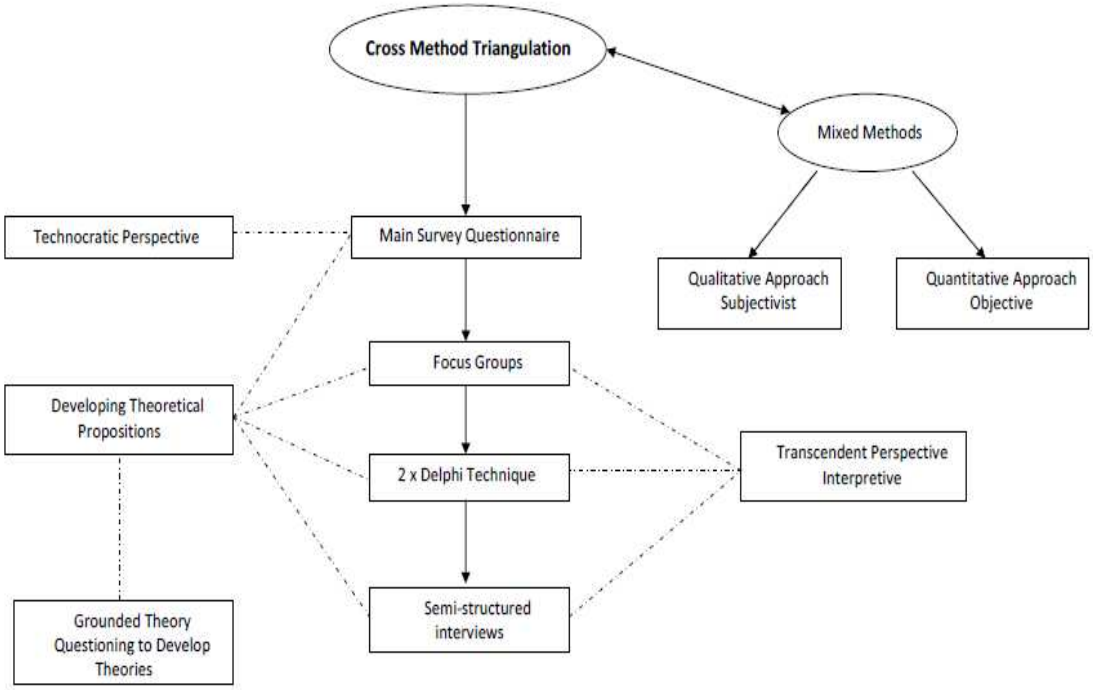


Figure 2. Research Methodology (Triangulation of data)

4 Findings and Discussion

4.1 Case Studies

The following case studies have been chosen to highlight the cost saving benefits of using cloud computing and BIM in the construction industry. The first case study focuses on a small to medium size architectural firm using 'Cloud BIM' to assist in reducing costs in hardware expenses, enhance collaboration with external consultants, and have full mobility through a high performance workstation. The second case study is based on a construction firm, 'Bechtel.' This case study examines the capabilities of reducing infrastructure costs by adopting an architecture that creates a legacy free infrastructure through enabling virtualisation and horizontal connections to other operating systems.

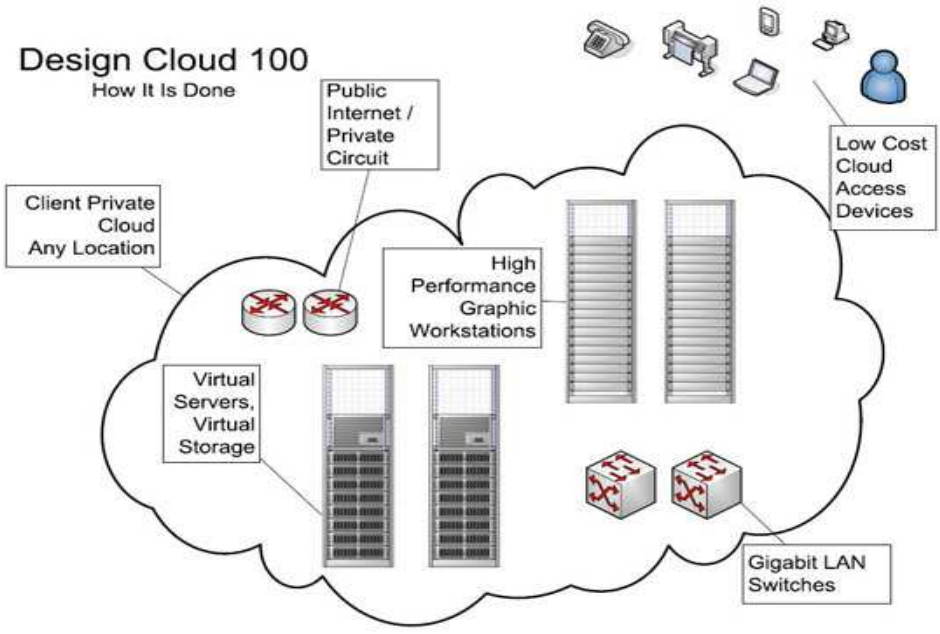
4.2 Case Study 1: High Performance Graphical Workstations

France (2010) acknowledges that most of the current discussion around cloud computing has been dealing with servers (or back-end systems); only recently have businesses begun to put their desktops and workstations into the cloud. France stated in 2010 that their private cloud is the first Architecture, Engineering and Construction workstation cloud in production and is on track to

reduce their workstation and laptop hardware expenses by 67% ($2m) over the next 10 years. France attributes the business benefits of workstation clouds to BIM, as designers are now able to construct a fully documented, 3D building on a computer before they actually build it on-site. This process requires a lot of computer power and overcoming obstacles, such as, (i) growing desktop computing needs – applications which require a lot of simulation, analysis, rendering, and 3D modelling, in order, to design buildings, each year. France's company spends between $250,000 - $300,000 on refreshing laptops with more software capabilities. Based on the cloud access devices, new laptops were purchased for less than $1000 and only when required, (ii) collaborating with outside firms on the same model – with the widespread usage of BIM cloud technology can define real-time collaboration between firms allowing external consultants' employees to develop on the same models, and (iii) full mobility – the high performance workstation enables laptop connection through a Remote Desktop Protocol to have full usage of resources such as a 20MB internet connection.

In continuation of driving down costs and greatly increasing operational capabilities such as "instant" provisioning, disaster recovery, and business continuity, all servers were placed into a virtual infrastructure. Technically the workstations were not virtualised; they were identified as more of a utility that creates the ability to share Windows 7 64-bit operating system with many users at the same time. This process is used for adapting the servers. Storage capability had to be reconfigured for the desktop virtualisation products due to the inability to virtualise the Graphic Processing Unit (GPU), which would have led to a slower performance. The model for GPU computing is to use a Computer Processing Unit (CPU) together in a heterogeneous co-processing mode meaning the sequential part of the applications run on the CPU and the computationally intensive part is accelerated by the GPU.

Figure 3.



Implementation diagram of the HPGW cloud (Source: France, 2010)

France's solution was to use a hybrid approach, turning a single-user workstation into a multi-user workstation (workstation server). To the end-users it represented virtualisation and it was cloud based; to the IT staff it was a piece of shared hardware that enabled 10 people to share this workstation. Figure 3 shows the implementation of the virtualised High Performance Graphical Workstations (HPGWs). By changing to cloud computing France's firm (of 225 people) can now provide design services on 20 HPGW cloud computers and the workstations will not need to be refreshed every two years. The result of this action will mean most of the computing load will be moved off the laptops, estimating a spending cost of $1m over 10 years in contrast to $3m due to purchasing desktop hardware for the same period.

4.3 Case Study 2: Transforming ICT Systems based on Cloud Computing

In 2009, PriceWaterHouseCoopers (PwC) published a quarterly journal based on the real promise of cloud computing. Within this report PwC analysed Bechtel, a construction company with an elastic workforce of 44,000 employees and revenue of $31.4 billion in 2008. Bechtel had made a massive leap towards cloud computing after identifying the problems associated with traditional ICT vertical stacks. The three principal layers of a typical traditional stack are: infrastructure, including compute, storage, and networking assets; application workloads that enable business processes; and end-user devices, which provide the interfaces to access applications. This vertical technology delivered a solution with an acceptable performance. The hardware, application software, and middleware tools are built to order for the application requirements. However, this system creates an instant legacy problem of interdependencies among process logic, data logic, integration logic, compute capacity, storage capacity, and networking functionality. The problems associated with creating interdependencies with standalone stacks becomes evident from the complexity of making changes to individual layers to the increased cost of support and maintenance due to knowledge becoming scarce. The typical ICT environment today is a collection of hundreds or even thousands of tightly coupled vertical stacks integrated with each other.

Bechtel transformed its ICT systems and processes based on best practices of cloud computing providers and in doing so moved towards a more cost efficient, high performance computing. PwC describes this move as Evergreen ICT. Evergreen ICT is an infrastructure architecture designed to deliver loose coupling between distinct layers of ICT stacks, and transition of ICT operations from manual to automate through intelligent software. The critical ingredient for Evergreen ICT architecture is the loose coupling between hardware or middleware and application workloads. The software sits between the raw computation, storage, network environment and the applications known as the software mediation layer. Figure 4 illustrates how the software mediation layer can decouple infrastructure and support the automation of the ICT processes of provisioning, management, and orchestration. In practice, this means that the mediation layer should be configurable to emulate whatever application programming interfaces to which the application were written; for example, Windows and various versions of UNIX.

In conclusion the history of ICT has been dominated by build-to-order systems, resulting in legacy environments. However, the adoption of architecture that can create loose coupling between infrastructure and applications will create legacy-free infrastructures. As Bechtel has indicated, it does not have to happen in one big move, but rather, a process that begins with creating standardised infrastructure, onto which compliant workloads can be moved and over

time organisations can move more complex application workloads to this infrastructure as software mediation (virtualisation) technology matures (PriceWaterHouseCoopers, 2009). Figure 4 illustrates the decoupling of the middleware that enables virtualisation and horizontal connections to other operating systems.

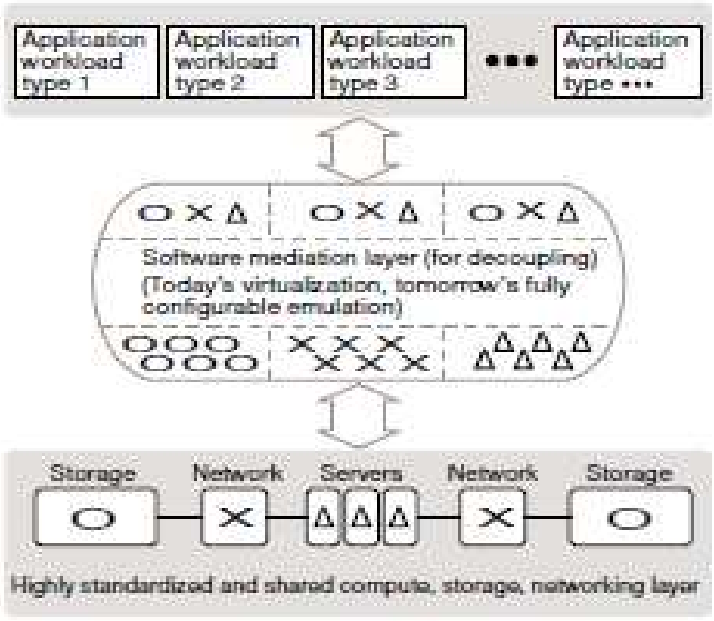


Figure 4. Software Mediation Layer (Source: PwC, 2009)

5 Conclusion and Further Research

The identification of the necessary tools that can successfully improve the performance of a building throughout its life-cycle has always been a challenge, which can be related to the lack of industry standards, inefficient collaboration tools, and design team member's inability to access interoperable applications. In section 2, the benefits of interoperability through passing data between applications, allowing multiple types of experts and applications to contribute to the work at hand was highlighted. The advantage of having a BIM model prior to construction was referred to as a process that minimizes waste on-site and enables products to be delivered when needed. However, in order for BIM to successfully integrate with various applications, open standards for data exchange and sharing would have to be co-ordinated. Section 2, also identified that by using a cloud platform for BIM, the potential exists for saving costs by exchanging information from interoperable energy consumption applications with estimating BIM software. The methodology section (section 3) highlighted the results of the three survey techniques undertaken to date; cloud computing survey, focus group and Delphi questionnaire. The full scope of the research will also include semi-structured interviews, in order, to full identify the reduced costs benefits of implementing cloud computing and BIM, into the construction industry. The cloud-based BIM study of a small to medium size architectural firm emphasized how using this technology enabled them to define real-time collaboration between firms on the same model and reduce hardware expenses by $2m over a 10 year period. The ICT transformation of 'Betchel construction' from traditional standalone vertical stacks to cloud

computing enabled a more cost efficient and high performance computing by adopting an architecture that created loose coupling between infrastructure and applications. In conclusion, this paper has identified the potential cost savings of using services, such as cloud computing and BIM in providing an integrated project delivery. However, in relation to the methodology, further research is being undertaken to investigate the enhancing possibilities of exchanging information through a cloud platform using a BIM model to improve productivity in the UK construction industry.

6 Acknowledgement

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Energy-led retrofitting of solid wall dwellings – technical and user perspectives on airtightness

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Abstract:

Mechanical ventilation with heat recovery (MVHR) is increasingly being promoted in the UK as a means of reducing the CO_2 emissions from dwellings, and installers report growing activity in the retrofit market. In parallel with a survey of householder preferences and practices, the behaviour of a whole-house MVHR system installed in an experimental house, purpose built to typical 1930s standards, has been simulated. The range of air permeability values corresponded to those achieved in a retrofit upgrading process carried out on the house. In the house considered, air permeability, as measured in a 50 Pa pressurisation test, must be reduced below 5 $m^3/m^2.h$ for MVHR to make an overall energy and CO_2 saving. This required a level of disruption that would be unlikely to be tolerated by owners of solid wall dwellings.

Keywords:

airtightness, dwellings, householders attitudes, mechanical ventilation

1 Introduction

The UK has the oldest housing stock in the developed world (Energy Saving Trust, 2003). Of 25 million dwellings in the UK, 34% have solid walls and are responsible for 50% of the total UK domestic sector CO_2 emissions. In a typical unimproved UK solid wall dwelling the ventilation heat loss rate is approximately equal to the heat loss rate through the fabric (walls, roof and ground floor) so, in the context of Government targets of reducing CO_2 emissions from buildings, reducing this ventilation heat loss is attractive and the Energy Saving Trust (2005) emphasises the importance of improving the airtightness of dwellings. Since mechanical ventilation with heat recovery (MVHR) is an established contributor to achieving the zero carbon homes standard required by UK legislation for all new homes by 2016, including those reaching Passivhaus standards, there is an emerging market for MVHR in retrofit installations. However, it is much more difficult to achieve the required low levels of air permeability by retrofitting an existing dwelling than when building a new one, and it is not clear to what extent users and specifiers of retrofit MVHR systems realise how important the building's airtightness is in achieving the anticipated savings. Understanding the technical implications and the user perspectives on airtightness is therefore necessary to prevent inappropriate advice, potentially leading to undesirable disruption and expensive mistakes, being given.

This paper describes some of the work in progress as part of a consortium project entitled *Consumer appealing low energy technologies for building retrofitting* (CALEBRE -

www.calebre.org.uk), which aims to establish a validated, comprehensive refurbishment package for reducing UK domestic carbon emissions, that is acceptable and appealing to householders, and specifically targeted at UK owner occupied solid wall properties (classified as 'hard-to-treat'). It is investigating a selection of technologies, informed by the reality of the user perspective, addressing such questions as the degree of disturbance that householders are prepared to tolerate during a refurbishment programme. Some of the retrofit solutions have been installed and are being evaluated in a newly-constructed test house (the E.ON 2016 House, Figure 1), specially built in 2008 to 1930s standards at Nottingham University. This house has cavity walls which are assumed to have similar performance, when the cavity is filled, to solid walls with external insulation, and there is no reason to expect the air permeability to be different in the two cases. This paper describes results in two main areas, (i) the importance (and difficulty) of achieving airtightness in reducing heat losses and CO_2 emissions from dwellings and (ii) homeowners' perspectives on this aspect of the retrofitting of their homes.

2 Indoor air quality, ventilation and airtightness

2.1 Technical background

Ventilation is needed to dilute and remove pollutants produced indoors, such as moisture, body odours, cooking smells and volatile organic compounds, as well as to supply fresh outdoor air (Awbi, 2003). If moist air comes into contact with a cool surface, the local relative humidity increases, and when it exceeds 80% the risk of mould growth increases rapidly (Roulet, 2001). Any surfaces below the dew-point temperature will permit condensation to form, a serious problem with uninsulated external walls. The development of damp, mould and fungi can result in health and comfort issues for occupants, therefore it is important for the ventilation strategy to maintain RH levels between 30-70% (Carrer et al, 2001). This means that in general the ventilation rate is greater than that required merely to supply fresh air (Energy Saving Trust, 2003). For dwelling renovation, therefore, it is important to consider the ventilation strategy when implementing measures to improve the building airtightness to ensure there is no detrimental effect on occupant comfort or the building fabric.

The UK's relatively mild climate means dwellings predominantly rely on uncontrolled natural ventilation. This does not guarantee a sufficient air change rate to maintain indoor air quality all year round, but allows excessive ventilation and heat loss in windy conditions. Until the recent drive towards low carbon housing, the airtightness of UK dwellings showed little improvement. In a survey of 471 dwellings (Stephen, 1998) those constructed between 1900-1930 had a mean air permeability just over 10 air changes per hour (ach^{-1}) at 50 Pa, measured by the pressure test (CIBSE, 2000). For a sample of houses built 1930-1960, it exceeded 15 ach^{-1}, while in the most recently constructed properties it had returned to 10 ach^{-1}. In other parts of Europe dwellings are much more airtight and mechanical ventilation (with or without heat recovery) is universal. It should be noted that the 50 Pa value, specified in standards, is different from the unpressurised infiltration rate that should be used in thermal energy calculations. Kronvall (1978) derived a 'rule of thumb' method in which the natural infiltration rate is 0.05 times the tested air change rate. In this paper, all measured air change rates and permeabilities are 50 Pa pressure test values.

Passivhaus standards (2011) specify 0.6 ach^{-1} at 50 Pa and were developed to enable the design and construction of dwellings with annual heating or cooling energy consumption below 15

kWh/m^2 treated floor area. At this level, the ventilation system can address the space heating needs and a whole house MVHR system is an essential component of this strategy. Although strictly these standards apply only to new buildings, they are increasingly being implemented in refurbishment projects, and the first certified Passivhaus retrofit in the UK was recently achieved for a terraced Victorian property (Octavia Housing, 2011).

The heat recovered from the ventilation air by MVHR offers a modest contribution to CO_2 emissions savings. As a result the market for MVHR systems in the UK has been stimulated and in 2009 was estimated at 15000 units annually, worth £30million. Of this the retrofit sector accounts for a small but growing share of about 5% (Waddell, 2010). Since the effectiveness of an MVHR system depends on the correct balance between heat recovery efficiency, fan efficiency, air flow rate and building airtightness there is a technical challenge in using MVHR for retrofit. Since there was no prior information on this, the technical objective of this investigation was to establish the airtightness level that must be achieved in order for MVHR to have a significant effect on the CO_2 emissions, using both modelling and monitoring.

Macintosh and Steemers (2005) found differences between the expectations and reality for an MVHR system in housing in four areas:

Noise – disturbance from external noise and pollution should be improved, but residents in the study reported noise from inlet vents which was unwanted.

Perceived freshness – ventilated air may not be perceived as fresh as it is not at external temperature and no direct connection to the outside (for example via a window) was made by residents.

Perceived control – residents opened/closed windows much more frequently than they made adjustments to the MVHR controls.

Misunderstanding – residents misunderstood what the ventilation was for and when it should be used.

In light of this, the behavioural objective of the investigation in this paper was to compare the technical findings with user perspectives in order to identify acceptable ways forward.

2.2 User centred design background

For any new technology to be successful, it must be accepted by the end users and meet their needs. These needs include their social, emotional, practical and economic needs. For a technology such as MVHR, it is critical that it is considered in context of the built environment and the end users, that is householders. By taking a user centred design approach, it should be possible to explore the existing ventilation practices of householders and identify requirements for the technology that will meet these requirements in context. The principles of user centred design are generally accepted to be an early focus on users and tasks, empirical measurement and iterative design (Gould and Lewis 1985), leading to the design of useful, useable and desirable products. Preece et al. (2002) propose that providing "an easily accessible collection of gathered data" will help designers remain focused on user needs. Clear communication of requirements to designers and technologists in a way that is meaningful and relevant is therefore a crucial

component of user centred design. To this end, CALEBRE is taking a user led approach to understanding householders with the intention of ensuring that the resulting technologies are designed to be acceptable and appealing.

3 Research Methodology

3.1 Summary of the CALEBRE project

The CALEBRE project aims to develop a number of technologies suitable for retrofitting to solid wall dwellings. These are at various stages of completion and will be tested either in the laboratory or in service in the E.ON 2016 house. In addition to the work described in this paper, there are a number of technological workpackages, which can be summarised as follows:

Develop an electric air-source heat pump, able to deliver hot enough water to make it suitable for replacing the boiler in an existing central heating system.

Develop a gas-fired air-source heat pump, able to deliver hot enough water to make it suitable for replacing the boiler in an existing central heating system.

Develop vacuum double and triple glazing units, able to achieve U-values of 0.33 $W/m^2.K$ or less, suitable for use in conventional windows.

Develop advanced surface treatments for internal walls, with hygrothermal properties able to smooth the changes in air temperature and relative humidity.

In addition, the project will explore the market development issues associated with mass production of these novel technologies and develop a prototype selection tool, informed by the identified needs of homeowners. The project has a strong consumer focus and a group of householders has been recruited to participate in the evaluation of the technologies and their implications for user behaviour and performance in service.

3.2 Airtightness measures

Air permeability tests using the 50 Pa fan pressurisation technique (CIBSE, 2000) were carried out on the E.ON 2016 house in its initial state and following each stage of the application of a series of retrofit solutions (Table 1), installed over several months with the aim of reducing the level of uncontrolled ventilation. This provided a series of measured permeability values which could inform the infiltration value used in a dynamic thermal model of the house to assess the impact on the annual energy consumption and CO_2 emissions. Some of the upgrades to the external fabric and glazing have multiple benefits in that they contribute to reduced infiltration rates as well as conduction losses. Measuring the changes in the building's air permeability allows the combined effect of these improvements to be assessed as a series of retrofit measures by updating these properties simultaneously in the thermal model.

3.3 Dynamic Thermal Modelling

Dynamic thermal modelling software (IES Virtual Environment) was used to build a model of the E.ON 2016 house (Figure 1) to simulate a year's operation and calculate the annual energy consumption and CO_2 emissions. Details of the building geometry and orientation were input

using the architectural drawings to create zones corresponding to each room and represent the building. The Nottingham Test Reference Year weather file (CIBSE, 2008) was used to simulate local climatic data.

Figure 1 E.ON 2016 house at The University of Nottingham and the IES VE Dynamic Thermal Model

The operational parameters for each room type were derived from the National Calculation Methodology database (NCM, 2010) to develop a set of templates representing the occupied house, specifying heating set-points, domestic hot water consumption and internal gains (lighting, equipment and occupancy), as well as diversity profiles set up to represent daily and weekly variations in these values.

These parameters were consistent for all the analyses so that the variations in energy performance would be attributable to the ventilation strategy and the thermal properties of the building. The thermal modelling assumes that there are no changes in the internal conditions before or after the application of the retrofit measures, and that occupants do not take the benefit of higher living temperatures. This may be wrong, as research into this 'rebound effect' shows (e.g. Sorrell, 2009), but will not be considered further here.

Construction templates were created defining both the internal and external constructions, and performance characteristics. This allowed the changes in U-value between the initial base case house, as built to 1930s construction standards, and the thermally upgraded construction, as per the improvement work carried out as part of the retrofit process, to be replicated in the E.ON 2016 dynamic thermal model. This would simulate the differences in conduction losses associated with the improved glazing and building fabric.

3.4 Understanding of User Requirements

To understand the requirements of the users in context, twenty households (with 66 permanent occupants) were recruited to take part in a series of data collection activities. Each household lived in an owner occupied, solid wall house in the East Midlands region of the UK. A purposive sampling approach was taken, to ensure inclusion of a range of house types (detached, semi-detached, link, mid and end terraced), household types (single, couples, families with young, older and grown up children), participant age ranges (28 – 80 years old), income bands (under

£10,000pa – over £70,000pa) and location (urban, suburban, rural). While not intended to be a statistically representative sample, it allowed detailed exploration of a snapshot of different domestic situations.

Two in-depth interviews were undertaken with all adult household members wherever possible to ensure a whole household perspective. The first interview explored reasons for buying the property, improvements made to the house and issues relating to these (who did the work, levels of disruption, approximate cost, etc). These were drawn up with the householders using an innovative 'timeline tool', reported in more detail in Haines et al (2010). Issues relating to comfort and home improvement aspirations were also covered. In the second interview, attitudes towards energy saving were explored, the CALEBRE technologies were described to the householders and initial responses obtained. Questions were then asked about the householders' various practices in the home that related to the design of the technologies. These were intentionally focused on the householders and their home lives to ensure a relevant and engaging conversation, rather than a more formal question and answer session. Finally a tour was made of the home to see in detail aspects of the house that had been mentioned in the discussions, as well as to take a photographic record of the various features. Digital audio recordings from these interviews were transcribed and analysed using NVivo 9. Conversational extracts relating to ventilation and related practices were analysed in detail and the key findings are presented in this paper.

4 Results and Discussion

4.1 Air permeability

Each set of improvement measures applied to the E.ON 2016 house contributed to a reduction in the building's air permeability, but with variable success (Table 1). In its original state the house was very leaky and the extensive stage 1 improvements were expected to significantly reduce the measured air permeability but succeeded in reducing it only from 15.57 to 14.31 $m^3/m^2.h$. The relationship between permeability in $m^3/m^2.h$ and air change rate is specific to the geometry of the building: in this case 15.57 $m^3/m^2.h$ = 14.85 ach^{-1}. Noting the inconsistency with air change rates mentioned earlier, we report permeability values here because they are familiar to UK professionals. Inspection revealed that the draught-proofing had been poorly applied to the windows and doors, often with an incomplete seal around the perimeter of the component, and installing the MVHR system had created new gaps in the building envelope and duct connections to the rooms, permitting uncontrolled airflow. In stage 2 the draught-proofing was re-done and extended to the remaining doors and windows, reaching 9.84 $m^3/m^2.h$. The building air permeability was further reduced by the two remaining stages, culminating in the final measure of sealing and insulating the ground floor, which achieved the final building air permeability value of 5 $m^3/m^2.h$ at 50 Pa.

Much effort and cost was needed to reduce the air permeability and the research team were surprised at how poor was the workmanship in the initial stages of draught-proofing, undertaken professionally to current industry standards. Gaps were left around doors and previously installed insulation disturbed by later work. The final stage was especially disruptive and involved lifting floor coverings and furniture before installing a membrane over the timber floor. The total cost

of draught-proofing exceeded £12000, and with the MVHR installation costing £6000 this is unlikely to be economic.

While sealing a house is perceived as a simple task, it is in fact much more challenging because of the care and attention to detail needed by the workforce. Air permeability is made up of a myriad of entry points in the fabric, which can be created by oversize holes for pipes and wiring, irregular gaps between new windows and brickwork openings, gaps between walls / floors and walls / ceilings, etc (Energy Saving Trust, 2005). Suspended timber ground floors can be a particular problem and in this case success was achieved by installing a membrane across the boarding, which was dressed up behind the skirting boards.

Table 1. E.ON 2016 house measured air permeability values

Stage	Air permeability at 50Pa ($m^3/m^2.h$)	Description of work
As built	15.57	Single glazed windows Uninsulated walls, floor and roof space No draught-proofing
1	14.31	Double glazing installed Insulation applied to walls and loft Draught-proofing applied to windows (excluding kitchen, bathroom and WC) and doors Installation of whole house MVHR system
2	9.84	Kitchen, bathroom, WC windows and under croft trap-door draught-proofed Draught-proofing throughout house re-installed Window trickle vents blocked up
3	8.60	Service risers sealed Pipework penetrations sealed (radiators, water pipes etc.) Sealing around boiler flue Covers fitted to door locks Kitchen fan removed and bricked up
4	5	Suspended timber ground floor insulated and sealed

4.2 Heat losses, energy consumption and CO2 emissions

Full details of the dynamic thermal simulation and energy modelling have been reported elsewhere (Banfill et al, 2011) and are summarised here. Figure 2 details the disaggregated loads on the heating system at the time the peak space heating load occurs in the dynamic analyses. Note that, as the final retrofit measure is applied the peak load occurs at a different time of year. The results show the expected significant reduction in energy consumption as a result of the work, but since the focus of this paper is on airtightness, these will not be considered further. Note that measured thermal energy data is not yet available, since performance monitoring is still in progress. Comparing the performance of the building after stage 4 with the base case as built shows an overall 71% reduction in total annual building energy consumption from the base case.

This takes into account the energy associated with the space heating, domestic hot water, auxiliary (fans and pumps), lighting and equipment.

To investigate the effect of MVHR alone (i.e. separate from the other measures listed in table 1), a modelling study starting from a naturally ventilated base case of 10 $m^3/m^2.h$ (based on the recommended ventilation rate as advised by BRE Digest 398, where Kronvall's rule of thumb has been used to determine an equivalent air permeability value), simulated its effect on energy and CO_2 emissions at successively reduced air change rates, culminating in the Passivhaus standard of 0.63 $m^3/m^2.h$ (0.6 ach^{-1}) and the results are given in table 2.

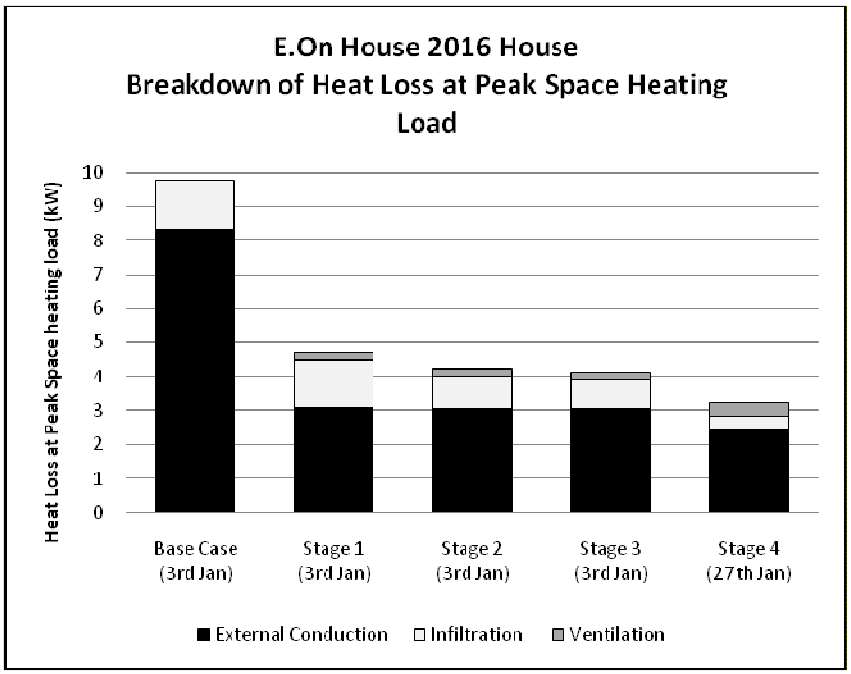

Figure 2 E.ON 2016 House: breakdown of heat loss at peak space heating load

It may be recalled that stage 4 of the retrofitting measures achieved a 50 Pa air permeability of 5 $m^3/m^2.h$. At this level the annual energy consumption is barely reduced and the CO_2 emissions are still above the unimproved house. Further improvements in air permeability would be necessary to effect a significant reduction in energy and CO_2 but even at 0.63 $m^3/m^2.h$, the Passivhaus level, annual energy consumption is only 11.7% lower and CO_2 emissions are only 5.3% lower.

The carbon intensity of the electricity used to operate the MVHR system is about three times that of the gas used for heating and this means that achieving an overall reduction in the building's CO_2 emissions requires the space heating demand to be reduced by three times the electricity consumption of the MVHR system.

4.3 Householder preferences and practices

Achieving an airtight house may be a desirable approach from the perspective of saving heat loss and hence CO_2 but any system, particularly one that will be retrofitted, must meet the

householders' requirements or else it will not be appealing nor acceptable. The practices and preferences obtained from the householder interviews uncovered a range of issues that may result in an unappealing system, or one that works sub-optimally. These are discussed below. Whilst many of the homes had some double glazing and loft insulation, none had more advanced energy efficiency measures installed. None had attempted to actively reduce the air permeability of their home (although attempts to reduce draughts had been made through fitting double or secondary glazing, by using carpets and soft furnishings and by blocking up chimneys). None of the houses had an MVHR system.

Table 2. Impact of airtightness on modelled annual energy consumption and CO_2 emissions of the thermally upgraded E.ON 2016 house using an MVHR system specified to best practice standards.

Study	Annual space heating energy (kWh/m^2)	Annual auxiliary energy (kWh/m^2)	Total building annual energy consumption (kWh/m^2)	% change (energy)	Total building annual emissions ($kg.CO_2/m^2$)	% change (CO_2)
10 $m^3/m^2.h$ naturally ventilated	65.7	9.6	126.9	0	44.6	0
10 $m^3/m^2.h$ with MVHR	76.4	10.8	138.8	+9.4%	47.4	+6.2%
7 $m^3/m^2.h$ with MVHR	66.3	10.8	128.8	+1.5%	45.4	+1.7%
5 $m^3/m^2.h$ with MVHR	62.9	11.4	125.9	-0.8%	45.0	+0.9%
3 $m^3/m^2.h$ with MVHR	56.5	11.4	119.5	-5.9%	43.8	-2.0%
1.05 $m^3/m^2.h$ with MVHR	50.3	11.4	113.3	-10.7%	42.6	-4.7%
0.63 $m^3/m^2.h$ with MVHR	49.0	11.4	112.0	-11.7%	42.3	-5.3%

4.3.1 Air flow and freshness

Many householders were keen to maintain air flow within their homes, even if it meant obvious heat loss. Current approaches to controlling air flow included opening and closing doors, windows or vents, or closing curtains to block off draughts. One participant spoke of the more refreshing "natural feeling of a breeze" (Male, age 29) and airtightness was seen as a negative issue: "I like to be able to breathe fresh air. I don't know if I'd really want an airtight house" (Female, age 61). Associations were made with the environment within an aeroplane, with words such as "recycled", "stale" and "manky" being used to describe their expectations of a mechanical ventilation system. When an MVHR system was explained to householders in more detail, the idea was more positively received (particularly in relation to some of the other

technologies presented) and so there is clearly potential for successful systems once the initial preconceptions are overcome.

4.3.2 Open fireplaces

Of the 20 houses surveyed as part of the project, 15 had some form of open chimney or vent for a wood burning stove. Of these houses, 9 of the householders said they would not be prepared to consider losing the functionality of all their fireplaces (even if they were able to keep the fireplace aesthetics). Some were prepared to lose the functionality of some of the fireplaces, but not all. The majority of households viewed the fireplace as an occasional 'treat' rather than the standard method of heating the home. Its use was described by one householder as "High days and holidays – not very often" (Female, age 51). However there were households in the sample that used their fireplaces every day during winter. Although householders may be aware that the fireplace inhibits the airtightness and increases draughts, they were still unwilling to remove its functionality and instead prefer to use temporary blocks for the chimney when it is not in use, as illustrated by this comment: "The only thing that would not be airtight...would be the fire place because there is no balloon in or cap or anything like that, so that can be quite draughty in winter, but we stick a black bag full of newspaper up there don't we, when we're not using it" (Male, age 29). Those householders that would be happy to lose the functionality of their chimney expressed a desire to keep the aesthetics of the traditional fireplace in order to maintain the period features of their home. Although some of the houses had fireplaces in upstairs rooms, none were used; when questioned, this was due to safety, and so could easily be made airtight.

4.3.3 Door opening practices

A retrofitted MVHR system is likely to require a good circulation of air within the home (as a more limited venting system will be easier and less disruptive to install) and so internal door opening practices were explored. Householders reported strong habitual practices, for example always closing certain doors at night time, or leaving doors ajar at certain times of the day. Reasons for habitually closing internal doors included to reduce internal noise (from other members of the household, or a striking clock), to stop dust circulating through the house, to keep pets and young children in particular areas of the house, for privacy or to keep light out, or to shut off part of the house, either when a child has grown up and moved away, or when only certain rooms are heated. This final practice was common in houses where householders did not heat their whole house every day (perhaps only doing so when guests were visiting) or to keep the heat from an open fire within a room for the "cosy family stuff" (Female, age 51). Internal doors were sometimes left open by householders as a regular practice, or were so poorly fitting that air would circulate past them easily even if closed: "When they do shut they have got gaps haven't they" (Female, age 43).

4.3.4 Damp

Many of the householders had damp areas in their homes and used ventilation as a means to control humidity. This may be as a short term measure (e.g. after a shower) or longer term, with the regular use of a de-humidifier. Whilst many householders recognised they had a draughty house, there was a feeling that the draughts kept the house adequately ventilated and healthy. The need for a system to replace what occurred naturally was not recognised. Communicating the benefits of an airtight house with MVHR system is critical to win over these householders.

4.4 General discussion

Achieving airtightness is clearly important for reducing heat losses and CO_2 emissions and MVHR can contribute to savings but levels sufficiently low for MVHR to be effective are very difficult to achieve in older properties, as demonstrated by the number of stages needed for sealing the E.ON 2016 house. In addition, people have features in their older homes that mean airtightness is difficult to achieve, in particular open fireplaces that are used regularly in the winter. They may be willing to block these (using a balloon or similar) in the summer but this is not the time when it is needed.

Retrofitting an MVHR system will probably mean a reduced number of vents, because the likely whole house disruption that will be caused by a more integrated system is unwelcome to householders unless they are doing total renovations. However, our study of 20 households suggest that whole house renovation is uncommon other than at the time of purchase (and even then not all householders did this).

Attitudes towards an MVHR system are initially negative: people like fresh air in their home, which they feel is necessary to deal with issues like damp and condensation, as well as a perceived negative effect on health through germs being recirculated. When it was explained to them, householders were more positive about MVHR, appreciating that it could help their damp problems and that the same air was not recirculated, and so the benefits would need to be clearly communicated. However, people have habitual internal door opening / closing practices that mean that air flow within the house may be limited (closing doors for privacy, keeping pets or children contained, etc), which could limit the effectiveness of an MVHR system.

5 Conclusion and Further Research

Airtightness is a crucial factor in achieving energy and CO_2 emissions reductions in dwellings and it is easy to over-estimate the reductions achievable by retrofitting MVHR. Even with equipment specified to best practice standards the air permeability measured at 50 Pa must be reduced to less than 5 $m^3/m^2.h$ to reduce annual building energy. We expect to be able to compare these modelled predictions with measured data in a future paper.

That even competent installers of draughtproofing find it challenging to achieve low air permeability in existing dwellings, because of the high level of care and attention to detail required, is an important and worrying finding. In the case of the E.ON 2016 house it was necessary to rigorously seal the entire ground floor, as well as the various penetrations of the building envelope, in order to reduce the permeability to 5 $m^3/m^2.h$. The disruption involved in this process is unlikely to be tolerated by the occupants, who additionally value the very features in their homes that make achieving airtightness difficult. Other approaches to energy efficiency may be easier to implement in existing dwellings than MVHR.

6 Acknowledgement

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Towards Promoting Sustainable Construction In Egypt: A Life-cycle Cost Approach

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Abstract:

People spend most of their lives in buildings either homes, work places, education facilities or entertainment centers. Buildings represent a large economical investment and have huge effects on our lives and performance. With the presence of challenges such as: the rise in green house gases emissions, global warming, resource depletion….. etc., buildings design should have futuristic visions and innovative solutions to cope with such considerations. Design for sustainable/green buildings should be indispensible alternative in the construction industry. This paper introduces a framework for green buildings design in order to support planners to choose optimum customized building envelope design (orientation, walls, windows & roof) with least possible costs over the building lifetime. The proposed framework has unique focus on using sustainable approaches (material efficiency, indoor air quality, energy efficiency, passive solar design and natural illumination) to meet least life-cycle costs. A friendly prototype (Easy Design Integrated Tool- EDIT) is introduced based on proposed framework. It represents a comprehensive and easy application tool. (EDIT) is composed of five main modules: (1) user interface, (2) Interactive database, (3) systems builder, (4) systems assessment and (5) optimization engine. A case study is further implemented using the prototype (EDIT) and design results are discussed. Moreover, more analysis is developed as comparative analysis between green and traditional building designs. The analysis shows that green design exhibited life cycle savings of 16.3% and energy savings of 50% annually if compared to traditional design. Furthermore, simulation of all design systems alternatives is conducted to present a tradeoff comparison between initial and energy costs of different designs. Finally, the framework proves to be a credible, verified and validated. It can aid consultants, project managers and owner organizations at first stages of design to reach optimum building envelope systems design that ensure sustainability approaches and operation with least possible costs.

Keywords:

building thermal performance, design optimization, green buildings, life-cycle cost, sustainable design.

1 Introduction

Buildings' design is mostly selected based on standard construction techniques merely focusing on schedules and budgets only. Such techniques may overlook long term performance, environment impair…etc. According to the US Environmental Protection Agency, buildings contribute markedly to the environment degradation. Buildings alone use about 39% of total country's energy, consume 12% of the total water consumption and utilize 68% of total electricity utilization. Moreover, they emit 38 % of total carbon dioxide emissions (Green Buildings, 2010). According to that, sustainability techniques in building design should be employed without sacrificing costs or performance.

Three main aspects have contributed the most to motivate this research which are: (1) the current environmental challenges that the world is facing, (2) the lack of environmental awareness specifically in Egypt and (3) the presence of many limitations in buildings design research and tools. The first aspect is the environmental challenges as the rise in carbon emissions, global warming, scarcity of resources….etc which are great threat to the world (Intergovernmental Panel on Climate Change, 2007). Consequently, promoting the use of sustainable techniques in the construction industry would indeed serve as a constructive step to a better tomorrow for our society, country and world. The second aspect that motivated this research is that although most developed countries are aware of the globe environmental challenges and are adopting sustainability approaches, Egypt is still limping in such field. Till now, Egypt does not have an established buildings green rating system (Egyptian Green Building Council, 2011). Moreover, ignorance of green designs main principles has made engineers and investors fear their adoption and conceive it as waste of time and money (Shafik, 2009). The third aspect is the presence of limitations in available design tools/programs. Many design professional and investors criticize available design tools/programs for being complex and demanding since large amounts of information and detailed design are required for their operation which is usually not available at first design stages (Mckay, 2007).

This paper would be dedicated to promoting green/sustainable building design in Egypt by providing an easy comprehensive framework to be adopted. The research scope is shown in figure (1) to reach an optimum green building envelope design based on above mentioned considerations. The process is achieved through the formulation of a building optimum design that is based upon two levels. The first level is the building level which depicts the optimum building orientation from 8 different orientations. The second level is the systems level which depicts the best walls, roof and windows systems composition for each of the four facades of the building. The optimum design is based upon considerations as energy efficiency, thermal comfort, passive solar design, costs, daylighting, and user preferences.

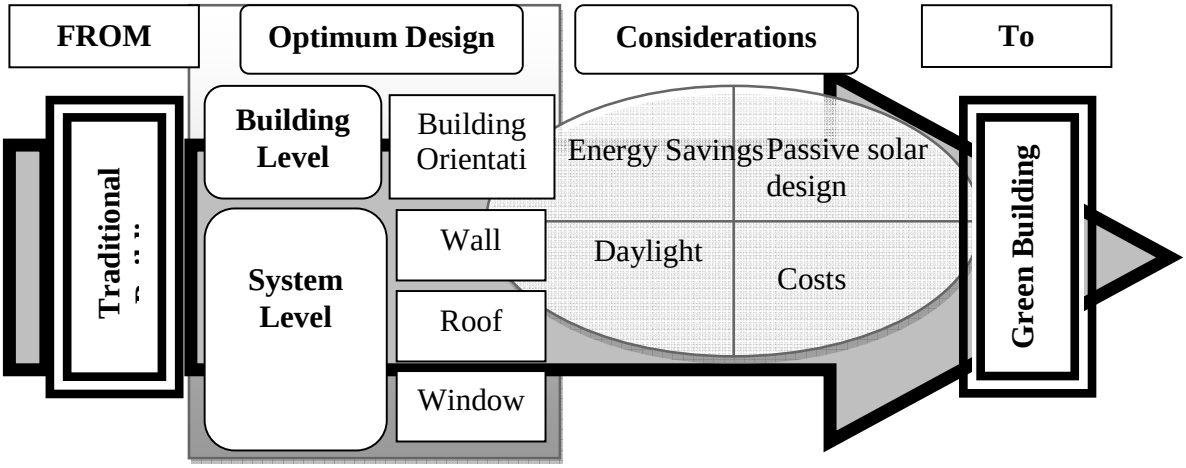


Figure1: Scope of Work

2 Literature Review

Researchers have been studying different green design parameters and their effect on the over all performance of buildings mainly energy savings or buildings life-cycle costs. Some of which have dedicated their work to study such effects on the cost of building systems. Some Researches have been focusing on the whole life-cycle costs of buildings since buildings live tens of years (Fuller, 2007), while others just focused on certain aspects as energy savings (Abraham, 2003). Other researchers have been focusing on no-cost measures as building orientation to have less running costs (Winkler *et al*., 2002). Some studies have been focusing on elements in the design as insulation and its contribution to the optimization of life-cycle costs (Abdullah *et al*., 2008). Other designers have been employing optimization of multiple objectives as to reach optimum design (Nielsen and Svendsen, 2002). However, Most of them studied only one design parameter at a time and showed their performance on energy/life-cycle costs. Integration between different building systems is mostly ignored. Moreover, all their presented approaches/models need a high level of complexity. Also the integration of daylight analysis in green buildings has become an important strategy that has been overlooked in the research area (Nielsen and Svendsen, 2002). This paper research intends to build on the literature findings and attempts to avoid its limitations. It would offer a framework for an integrated green buildings design optimization. Parameters studied would be buildings envelope walls, windows, roof and orientation considering their integration effect. Green approaches would focus on indoor quality, thermal comfort and energy efficiency techniques. This framework is intended to address economic aspects and show savings as a tool to promote sustainability in construction management in Egypt. Furthermore, a generic model (EDIT) is discussed to be used by design professionals at conceptual design phases. Finally, a case study would be applied for discussing results and incurring risk assessment.

3 Research Methodology

The proposed framework to reach optimum green buildings' design is through the implementation of a model which its main modules are shown in figure (2). It consists mainly of 5 modules that interact together to reach the optimum green design.

3.1 Interactive Database

The first module is the "Interactive Dynamic Database". This database is fed on 2 levels. The first level is more specific to the building or project under analysis. This information is related to the building studied as: the building geometry information as length (L), width (W), height of Floors, number of floors, area of window (%) and location of building. It also includes preferences in the analysis as preferred building interior temperature in summer and winter and the analysis Lifetime study (years). The second level is to set up the program. It mainly feeds 3 main groups. Group one is material related information including list of materials and their technical data as conductivity, U-value, shading coefficient, design parameters, lifetime. Group two is costs related information and it includes list of materials and their related costs (initial, maintenance, replacement) and energy costs.

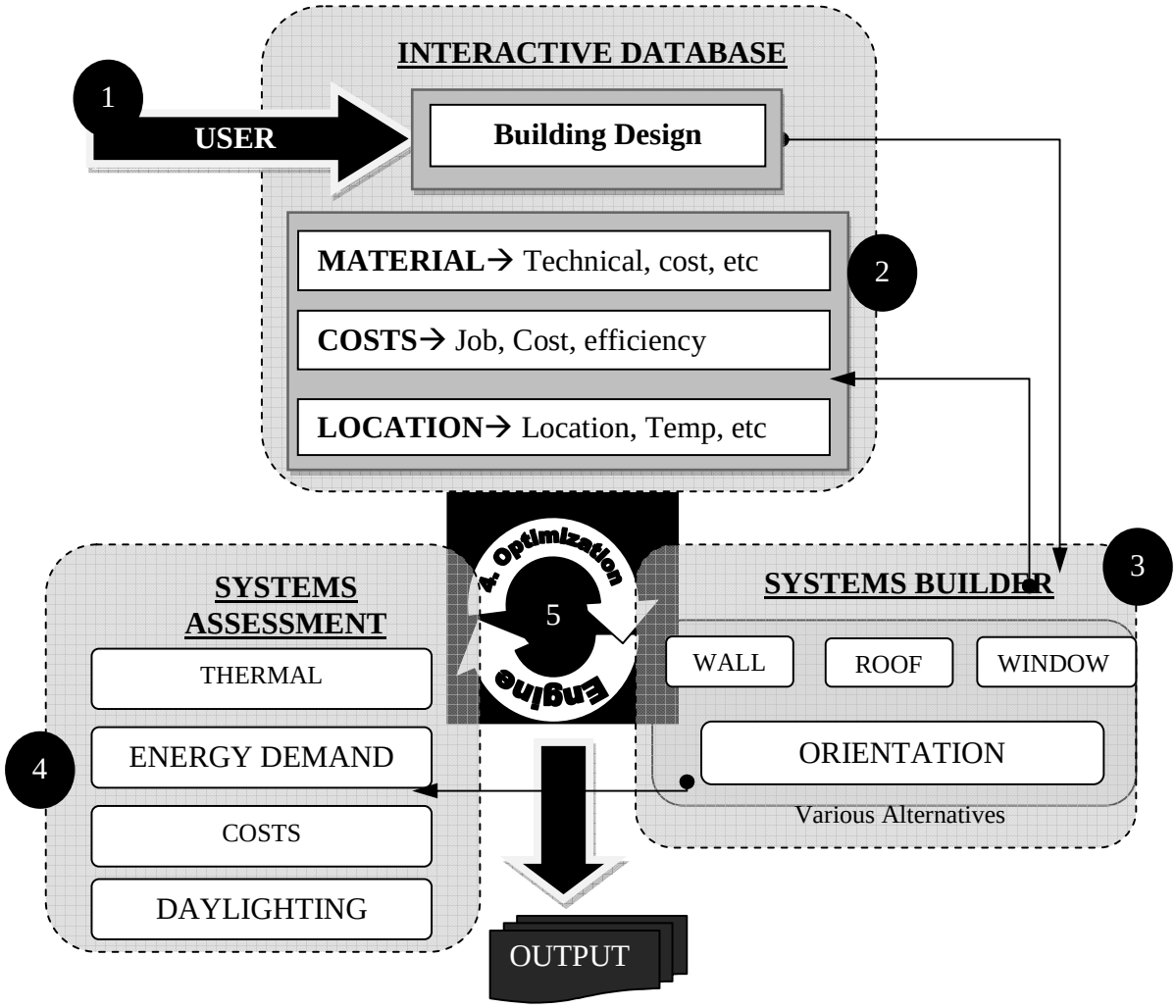


Figure 14: Framework Main Modules

Group three includes location related data as (1) weather related information as monthly average ambient temperature data, (2) orientation related data which also depends on location as solar heat gain factor and cooling load factors. This second level that contains the three groups is filled by model designer and it aids in feeding the system set up. To feed level two, integration of data should be processed depending on place of operation of the model. In this model, Group one and three sets of information were obtained from design books following the ASHRAE (McQuiston and Spitler, 1997). Group two was obtained from market and local contractors databases. (United Company, 2010) Group three was obtained from US department of energy (Weather Data, 2011). The first level is fed from user entry feeder and changes from one project to another. However, the second level needs frequent updating to be in phase with local and global changes.

3.2 Systems Builder

The Third module is the systems builder. This module builds different design systems in building envelope. Three main elements are considered in the envelope which are exterior walls, the roof and windows. The builder is mainly fed from the central dynamic database to produce different combination of systems under each element at different building's orientation. Different systems are formed of different alternatives to reach the optimum building orientation, walls system, roof system and windows system designs. The final optimum design is based upon certain green considerations. Considerations as indoor quality, material efficiency, energy efficiency and daylight measures are all included. Also cost is another consideration that is concerned. Finally, a daylighting index is also considered in the analysis. The considerations just mentioned above are fed to the system builder through module four which is the systems assessment.

3.3 Systems Assessment

The third module is the systems assessment. This system feeds the systems builder to reach the optimum building orientation and envelope design. Four main assessments are working in parallel: thermal, energy demand, costs and daylight.

3.3.1 Thermal Assessment

This first assessment calculates the amount of heat/cooling load needed to reach satisfactory thermal envelope condition. In this work, and with the absence of the residential building energy code for Egypt, the heating/cooling demands for residential buildings were calculated based upon the ASHRAE design book (McQuiston & Spitler, 1997). Heating/Cooling loads of buildings according to ASHRAE depend on three main assessments: conduction through building walls/roof, conduction through windows and solar radiation through glass. Heat gain/loss due to conduction through walls/roof (Watt/m^2) depends on U-value of the walls/Roof (Watt/m^2 ^oC), the area of opaque walls/ Roof (m^2) and the different temperature between outdoor temperature and indoor preferred temperature (^oC). Heat gain through Windows (Watt/m^2) depends on U-value of the window glass (Watt/m^2 ^oC), area of window (m^2) and different temperature between outdoor temperature and indoor temperature (^oC). Finally, solar heat gain (Watt/m^2) depends on the net glass area of windows (m^2), shading coefficient of window glass (unit less), solar heat gain factor for that orientation (watt/m^2) and cooling load factor (unit less).

3.3.2 ENERGY DEMAND

The second assessment is the energy demand. It relies on the amount of calculated heating/cooling loads needed to be offset received from the first assessment. Equation (1) is used to present the energy demand of any built system (Haines and Wilson, 1998).

$$Energy\ Demand = \frac{Q_{Total\ of\ all\ systems}}{C.O.P} \quad (1)$$

Where $Q_{Total\ of\ all\ systems}$ is the total amount of heat gain/loss in watts, C.O.P is the coefficient of performance of cooling/heating system.

3.3.3 Costs Assessment

Operation costs are mainly the electricity costs, Equation (2) is used to present the electricity costs per year (Haines and Wilson, 1998)

$$E = Energy\ demand. \ h \ . \ E_{price} \quad (2)$$

Where E is the calculated electric costs per given year (L.E /year), h is number of hours of operating cooling/heating system per year (hr), C.O.P is the coefficient of performance of cooling/Heating system depends on function needed and season of operation and E price is the price of 1kw.hr consumption of electricity (LE/kw.hr). E price is received from annual ministry of electricity and energy (Egyptian Electricity Holding Annual Report, 2011). After knowing all cost values and their repetition along the analysis period for all systems forming the building, all costs are discounted back resulting in an equivalent net present value for the whole building (NPV) (Sullivan, 2006). In this assessment, a market interest rate for each repeated cost is calculated from real interest rate and general inflation rate that can be obtained from Egyptian central agency for public mobilization and statistics (Price Indices, 2010) and then used in the NPV calculation (Sullivan, 2006).

3.3.4 Daylight Assessment

This assessment provides a set of daylighting indices for the four building façades. The natural illumination in (LUX) at a certain reference points is calculated from each façade orientation and daytime, view factor between reference position and window, Window to floor area ratio, the net glass area, and maintenance factor (Fikry, 2006). After the calculations of these daylight indices, one weighted sum is reflected to guide the internal design of the building.

3.4 Optimization Engine

With unique formulation and integration among the previous calculations, a building can be composed using arbitrary orientation and systems. For any arbitrary design total cost and daylight indices are automatically calculated opening the door for calculation. Due to the complexity of framework formulation non traditional optimization (GAs) is used.

4 Case study Application & Discussion

To implement the proposed framework a case study is introduced and implemented to (EDIT) model. (EDIT) model is composed of various spreadsheets. Many sheets were used as databases for material, labor/equipment, etc. Another sheet was developed to function as the system builder which is supported by data validation features of Ms Excel to select from available materials. In the same sheet technical data were matched and retrieved based on formed systems. Various calculators were developed after a proper decomposition for the equations needed for each calculator. Finally, a separate sheet was used as an interface which allows feeding the building information and preferences then facilitates optimization and results screening. For optimization EVOLVER 5.5 which is a GA based optimization solver for MS Excel was then used to optimize the design. Figure (3) shows a screenshot for the developed spreadsheet model. The considered

optimum design from the case study is envelope maximum thermal insulation of four facade walls and roof and no necessary insulation for windows.

4.1 Comparative Analysis

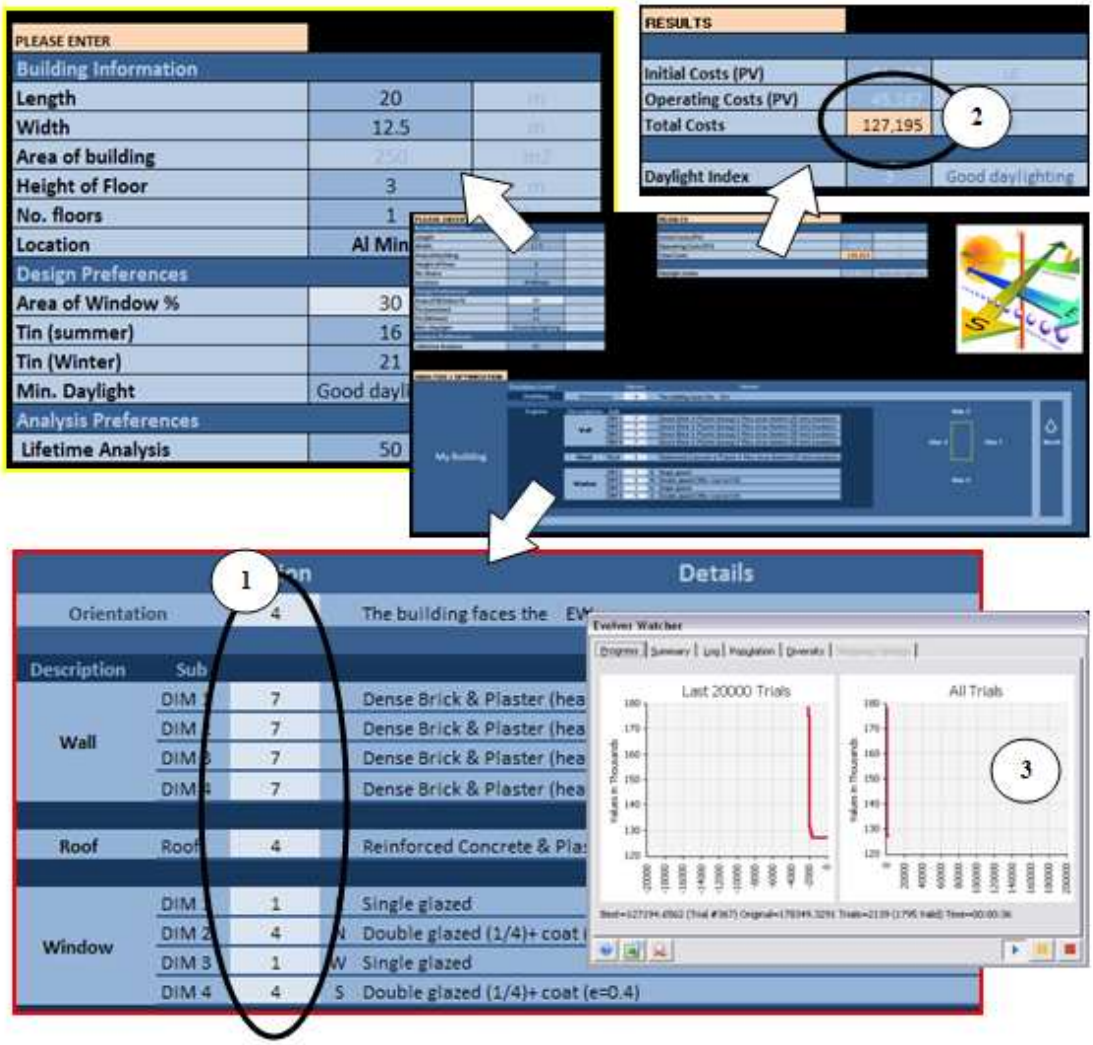
A numerical comparison is done to show the marked savings of the optimum green alternative by comparing it to its equivalent but of traditional design of least initial costs. The comparative results in (EDIT) shows that green alternative exhibits huge savings in the life-cycle costs and energy costs. A total life-cycle savings of 16.3% would be achieved if adopting the green design instead of the traditional one. Accordingly, the increase in initial costs for adopting the green design alternatives has resulted in approximately 5.4% increase. However, the energy savings have yielded 50% annual savings. Moreover discounted payback period between the green and traditional design is computed to be 3 years.

4.2 Sensitivity Analysis

It is worth reminding here that with the increase in population and demand, resources are becoming scarcer. One of such resources is energy. Thus, a sensitivity analysis is done to further understand the effect of electricity prices increase on life-cycle costs (LCC) and optimum design

4.2.1 Effect On Life-cycle Costs

The first assessed factor is percentage change in life-cycle costs due to electricity prices increase. A relationship has appeared between percent increase in electricity prices and percentage savings in life-cycle costs. If electricity costs would reach the double, the life-cycle costs savings would increase to 23.6 %.



1- Optimization Variable 2- Objective function 3- EVOLVER watcher

Figure 3: Implementation Spreadsheet Model

4.2.2 Effect on Optimum Design Scenario

Not only does the percentage increase in electricity prices changes the life-cycle costs, but it also changes the optimum design alternatives in each system. At 20% increase in electricity prices the optimum design would include different types of windows with more thermal insulation in east and south facades while still the south and north of no insulation. However, at 30 % increase in electricity costs, higher types of insulation alternatives are required for all the four windows facades.

4.3 Building Simulation

Another analysis is done to further study the green approach and its relationship to costs. Based on the current data in the construction elements database, simulation has been conducted to see the tradeoff between initial costs and energy costs

4.3.1 A Cost/Energy Tradeoff

Systems options were selected randomly based on discrete uniform distribution ranged from 1 to available options for each system. Two predictions were tracked, the building initial cost and the building energy costs (electricity cost/year). Nine thousand different design combinations were performed and all data were extracted. The relation between different design combinations initial and energy costs (electricity cost/year) for trade-off is plotted as shown in figure (4). The x-axis represents the energy costs of different building design combinations scenarios. The y-axis presents the total initial costs of each scenario. The graph represents the least energy consumption available scenarios (section 1 and 3). While the bottom half of the graph represents the least initial cost scenarios (section 3 and 4). Section 3 represents design combination scenarios with relative less initial and energy costs. Designers could further trace easily their optimum design. Also, comparative study can be easily made through such figure between different design scenarios alternatives.

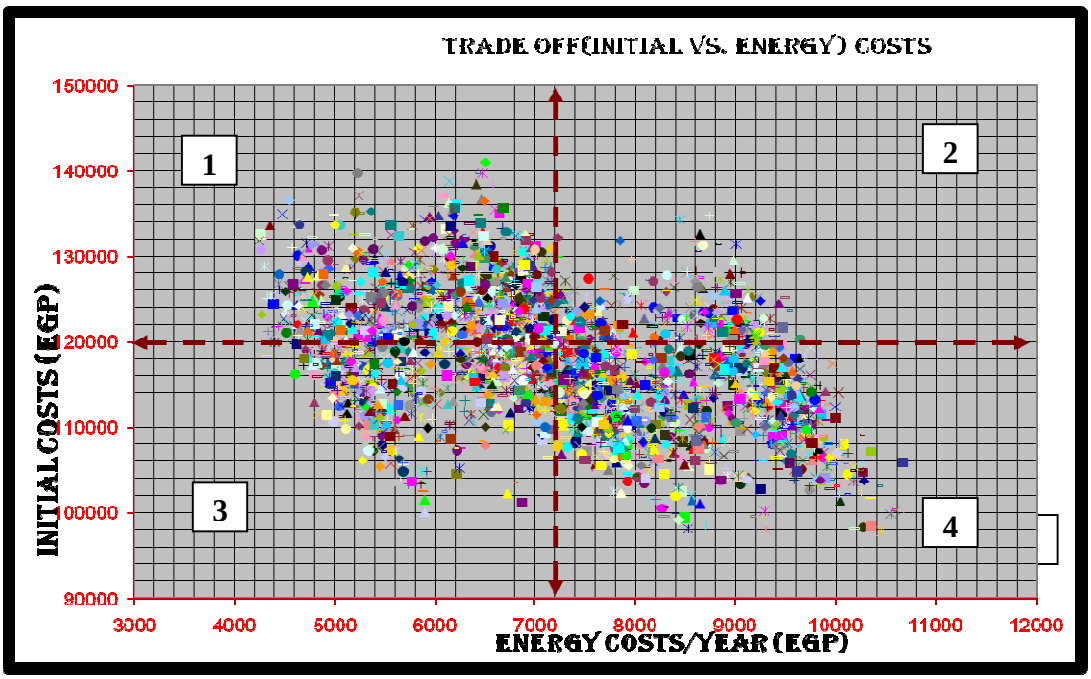


Figure 4: The relationship between initial cost and energy costs

Finally the model was verified of being comprehensive, user friendly and of high quality. Two surveys were conducted about the model and distributed to eleven professionals for model validation and verification. The Professionals were four chairmen of large scale investment firms, two middle-large scale construction investment owners, three consultants and two architects. Professional experiences were chosen to range from 8 – 30 years in the field on construction in Egypt. According to those professionals, and after they applied the model to their own projects, it provided a comprehensive framework for green building design.

5 Conclusion and Further Research

With the world heading towards sustainability to face current and future challenges, green buildings in the construction industry has become an inevitable choice. Green building research has been lately prevalent however they include many limitations. Furthermore, green assessment tools were viewed by many design professionals as being complex and expensive. The main objective of this paper research is to promote sustainability in Egypt to serve a better tomorrow. This research aims at developing an integrated green building design framework with optimization features to provide an optimum green building envelope design with least available life-cycle costs. A case study was further implemented using the (EDIT) model. Comparative analysis between edit results and traditional design of least initial investments showed marked savings reaching 16.3% with a compounded payback period of only three years. Furthermore, simulation of all design systems alternatives has been conducted to provide easy tools for selecting optimum building design with relative less initial and energy costs. Finally, the (EDIT) model was verified and validated using surveys distributed to design professionals, consultants, developers, investors and owners.

This paper research opens the door to more research areas and considerations. If more sustainable parameters could be assessed as embodied energy, carbon footprint, recycling…etc., it would add greatly to the value of the work. It would raise environmental awareness along with the costs promotion. Moreover, if environmental benefits would be considered as non-tangible costs showing the effect of green construction on Egyptian people performance as their: productivity, internal health, mental integrity, performance, happiness…etc. Moreover, in this research buildings envelope components were only considered due to their most contributions to heat gain/loss that mostly affects building thermal and economic performance. However, other components as (interior walls, ceilings, doors, presence of equipment...etc.) can be further considered and show their effect on final results.

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Use of Building Integrated Photovoltaic Roof Tiles in Residential Buildings

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Abstract:

A Building Integrated Photovoltaic (BIPV) material has a great potential of being used as a source of renewable energy for buildings. The purpose of this study was to analyze the cost-effectiveness of BIPV roofing for residential buildings in the United States. A total number of 70 sites, 14 each from five climatic zones in the United States, were randomly selected for the study. A general linear model was used to find out the cost effectiveness of BIPV roof compared to asphalt shingle roof, using net present values of both the roof types. Net present value of asphalt roofing was done based on available database of material and labor costs in the cities selected. Net present value of BIPV roofing was done using a simulation model developed by National Renewable Energy Laboratory. A similar model was used to determine energy savings estimates for BIPV roof.

The results of the analysis indicate that the use of BIPV roofing is not currently cost-effective when compared to asphalt shingle roofing in residential buildings. However, the installation of BIPV roof tiles provide a significant saving in energy costs. The energy savings of a building using BIPV systems was found to be affected by annual heating degree days and location of the building.

Keywords:

Building Integrated Photovoltaic, cost effectiveness, energy savings, net present value, residential buildings

1 Introduction

1.1 Statement of the Problem

Building Integrated Photovoltaic (BIPV) is one of the most promising renewable energy technologies. It allows buildings to generate all or part of their energy needs using photovoltaic (PV) panels that are integral part of the structure. In BIPV systems, the PV array is part of the building's roof, wall, or windows. A PV array directly converts solar radiation to electrical energy. A residential PV system can be can be hooked up with utility grid, making it possible to export the excess energy to the utility company (Muhida *et al.*, 2009).

Even though BIPV technology has been in existence for over a decade, cost issues have slowed down wide-spread acceptance and installation of the systems. Cost-effectiveness of BIPV roof tiles, in comparison with asphalt roof shingles, for residential buildings has been analysed in this study. The primary objective of the study was to find out the economic viability of the use of BIPV roof tiles for residential buildings in the United States. Building Integrated Photovoltaic (BIPV) is one of the most promising renewable energy technologies. It allows buildings to generate all or part of their energy needs using photovoltaic (PV) panels that are integral part of the structure. In BIPV systems, the PV array is part of the building's roof, wall, or windows. A PV array directly converts solar radiation to electrical energy. A residential PV system can be can be hooked up with utility grid, making it possible to export the excess energy to the utility company (Muhida *et al*., 2009).

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1.2 Hypothesis

1.2.1 Hypothesis 1

It was hypothesized that net present value of the roof of a residential building using BIPV roof tiles is significantly different that of the roof of a residential building using asphalt shingles.

1.2.2 Hypothesis 2

It was hypothesized that net energy savings of a residential building using BIPV roof tiles is affected by the climatic location of a building, and number of heating and cooling degree days of the location.

2 Literature Review

With an increase in worldwide energy consumption and consequent build-up of greenhouse gases, there has been a continuous pursuit for developing clean energy. The use of solar energy, in the form of PV cells, is recognized as an important approach to generate an environmentally friendly, sustainable, and clean energy to replace fossil fuels (Li and Lam, 2008).

Photovoltaic cells (PV) are made by joining P and N type semi-conductors. P types contain positive ions, while the N types contain negative ions. These ions produce an environment necessary for flow of electrical current within the cells. Current generated by the cells. is DC, which has to be converted to AC by using an inverter (Figure 1).

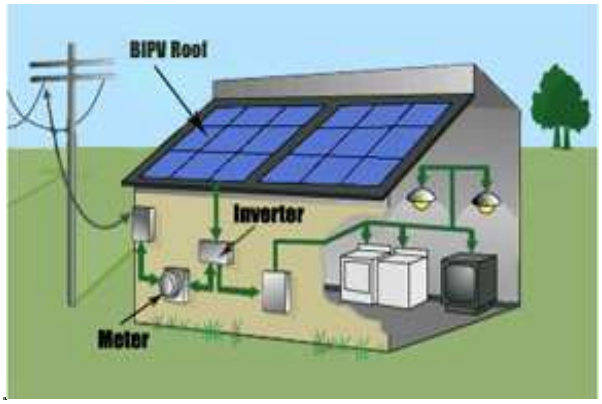

Figure 1. Residential BIPV Systems

PV cells were first used commercially in the late 1950s to power communication satellites (Cholakkal, 2006). Gradually, the practical application of the technology expanded to include building industry. The benefits of using PV energy compared to fossil fuel energy include (1) autonomy, (2) reliability, (3) sustainability, and (4) zero emission. The quantity of energy savings due to installation of BIPV systems, however, may be affected by the geographical location of the building.

PV cells can be woven into building components such as wall and roof, making them an integral part of the building. Building Integrated Photovoltaic (BIPV) systems activate the PV system very efficiently by utilizing PV cells as surface materials of buildings (Hoon *et al.*, 2011). The system assumes multi-faceted roles by replacing conventional exterior walls, roofs, windows, and shading devices.

BIPV systems for buildings can be either stand-alone or connected to grid. Grid-connected systems are advantageous in the sense that any surplus energy is exported to the utility grid, eliminating the need for on-site batteries. The owners are thus able to sell excess energy.

Apart from solar radiation, power production by BIPV is correlated with a number of other variables. They include (1) solar altitude, (2) solar azimuth, (3) outdoor dry-bulb temperature, (4) shading, (5) dirt accumulation on the surfaces, and (6) efficiency of the cells (Cholakkal, 2006). Solar altitude and azimuth, and outdoor dry-bulb temperatures vary according to geographical setting. It is, therefore, likely that quantity of energy savings due to installation of BIPV systems, may be affected by the climatic regions, and heating and cooling degree days of a location.

Despite some significant advantages of using PVs to produce energy, the manufacturing and installation costs of the systems were higher than that for conventional sources of energy in the past decade (Oliver and Jackson, 2000). A study done in the mid-2000s provides similar report related to cost-effectiveness of the technology (Cholakkal, 2006). Another study conducted by Muhida *et al.* (2009) also fails to offer any encouraging evidence in support of the BIPV systems as far as costs are concerned. The authors, however, conclude that "break event (sic) point for this system is still far from our wishes, but this system gives a contribution in reducing air pollution and promoting the clean energy (p. 698)."

Li and Lam (2008), however, report some positive economic aspects of using BIPV facades for 40-storey office building in Hong Kong. Their results indicate that when incorporated properly with daylight, the overall simple monetary payback for installation of BIPV systems would be 6 ½ years. This is remarkable considering the high first cost of the systems. The authors, of course, limit the findings only to commercial buildings.

There are some optimistic view points regarding cost-effectiveness of BIPV systems. Davis (2002), using what he calls an experience curve, reports that the price of PV cells decreased by 82 per cent over a period of one and half decades. Assuming a continuation of this trend, the author predicts that the production cost of BIPV-generated energy will be comparable to that of fossil fuel electricity by 2020.

The literature review provides an understanding of the basic principles, advantages, limitations, and economic aspects of BIPV systems. The cost of BIPV is reportedly on the decline. Based on the current cost of materials and installation of BIPV roof tiles, the cost-effectiveness of the system has been analysed in this study.

3 Research Methodology

3.1 Data Collection Procedure

Energy performance of BIPV roof tiles in different climatic locations of the United States was required to be ascertained for the study. This was done through simulation by using Solar Advisor Model (SAM), also known as System Advisor Model, developed by the National Renewable Energy Laboratory (US Department of Energy, 2011).

SAM is a performance and economic model designed to facilitate decision making for people involved in the renewable energy industry (Figure 2). The software makes performance predictions for grid-connected solar systems, small wind and geothermal power systems, and economic estimates for distributed energy and central generation projects. It calculates the cost of generating electricity based on information provided about a project's location, installation and operating costs, type of financing, applicable tax credits and incentives, and system specifications. SAM also calculates the value of saved energy from a BIPV system.

Figure2. Screenshot of BIPV analysis using SAM

All data related to BIPV roof tiles was collected by using SAM. The data included cost of BIPV roof tiles including their installation for all locations, operation and maintenance costs, cost of auxiliary devices such as inverters, and energy savings.

Cost of asphalt roof shingles for different locations in the United States was obtained from published sources (Waier *et al*., 2010). The costs were adjusted for all different locations.

3.2 Location

Seventy locations were selected from the 5 different climatic zones of the United States, 35 each for buildings using BIPV roof tiles and asphalt roof shingles. The climatic zones are: (1) Zone 1 (Cool), (2) Zone 2 (Temperate), (3) Zone 3 (Moderately temperate), (4) Zone 4 (Hot and arid), and (5) Zone 5 (Hot and humid).

3.3 Prototype Residential Building

A simple prototype residential building was designed by the authors for the study (Figure 3). The roof area of the building was 1680 sq. ft. Data on different variables was collected for the same building, assumed to be constructed in all the selected locations. Data collection for buildings using BIPV roof tiles was done using SAM.

Annual incident energy striking a roof surface is a function of solar altitude and azimuth angles. SAM selected the part of the roof that would contribute to energy savings when BIPV roof tiles

were installed. Figure 4 shows the roof area selected by SAM for this purpose. Cost comparison was done based on only this part of the roof.

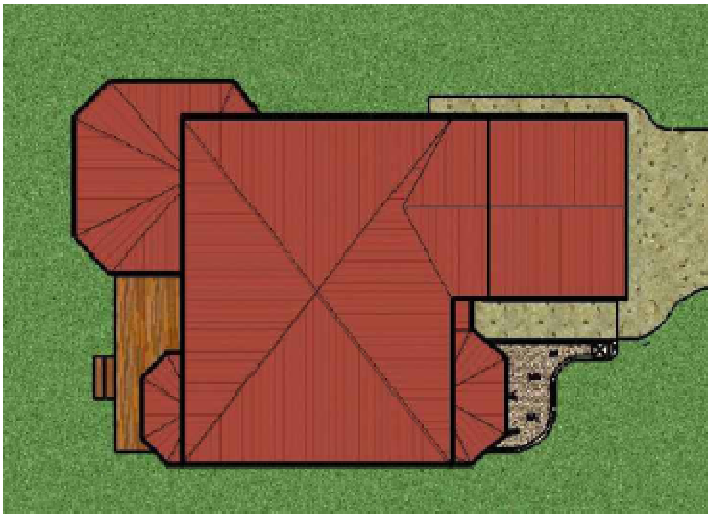

Figure 3. Roof plan of the prototype residential building

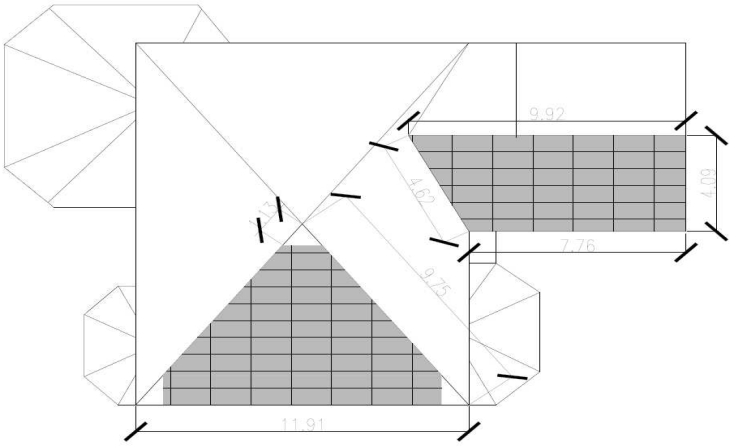

Figure 4. Roof plan of prototype building showing the location of BIPV roof tiles

3.4 Variables

Roof type (MATERIAL): It is the type of roof used for a residential building according to material used. This is a categorical variable with two levels, 1) BIPV and 2) ASPHALT.

Net Present Value (NPV): This is the net present value of the buildings using both BIPV roof tiles and asphalt roof shingles, assuming a life span of 25 years and discount rate of 10 percent. It was measured in US dollars. NPV was calculated using the cost of materials and installation of roof, energy savings due to installation of BIPV systems, and operations and maintenance cost of

the building during its life span. Since NPV takes into account all cost inflows and outflows of a project over its lifetime, it is considered as an ideal variable for analyzing cost-effectiveness of an investment. This variable was used as a proxy for cost of the prototype residential building at different locations.

Location (LOCATION): It is the climatic zone in which a residential building was located. This is also a categorical variable with five different levels, (1) ZONE 1, (2) ZONE 2, (3) ZONE 3, (4) ZONE 4, and (5) ZONE 5.

Energy savings (ENERGY): These are the net savings in electrical energy costs for a building using BIPV systems, during the first year of its operation. The variable was measured in US Dollars.

Annual Cooling Degree Days (CDD): A cooling degree day is a difference of 1°F between balance point temperature and average daily outdoor dry-bulb temperature of a location. When this difference is higher than the balance point temperature, it is one cooling degree day. The sum of this difference for a year is the annual cooling degree days for the location.

Annual Heating Degree Days (HDD): A heating degree day is also a difference of 1°F between balance point temperature and average daily outdoor dry-bulb temperature of a location. When this difference is lower than the balance point temperature, it is one heating degree day. The sum of this difference for a year is the annual heating degree days for the location.

4 Findings and Discussion

4.1 Hypothesis 1

5 Hypothesis 1was tested using a General Linear Model available in SPSS statistical package. The following model was used for the analysis:

$$NPV = \beta_0 + \beta_1(MATERIAL) + \beta_2(LOCATION) + e \qquad \text{Eqn. (1)}$$

Where NPV = net present value, MATERIAL = roof type in terms of material used, LOCATION = climatic location of the building, β_0 = intercept, β_1 and β_2 = regression coefficients, and e = error term.

Results of the analysis are shown in Table 1:

Table 1. Summary of statistical analysis using NPV as dependent variable

Variables		Intercept	Regression Coefficient	t-value	p-value
Intercept		-23155.98		-38.80	<0.0001
MATERIAL	ASPHALT		26214.65	31.06	<0.0001
	BIPV		0*		
LOCATION	ZONE 1		874.44	1.04	0.30
	ZONE 2		543.38	0.64	0.52
	ZONE 3		0*		
	ZONE 4		-1149.40	-1.36	0.18
	ZONE 5		-1745.60	-2.07	0.04
F = 540.38 p-value: <0.0001		Model R^2 = 0.97		Adjusted R^2 = 0.97	

* This parameter was automatically set to zero by SPSS.

The model, which is derived from empirical data, needs to be checked for its predictive efficacy. A widely used measure for checking the predictive efficacy of a model is its coefficient of determination, or R^2 value. Perfect relation is said to exist between the dependent and independent variables, if R^2 is 1 and no relationship exists between the dependent and independent variables, if R^2 is 0. Predictive efficacy of this particular model was found to be quite high with an R^2 of 0.97, and also an adjusted R^2 of the same value. This means that 97 percent of the variances in net present value (NPV) are explained by the variables included in the model.

The F-value of the model was found to be 540.38, which is statistically significant at less than the 0.0001 level. It indicates that the model as a whole accounts quite well for the behavior of the predictor variables.

The results indicate that net present value (NPV) has a statistically significant relationship with roof type (MATERIAL), at the level of significance of less than 0.0001. It means that BIPV roof tiles are not cost-effective compared to asphalt roof shingles used in residential buildings in the United States. This is despite the fact that the use of BIPV roof tiles generated considerable amount of energy (Table 2), resulting in a substantial saving in energy costs (Table 3).

Table 2. Annual energy output (in kWh/kW peak rating) from BIPV roof tiles installed in prototype residential buildings at 35 locations

Loc.	Annual Energy	Loc.	Annual Energy	Loc.	Annual Energy	Loc.	Annual Energy	Loc.	Annual Energy
1	4000	8	4100	15	3900	22	4800	29	4700
2	4500	9	3800	16	3700	23	4000	30	4200
3	3800	10	4800	17	3900	24	4100	31	4500
4	3500	11	4200	18	3900	25	5200	32	4200
5	3900	12	4000	19	3900	26	4700	33	4300
6	4300	13	4900	20	3800	27	4100	34	4900
7	4200	14	4900	21	5200	28	4200	35	4200

Table 3. Average annual energy savings (in US $) for prototype residential building using BIPV roof tiles at 35 locations

Loc.	Annual average	Loc.	Annual average	Loc.	Annual average	Loc.	Annual average	Loc.	Annual average
1	939	8	1077	15	1010	22	1208	29	1199
2	1069	9	978	16	997	23	1062	30	1118
3	906	10	1190	17	911	24	1093	31	1146
4	890	11	1112	18	1040	25	1275	32	1102
5	1037	12	1049	19	1038	26	1164	33	1119
6	1069	13	1216	20	972	27	1076	34	1226
7	1005	14	1203	21	1290	28	1101	35	1100

None of location variables, except ZONE 5 (hot and humid region) were correlated with NPV of the buildings. It was found to be statistically significant at the level of 0.04.

5.1 Hypothesis 2

Hypothesis 2 was also tested using a General Linear Model using SPSS statistical package. This test was done using the data only from 35 locations where BIPV roof tiles were used for the residential buildings. The following model was used for the analysis:

$$ENERGY = \beta_0 + \beta_1(LOCATION) + \beta_2(CDD) + \beta_3(HDD) + e \qquad \text{Eqn. (2)}$$

Where ENERGY = net energy savings cost, LOCATION = climatic location of the building, CDD = annual cooling degree days, HDD = annual heating degree days, β_0 = intercept, β_1, β_2, and β_3 = regression coefficients, and e = error term.

The results of the analysis are shown in Table 4.

Table 4. Summary of statistical analysis using ENERGY as dependent variable

Variables		Intercept	Regression Coefficient	t-value	p-value
Intercept		1423.61		13.61	<0.0001
CDD			0.011	0.66	0.52
HDD			-0.05	-3.23	0.003
LOCATION	ZONE 1		-72.26	-1.56	0.13
	ZONE 2		-199.71	-3.87	0.001
	ZONE 3		0*		
	ZONE 4		-141.44	-2.36	0.03
	ZONE 5		-222.01	-2.81	0.009
F = 6.39 p-value: <0.0001		Model R^2 = 0.58		Adjusted R^2 = 0.49	

* This parameter was automatically set to zero by SPSS.

F-value of this model was found to be 6.39, which is also statistically significant at less than the 0.0001 level. However, predictive efficacy of the model was not that high. Adjusted R^2 of the model was found to be 0.49. This means that 49 percent of the variances in energy savings (ENERGY) are explained by the variables included in the model.

The results indicate that net energy savings has a statistically significant relationship with almost all the climatic zones (LOCATION) except ZONE 1 (cool zone), at the level of significance of less than 0.05. It means that the savings in energy cost would be significantly different for buildings using BIPV roof tiles with respect to climatic regions in which they are located.

HDD (annual heating degree days) was also found to have a statistically significant on net energy savings, at less than the 0.05 level. The results show an inverse relationship exists between HDD and Energy, which means that higher the number of annual degree days, lower is the amount of energy cost savings. However, CDD was not found to have any statistically significant relationship with ENERGY.

6 Conclusion and Further Research

Use of BIPV systems in the building sector is receiving immense interest nowadays in order to make the buildings able to supply their own energy requirements. This study was conducted to find out the cost-effectiveness of BIPV roof tiles in residential buildings, compared to conventional asphalt roof shingles. A secondary objective of the study was to find out the factors of energy cost savings for residential buildings using PIV system.

Computer simulation, which is a non-invasive and powerful tool, was used for assessing the performance of BIPV systems. Particular software selected for the purpose was Solar Advisor Model (SAM) developed by the National Renewable Energy Laboratory. The findings of the study indicate the net present value of such buildings is significantly lower than that for buildings using asphalt roof shingles. In other words, at current costs of materials and installation, BIPV systems are not economically attractive for use in residential buildings in the United States. However, the results demonstrate that the use of BIPV roof tiles results in considerable saving in energy costs for the residential buildings. The net energy cost savings are correlated with all but one climatic region in which a building is located and the annual heating degree days of that location.

Despite this drawback, it would not probably be a good idea for the industry to give up on the technology altogether. It is energy-efficient, renewable, sustainable, and "green."Apart from making the buildings autonomous, BIPV is one of the best sources of clean energy. Buildings, including production and transportation of materials, consume about 50 percent of energy (Wattkopf, 2007). A large portion of this percentage is used by residential buildings. Therefore, adoption of the technology by the building industry would help reduce environmental degradation to a considerable extent.

Like all other new innovations, the cost of BIPV is also continuously declining. Cost improvements are expected with the increase in cell efficiencies, reduction in the use of materials, and improvement in mass production techniques. It is expected to be eventually competitive with conventional energy in near future. Until the systems become economically attractive, financial incentives in the form of federal and state subsidies may be continued for dissemination of BIPV systems.

Only BIPV roof tiles have been analyzed in this research. Other BIPV components are also currently available. A study in Hong Kong (Li and Lam, 2008) was conducted to find out the cost effectiveness of BIPV façade for commercial buildings. The authors concluded that the payback period for such a system for a commercial building would be 6 ½ years. It would be interesting to conduct a similar study for residential buildings in the United States, using BIPV wall and window components.

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Design of Reinforced Concrete Beams to ACI318-and-SBC304; and EC2 Codes

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Abstract:

Reinforced concrete beams are part of the structure so their design depends on the structural Code and its requirements. In this paper, two simply supported R.C. beams were designed in terms of flexural and shear strength design requirements when subjected to two asymmetric concentrated loadings, where one load is double the other one. Both beams had dimensions of 3500mm length, 200mm width, and 300mm height. The first beam (beam B1) was designed according to the combined of the structural requirements of American and Saudi Building Codes (ACI318-and-SBC304). While the second beam (beam B2) was designed according to the structural requirements of Eurocode (EC2). It was concluded from this paper that the ACI318 and SBC304 design approaches are safer than the EC2 design approach, while the EC2 design approach is more economic than the ACI318 and SBC304 design approaches.

Keywords:

R.C. Beams, ACI318-and-SBC304, EC2, R.C. Design, Flexural & Shear, Deflection & Crack

1 Introduction

Reinforced Concrete Beams are part of the structure so their design depends on the structural Code and its requirements. In this paper, the design method of reinforced concrete beams (narrow and wide beams) was outlined and compared in accordance with the structural American Building Code, ACI318, (ACI318, 2008) combined with the Saudi building Code, SBC304, (SBC304, 2007) requirements, and the structural Eurocode2, EC2, (EC2, 2004) requirements.

The objective of this paper is to study the theoretical design of 3500mm long simply supported reinforced concrete beams when subjected to asymmetric concentrated loadings, where one load is double the other one (140kN:70kN). The beam had a 200mm x 300mm cross sectional area. Two beams were designed in terms of flexural and shear strength design requirements and checked for serviceability (mid-span deflection and flexural crack width) check requirements. The first beam (beam B1) was designed according to the combined of the ACI318-and-SBC304 Code requirements (both Codes deal with the same design provisions). While the second beam (beam B2) was designed according to the EC2 Code requirement.

2 Literature Review

Reinforced concrete consists of two main construction materials that are used in the construction works, and were introduced in the first half of the nineteenth century; the first one is plain concrete, which will resist compressive stresses and the other is reinforcement bars to resist tensile stresses. Plain concrete is a mix of cement, coarse aggregate (gravel), fine aggregate (sand), water and admixtures, whereas the density of normal weight reinforced concrete is approximately 25 kN/m³ (2500 kg/m³); the gravel has gradation ranging from 6 to 25 mm particle size for building construction purposes

Reinforced concrete beams are common elements in more than 80% of the structures around the world, used as horizontal members transferring the load from the floor slab above them to the vertical members below them. The most common R.C. beams are inform of solid rectangular shape. The selections of their geometries are constrained by both structural and architectural requirements.

2.1 Reinforced Concrete (R.C.) Beams

The cross section shape of the beam, the main tensile reinforcing ratio, and shear reinforcement (stirrups) can have an effect on the beam design for flexure and shear capacity (Grant, 2003). In rectangular slender beams (either shallow and/or deep beams, or narrow and/or wide beams), the ultimate flexure and shear stresses increase when the member width to effective depth (b/d) ratio increases, (Figure 1). Also the increasing of beam width (b) is effect to increase both flexure and shear strengths of beams (Leonhardt and Walther, 1961; de Cossio, 1962; Alluqmani, 2010). Therefore, there is a benefit to use wide R.C. beam in construction industry which has a width larger its depth, where the rectangular R.C. beam which has a width (b) larger than its depth (d) and have obvious (b/d) ratio, is called wide reinforced concrete beam, and also is designed as conventional R.C. concrete beams. A wide beam must have a width to height (b/h) ratio exceeding 2.0, while slabs will typically have much larger ratios (Al.Dywany, 2010; Sherwood et al., 2006). Also, for wide beam, the shear span to effective depth (a/d) ratio is more than 1.0 (Teck FU, 2009). Wide members are frequently used as transfer elements where the total structural depth (h) must be kept to a minimum. Wide R.C. beams were used in buildings to reduce reinforcement congestion and floor heights for a required headroom. The beam width (b_w) in most of these cases is either equal or wider than that of the width of the supporting columns (b_s).

On the other hand, reinforced concrete beams are classified in general according to the geometry and shape of their cross-sections, as shown in Figure 1 and 2 (Al.Dywany, 2010), which bases on their dimensions, width (b), height (h), and length (L), where the structural designers classify the beams as following:

1. When $\mathbf{b \neq h}$, the beam is rectangular slender beam
   a) When $\mathbf{b < h}$, the beam is drop, or narrow beam in the vertical position
      I) When $\mathbf{h \leq 5b}$, the beam is shallow beam
      II) When $\mathbf{h > 5b}$, the beam is deep beam
   b) When $\mathbf{b > h}$, the beam is wide beam in the horizontal position (usually, when $\mathbf{b \geq 2h}$)
2. When $\mathbf{b = h}$, the beam is square beam
3. When $\mathbf{b = h = \Phi}$, the beam is circular beam

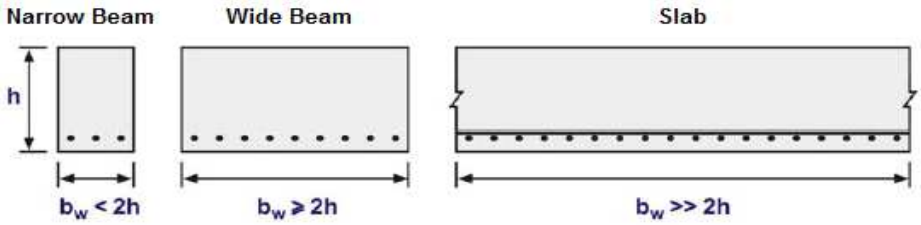

Figure 1: Classified of R.C. Members According to their Geometry
(Source: Sherwood et al., 2006).

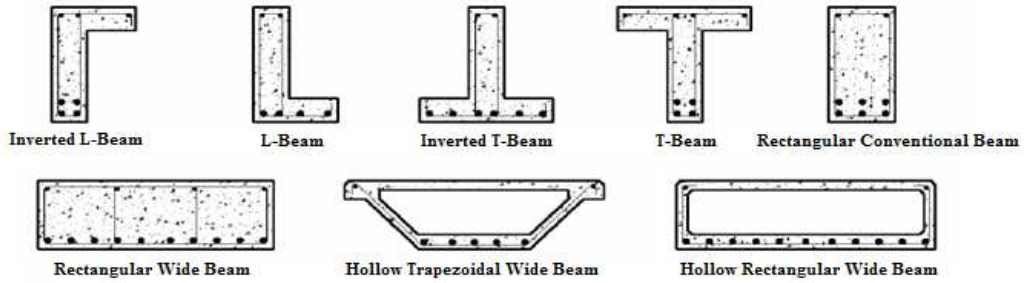

Figure 2: Types of Concrete Beams According to the shape of their Cross Section
(Source: Al.Dywany, 2010).

2.2 Structural Design Codes

The standards of construction to which building work carried out in Saudi Arabia must adhere in terms of fulfilling legal obligations are set out by the Saudi Building Code, SBC. SBC Code accounts for a range of conditions including the social environment, climatic conditions, soil types and material properties (SBC304, 2007; Alluqmani, 2010). The structural Saudi building Code for concrete structures, SBC304, roots regarding the design concepts it embodies can be traced back to the American building Code for concrete structures, ACI318, (ACI318, 2002). However, although parallels can therefore be drawn between the two Codes in relation to methods of analysis and design procedures for example, significant disparities are evident due to the seasonal temperature changes in Saudi Arabia which impact on climatic conditions while soil classifications represent a further case for the relevant adjustments to be made. There is evidence that such adjustments have indeed been accounted for by the SBC304 Code (SBC304, 2007; Alluqmani, 2010). While within Europe, Eurocodes like the independent national Codes, finds a compelling template in the CEB Model Code (CEB-FIP, 1990). However, the presentation and choice of wording employed by the structural Eurocode for concrete structures, EC2, may be instrumental in making any otherwise obvious correlations with many national Codes (EC2, 2004). A relevant example can be seen in the manifestation of design provisions markedly akin to those of the British Standard, BS8110, Code (BS8110, 1997) and the CEB Model Code (CEB-FIP, 1990). As a set of technical Codes charged with overseeing both the analysis and design aspects of any impending venture within the field of civil engineering, the Eurocodes embody a fundamental element in presenting ten sections which form the foundations of the proper design and construction which should be closely followed by said projects. EC2 takes account of

stipulated standards for durability, serviceability, resistance and fire-resistance; elements which are accounted for by Structural Eurocodes (0), (1), (7) and (8), (EC2, 2004; Alluqmani, 2010).

As part of the EU agenda to facilitate harmonization within its borders, the Eurocodes displaced the national British Standards last year, although a degree of independence remained in the limited provisions which could be ruled on at a national level. A period of temporary disruption, evidence of which will invariably emerge in rising costs, is likely to ensue, although these should be tempered by the long-term benefits. The Eurocodes will become familiar terminology to new and forthcoming graduates of UK universities but will require intensive training to re-educate those designers currently employed within the civil engineering industry as to the recent changes (May, 2008).

3 Research Methodology

3.1 Design Methods (Ultimate Capacity and Serviceability)

The design of ultimate capacity (section capacity) to design both flexure and shear capacity according to the design provisions in **EC2** Code deals with the **Ultimate Limit State Design Approach**, while it deals with the **Ultimate Strength Design Approach** according to the design provisions in both **ACI318** and **SBC304** Codes. In the serviceability (mid-span deflection and flexural crack width) check, the three Codes deal with the **Serviceability Limit State Design Approach** (Alluqmani, 2010).

The main requirement for the design of section strength used in both **ACI318** and **ABC304** Codes is expressed as follows (McCormac, 2001):

Design Strength ≥ Required Strength [Φ(Nominal Strength) ≥ U]

$$\Phi P_n \geq P_u, \qquad \Phi M_n \geq M_u, \qquad \Phi V_n \geq V_u, \qquad \Phi T_n \geq T_u$$

Where, P = Axial Load, M = Bending Moment, V = Shear Force,

T = Torsion Moment, Φ = Reduction Strength Factor

All notations with (u), $\mathbf{P_u}$, $\mathbf{M_u}$, and $\mathbf{V_u}$ refer to the required strength values while the design strength values are denoted by (Φ*nominal strength), $\mathbf{\Phi P_n}$, $\mathbf{\Phi M_n}$ and $\mathbf{\Phi V_n}$.

The main requirement for the design of section strength used in **EC2** Code is expressed as follows (Mosley et al., 2007):

Design Strength = Characteristic Strength / Partial factor of safety [$R_d = R_k/\gamma_m$]

The design resistance is equal to the characteristic resistance divided by the partial factor of safety for structural material.

3.2 Analysis and Design of Beam

The details of both beams that were used for analysis and design in this study is shown in Figure 3. The material properties for the ACI318 and SBC304 were a compressive strength of concrete ($\mathbf{f_c}$) determined using a cylinder specimen of **30** N/mm², the tensile yield strength of steel ($\mathbf{f_y}$) is taken as **420** N/mm² for hot rolled or cold worked high yield steel, and **280** N/mm² for hot rolled mild steel strength ($\mathbf{f_{ys}}$) for stirrups (**10mm** diameter). On the other hand, the material properties for the EC2 were a compressive strength of concrete ($\mathbf{f_{ck}}$) determined using a cylinder specimen of **40** N/mm², the tensile yield strength of steel ($\mathbf{f_y}$) is taken as **500** N/mm² for hot rolled or cold worked high yield steel, and hot rolled mild steel, but normally EC2 uses **250** N/mm² for mild yield steel strength ($\mathbf{f_{yv}}$) for stirrups (**8mm** diameter). The concrete cover ($\mathbf{C_c}$) was taken as **25mm**. The modulus of elasticity was $\mathbf{E_c}$ = **24500** N/mm^2 for concrete and was $\mathbf{E_s}$ = **200000** N/mm^2 for steel.

3.2.1 Beam Analysis

The beam that was analysed for this study is a simply supported beam. It carried two concentrated loads, of which one is double the other, and the total length of the beam is **3500** mm with a clear span is **2800** mm, as shown in Figure 3. The maximum shear force ($\mathbf{V_{max.}}$) is **123 kN** and the maximum bending moment ($\mathbf{M_{max.}}$) is **86 kN.m**.

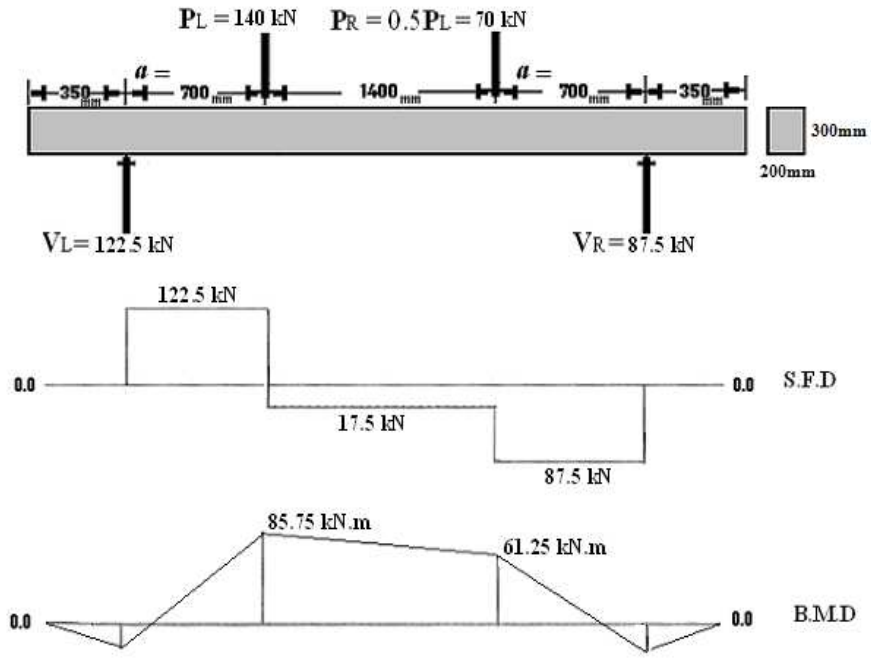

Figure 3: S.F.D, B.M.D and Beam Details used in Analysis and Design
(Source: Alluqmani, 2010).

3.2.2 Beam Design

The differences of load factors and design factors between ACI318-and-SBC304, and EC2 Codes are illustrated in Table 1 and 2, respectively.

Table 1: Comparison of the load factors toACI318-and-SBC304, and EC2 Codes (Source: Alluqmani, 2010).

ACI318 and **SBC304** Load Factors		**EC2** Load Factors	
Dead Load, **D.L** (1.4 old)	**1.20**	Permanent Action, **Gk**	**1.35**
Live Load, **L.L** (1.7 old)	**1.60**	Variable Action, **Qk**	**1.50**
Wind Load, **W.L**	**1.60**	Wind Action, **Wk**	**1.15**

Table 2: Comparison of the design factors to ACI318-and-SBC304, and EC2 Codes (Source: Alluqmani, 2010).

ACI318 and **SBC304** Strength Reduction Factor (**Φ**)		**EC2** Material Partial Safety Factors (**1/γm**)	
Reinforcement	**0.90**	Reinforcement, (**1/γs**)	**1/1.15 = 0.87**
Flexural Concrete	**0.90**	Flexural Concrete, (**1/ γc**)	**1/1.50 = 0.67**
Shear Concrete	**0.75**	Shear Concrete, (**1/γc**)	**1/1.50 = 0.67**

Figure 4 shows the comparison of stress-strain relationship for concrete that is assumed in the design process. The Elastic Modulus of Concrete (**Ec**) is the concrete stress divided by its strain, **Ec = σ/ε** (N/mm²) where, **Ec** = Elastic Modulus of Concrete, **σ** = Concrete stress, and **ε** = Concrete strain (Aitken, 2009). Also, it is obtained and taken as **4700**$\sqrt{\mathbf{f'_c}}$ = **24,500** N/mm² where the density of normal weight concrete is **2500** kg/m³ (**25** kN/m²). While, Figure 5 shows the comparison of stress-strain relationship for steel that is assumed in the design process.

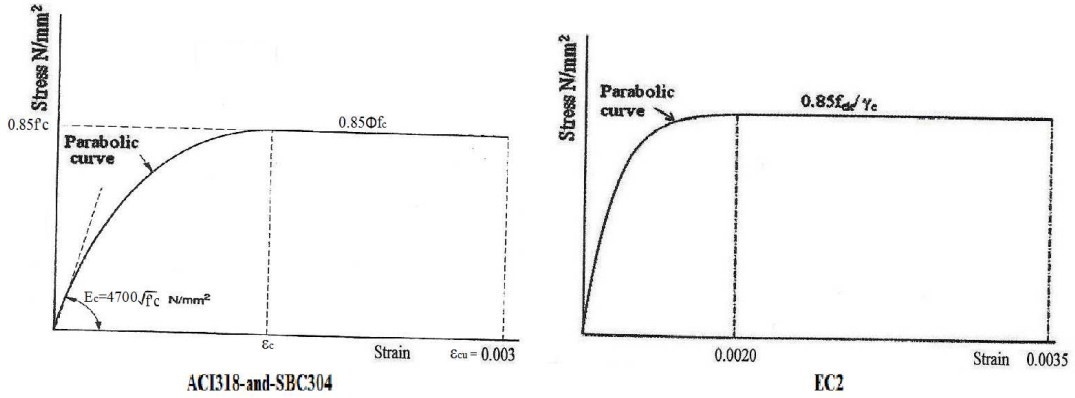

Figure 4: Stress-Strain Relationship of Concrete to ACI318-and-SBC304, and EC2 Codes (Source: McCormac, 2001; Mosley et al., 2007).

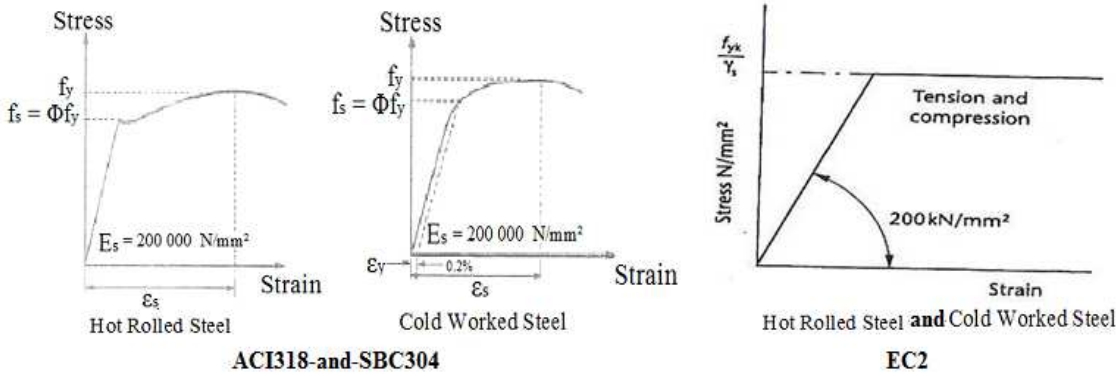

Figure 5: Stress-Strain Relationship of Steel to ACI318-and-SBC304, and EC2 Codes (Source: McCormac, 2001; Mosley et al., 2007).

4 Findings and Discussion

4.1 Finding of Beam Design Differences

The design differences refer to the diagram of the stress distributions (Figure 6), as shown below (McCormac, 2001; Mosley et al., 2007):

A. Ultimate (Specified) Concrete Strength Differences:

ACI318-and-SBC-304: $\mathbf{f'_c = \Phi f_c = 0.90*f_c}$ = 0.90*30 = **27.00** N/mm²
Also, $\mathbf{0.85f'_c = 0.85\Phi f_c}$ = 0.85*0.90*f_c = $\mathbf{\underline{0.765f_c}}$ = 0.765*(0.8*$\mathbf{f}_{cu}$) = $\mathbf{\underline{0.612f_{cu}}}$
EC2: $\mathbf{f_c = f_{ck}/\gamma_c = fck/1.50 = 0.67\ f_{ck}}$ = 0.67*40 = **26.80** N/mm²
Also, $\mathbf{0.85f_c = 0.85f_{ck}/\gamma_c}$ = 0.85*0.67*f_{ck} = $\mathbf{\underline{0.567f_{ck}}}$ = 0.567*(0.8*$\mathbf{f}_{cu}$) = $\mathbf{\underline{0.454f_{cu}}}$

B. Ultimate (Specified) Steel Strength Differences:

ACI318-and-SBC304: $\mathbf{f_s = \Phi f_y}$ = 0.90f_y =0.90*420 = **378** N/mm²
EC2: $\mathbf{f_y = f_{yk}/\gamma_s}$ = f_{yk}/1.15 = 0.87f_{yk} = 0.87*500 = **435** N/mm^2

In the three Codes, three types of stress distributions are used, triangular, parabolic (actual) and rectangular (equivalent) stress distributions, where the rectangular or equivalent stress-strain distribution is used in the design equations as shown in Figure (McCormac, 2001; Mosley et al.,

2007; Atiken, 2009; ACI318, 1984). However, the design equations are different, as shown below.

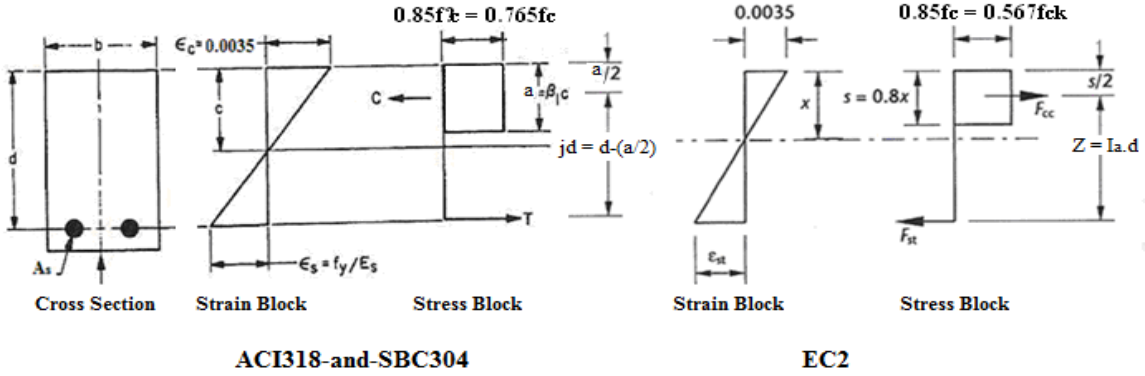

Figure 6: Equivalent Stresses and Strains Distributions on a Section Compared to both Codes (Source: Mosley et al., 2007; ACI318, 1984).

C. Flexural Design Differences:

ACI318-and-SBC304: $K=M_n/f_c*b*d^2$ = **0.245**, where, $M_n = M_u/0.90$ = **95.6 kN.m**.

EC2: $K= M/f_{ck}*b*d^2$ = **0.163**

Lever Arm

ACI318-and-SBC304: jd = (2/3)*h = d – a/2 = **200mm**

EC2: $Z = d\{0.5+\sqrt{[0.25- (K/1.134)]}\}$ = **212.3mm**

Required Area of Tension Reinforcement

ACI318-and-SBC304: $A_{s,req.} = M_u *10^6/ \Phi*f_y*jd$ = **1138.9 mm^2, <u>use 4Φ20mm</u>**

EC2: $A_{s,req.} = M / (0.87 f_{yk}*Z)$ = **932.3 mm^2, <u>use 3T20mm</u>**

The maximum spacing between the longitudinal tensile reinforcement in the three Codes should be not less than the bar diameter, maximum size of aggregate (plus 5 mm in EC2) or 20-25 mm (Mosley et al., 2007; ACI318, 1984). In this study, the compression reinforcement is used in the

design of the beam and it was assumed to be a quarter of main longitudinal reinforcement. Also, reasons for providing compression reinforcement are:

1. Reduced sustained load deflection,

2. Increased ductility, and

3. Change of failure mode from compression to tension (McCormac, 2001).

Required Area of Compression Reinforcement

ACI318-and-SBC304: $A_{s',req.} = 0.25*1138.9\ mm^2$ = **284.7 mm2, <u>use 3Φ12mm</u>**

EC2: $A_{s',req.} = 0.25*932.3\ mm^2$ = **233.1 mm^2, <u>use 2T12mm</u>**

D. Shear Design Differences:

ACI318-and-SBC304: $V_c = 0.167*\sqrt{f'_c}*(b_w*d)$ = **44.3 kN** , $V_s = Av*f_{ys}*d / S_L$ = **60.6 kN**,
$V_n = V_c + V_s$ = **104.9 kN**, $0.75*V_n$ **= 78.7 kN < V_u = 123 kN, <u>O.K.</u>**

EC2: $V_{Rd,max.} = 0.124*b*d*f_{ck}*[1-(f_{ck}/250)]*10^{-3}$ =**214.2 kN > V_{Ed} = 123 kN**, **<u>O.K.</u>**

$A_{sw} = V_{Ed} * S_L / 0.78*d*f_{yk}*\cot(\theta)$, $\cot(45°) = 1.0$; $\cot(22°) = 2.50$

Maximum Stirrup Legs Spacing Along the Beam Length (S_L)

ACI318-and-SBC304: $S_{L,max.} = 380(f_{ys}/f_s)-(2.5*C_c)$ **=191mm≤**$300*(f_{ys}/f_y)$=199mm<**200mm <u>O.K.</u>**,
But take **$S_{L,max.}$ = 185mm to get 19 stirrups**

EC2: $S_{max.} = 0.75*d$ = **193mm <600mm <u>O.K.</u>**,
But take **$S_{L,max.}$ = 185mm to get 19 stirrups**

Minimum shear links

ACI318-and-SBC304: $A_{v,min.} = V_s*S_L / f_{ys}*d$ = **157 mm^2**
Use **<u>19stirrupsØ10mm@ $S_{L,max.}$ = 185mm</u>** spacing centre to centre.

EC2: $A_{sw,min.} = V_{Ed} *10^3 / 0.78*d*f_{yk}*\cot(\theta)*S_L =$ **91 mm^2**, $\cot(22°) = 2.50$

Use **19stirrupsR8mm@ $S_{L,max.}$ = 185mm** spacing centre to centre.

Maximum Stirrup Legs Spacing Across the Beam Width (S_w)

Two stirrup legs were used across both beam widths. The stirrup legs spacing across the beam width (**S_w**) was **140mm** for beam B1, and **142mm** for beam B2.

The details of section design for both beams (Beam B1 and B2) are demonstrated in Figure 7.

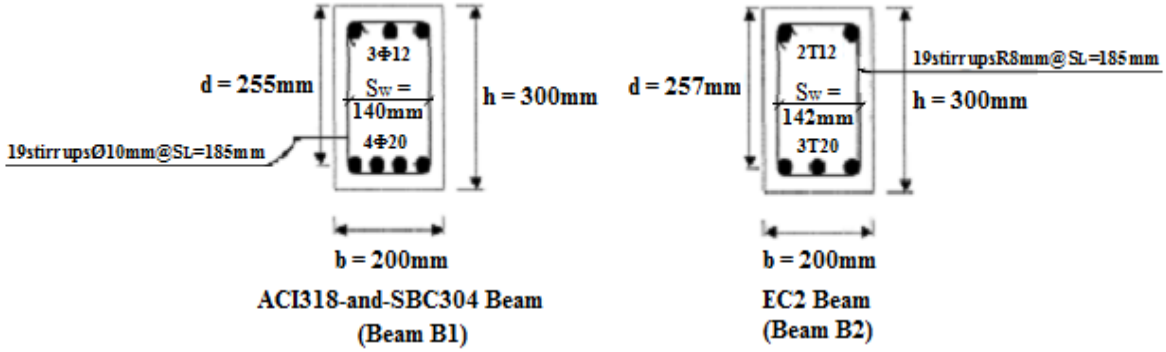

Figure 7: Design Details Compared for Both Beams

(Source: Alluqmani, 2010).

E. Deflection and Flexural Cracks Width Differences:

The three Codes use a Serviceability Limit State approach to calculate deflections and flexural crack widths but they are different in their calculations. Moreover, the three Codes are applied with the maximum flexural cracks width, which should not be greater than **0.40 mm** (ACI318, 2008; SBC, 2007; EC2, 204).

The **deflection** is calculated as follows:

ACI318-and-SBC304: $\boldsymbol{\delta} = P.(L_o)^3 / 48E.I =$ **5.81mm**, where $I = b*h^3/12 =$ **$450*10^6$ mm^4**.

EC2: **a** $= k.(L_o)^2.(1/r_b) =$ **7.65mm**, where, $k = 0.125-[a^2/6] = 0.125-[0.025^2/6] =$ **0.1249**, $(1/r_b) = M/E_c*I =$ **$7.81*10^{-6}$**

While the **flexural cracks width** is calculated as follows:

ACI318-and-SBC304: $z = [0.02f_s*(d_c*A)^{1/3}]/1000$ = **0.296mm < 0.40mm** **O.K.**, where,

$f_s = 0.6fy$= **252 N/mm²**, $d_c = C_c + \text{Ø}_{str.} + \Phi_s/2$= **45mm**, $A = b*2d_c/ N_s$=200*90/4 = **4500mm²**.

EC2: $w_{,k} = S_{r,max.}*(\varepsilon_{sm} - \varepsilon_{cm})$ = **0.281mm < 0.40mm** **O.K.**, where,

$S_{r,max.}$= $3.4C_c+[(0.42*k_1*k_2*\Phi)]/\rho_{p,eff.}$= (3.4*25)+{(0.42*0.70*0.4*20)/[932.3/(200*257)]}

= **214.67mm**, $\varepsilon_{sm}-\varepsilon_{cm} = 0.6*(f_y/E_s)$= 0.6*(435/200000)= **$1.31*10^{-3}$**.

The calculations of mid-span deflection and maximum flexural crack width for both beams (Beam B1 and B2) are demonstrated in Table 3.

Table 3: Comparison of maximum Mid-Span Deflection and Flexural Cracks Width for both Beams (Resource: Alluqmani, 2010).

Beam Type	Deflection, **mm**	Cracks Width, **mm**
Beam B1	5.81	0.296
Beam B2	7.65	0.281

4.2 Discussion of Beam Design Differences

4.2.1 Flexure and Shear Reinforcement Differences

For the flexural and shear design, the design fundamentals of the three Codes are similar, but there are some differences in the design equations and notations. Beam B1 had a flexural reinforcement more than beam B2. While both beams had the same shear reinforcement, but, they differenced in the stirrup diameter.

Generally, the EC2 design approach has a design which is economically better than the ACI318 and SBC304 design approaches; this refers to the design factors used in the three design approaches.

4.2.2 Deflection and Crack Width Differences

There are differences in the calculations of deflections and flexural crack width between the ACI318-and-SBC304, and EC2 design approaches.

Moreover, beam B1 had lower deflection and higher cracks width than beam B2, as shown in Table 3. These differences refer to the design of each beam where beam B1 had more tensile and compressive reinforcements than beam B2, based on the design factors used in both beams. Also, the deflections and crack width calculations depend on the properties of the structural materials (concrete and steel), and their design factors and strengths.

5 Conclusions

The ACI318 and SBC304 design approaches deal with design factors that are larger than the design factors used in the EC2 design approach. For that reason, both ACI318 and SBC304 approaches normally give more flexure and shear design than the EC2 approach. Also these give best strength and serviceable and then more safety in deflections and/or cracks width.

5.1 From this study, it was concluded that:

1. The ACI318 and SBC304 design approaches are safer than the EC2 design approach

2. The EC2 design approach is more economic than the ACI318 and SBC304 design approaches.

6 Acknowledgement

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Construction Law

The Extent of Enforcement of The Penalty Clause on Public Sector Construction Contracts in South Africa

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Abstract:

Background: A perception exists that public sector construction contracts in South Africa are generally completed late. The penalty clause is included in construction contracts to dissuade the contractor from completing the works later than the approved date. The extent of delays in the public sector, factors to be considered in determining the penalty/liquidated and ascertained damage (LAD) *quantum* and extent of enforcement of the penalty clause are unknown. The legal consequences of non-enforcement of the penalty/LAD clause, in light of the Municipal Finance Management Act 56 of 2003 (MFMA) and the Public Finance Management Act 1 of 1999 (PFMA) are also unknown.

Methodology: A survey, sample obtained through the convenience sampling technique, was conducted to investigate the extent of enforcement of the penalty clause, and matters connected thereto. Opinions of clients/employers, consultants and contractors involved in the implementation of public sector contracts in Gauteng province of South Africa were sourced through a questionnaire.

Findings: A need exists to develop a more scientific/sensible method to determine the penalty/LAD *quantum* in the public sector. There is a significant difference of opinion whether the penalty/LAD clause is generally enforced in delayed construction contracts implemented by the public sector in South Africa. There is a significant difference of opinion whether the type of works does influence the extent of enforcement of the penalty/LAD clause. Where the penalty/LAD clause is not enforced, it is mainly because clients are sympathetic to the contractor. Public sector clients are in violation of the PFMA and MFMA if they knowingly fail to recover penalties/LAD when these are due.

Research limitations: Using the convenience sampling technique means that the findings cannot be generalised, but provide a tentative overview of the situation. The research sample was only drawn from the province of Gauteng. The study only investigated the legal consequences of non-enforcement, and did not extend to general contractual/contract management consequences.

Practical implications: Public sector clients need to be awakened to the problems consequent upon the non-enforcement of the penalty/LAD clause, in regard to both contract administration and the legal consequences.

Keywords:

Construction contracts, liquidated and ascertained damages, penalties, public sector

1 Introduction

1.1 The penalty/LAD clause in construction contracts

Construction contracts normally make provision for a penalty clause (or sometimes liquidated damages/delay damages), which requires the contractor to reimburse the employer a certain pre-determined amount for the period the works remain incomplete after the lapse of the scheduled, and sometimes extended, time of completion. Damages for late completion of construction contracts are normally liquidated at the time of concluding the contract. This is because late completion of construction contracts is the most common breach normally suffered by employers in construction contracts (Eggleston, 2009). The main advantage of the penalty clause, compared to a claim for damages in construction contracts, is that the employer need not have suffered, or even alleged, any prejudice in order to be entitled to the penalties[225].

The agreed time of delivery of the product by the contractor is an *essentialia* of the construction contract, as it must always be contained in the contract (Nagel, 2006). The inclusion of this completion date (or contract period) is a matter of economic importance, both to the employer and to the contractor (Uff, 2009). The penalty/LAD clause thus becomes an *incidentalia* of the contract as it seeks to exclude, limit or alter the *naturalia* (i.e. general damages) of the contract. The penalty/LAD provision is regulated, protected and enforceable in South Africa under the Conventional Penalties Act 15 of 1962 (CPA). It is worth emphasising that the CPA does not require one to differentiate between a penalty and LAD. This means that the clause is enforceable, whether it is a penalty or LAD. This is a major difference in the legal position in South Africa compared to some jurisdictions in the world, especially those whose common law is heavily influenced by the English common law, where a penalty provision is not enforceable (Eggleston).

1.2 Determination of the penalty/LAD amount

There is currently no sensible/scientific method used to determine the quantum of the penalty/LAD in the public sector. The significance of this is that section 3 of the CPA empowers the courts to reduce a penalty if it is found to be 'out of proportion to the prejudice' that is likely to be suffered by the employer/client. It is important to note that the CPA refers to prejudice and not the actual damages/losses. As observed by Binnington (2009), prejudice is a much wider term in law and which would embrace, consequently, far more issues than would simply be covered if the employer had to demonstrate the actual loss/damages it had suffered. In simple terms, it would be very difficult for a contractor to convince the court that the penalty is indeed out of proportion to the prejudice. This is because a contractor would find it very difficult to

[225]Steinberg v Lazard (2006) SCA 53 (RSA)

assess the extent of the employer's prejudice that flows from the breach. However, the need to determine the *quantum* of the penalty/LAD still exists. Brümmer (1998) found that penalties imposed by the Department of Public Works (DPW) are substantially lower than those of the private sector. This results in public sector clients being under-compensated for damages flowing from the breach of contract.

1.3 The enforcement of the penalty/LAD clause in the public sector

There is a general perception that public sector clients do not enforce the penalty clause. The extent of delays, if any, in construction contracts implemented by the public sector is also unknown. It is unknown whether the type of works, i.e. civil engineering or building works, affects the enforcement of the penalty clause. Brümmer found that building projects implemented by the DPW are generally completed later than the approved date. Brümmer also found that the main contributing factor for these delays was the poor work performance by contractors. The penalty/LAD clause, by its nature, is included in construction contracts in order to dissuade the contractor from completing the works late. The extent of enforcement of this clause in projects implemented by the public sector in South Africa is presently unknown. The reasons for the non-enforcement of the penalty clause are also unknown. The CPA provisions make it almost impossible for a contractor to convince the courts of that a penalty is disproportionate to the prejudice. Court challenges of a penalty/LAD clause cannot therefore be the reason for non-enforcement as was the case in Ghana (Tuuli *et al*, 2007). In fact, there is only one reported court judgment in South Africa where a contractor successfully challenged the enforcement of a penalty clause[226]. Even in that case, the penalty was reduced because the court found that the prejudice suffered by the employer (Umkhanyakude District Municipality) was not caused by Afriscan Construction (the contractor) alone, but by other parties as well, whom the contractor had no control over. The court then apportioned the penalty accordingly.

1.4 Legal consequences of non-enforcement of the penalty/LAD clause

Two legislations were promulgated in South Africa to regulate, amongst others, the management of public funds by state organs; namely; the national, provincial and local government as well as other state-owned entities. The Public Finance Management Act 1 of 1999 (PFMA) regulates the management of public finances at national and provincial spheres of government as well as state-owned entities whereas the Municipal Finance Management Act 56 of 2003 (MFMA) regulates the management of public funds at local government level. The two legislations place a duty on public sector organisations to recover monies due to these organisations and prevent wasteful, fruitless or inefficient expenditure. The two legislations also regulate the contract management practices of state organisations. At face value, it appears that the clients' failure to recover penalties/LAD due to them could be a violation of the provisions of these legislations and could thus amount to financial misconduct.

[226] Afriscan Construction (Pty) Ltd v Umkhanyakude District Municipality & another [2005] JOL 14365 (D)

1.5 The purpose of the study

The purpose of the study can be summarised as follows:

To investigate the extent of enforcement of the penalty/LAD clause in construction contracts implemented by the public sector in South Africa, as well as matters connected thereto;

To investigate whether the type of works, i.e. civil engineering or building works, has influence on the enforcement of the penalty/LAD clause by public sectors clients;

To investigate the reasons for non-enforcement where instances of non-enforcement of the penalty/LAD clause are prevalent; and

To investigate whether the non-enforcement of the penalty/LAD clause by public sector clients amounts to the violation of the MFMA and PFMA.

2 Research methodology

A descriptive quantitative study was undertaken to solve the research problem. Research data were collected by means of a questionnaire survey that targeted construction industry professionals in the Gauteng province of South Africa.

2.1 Research questionnaire design

The research questionnaire contained seven sections (Section 1 to 7), with each section generally designed to obtain information that relates to each sub-problem. The questionnaire was designed such that open-ended questions were avoided. A combination of rating scales and checklist were used, depending on the type of question. The five-point Likert (rating) scale enabled the measurement of the intensity of the respondent's feelings about a statement, while the checklist was used to test which of the possible answers apply to the respondent. A few control questions were incorporated to detect instances where the respondents attempted to provide "socially acceptable" responses (Leedy & Ormrod, 2010).

The University of Pretoria's Department of Statistics evaluated the questionnaire and checked for compatibility with the proposed statistical analysis methods. The questionnaire was then tested in a pilot study, with five respondents, to highlight any ambiguities and other potential problems. Minor adjustments were then made based on the comments and problems highlighted during the pilot study.

The same questionnaire was used for clients, consultants and contractors. However, those sections that did not apply to one category were highlighted in the instructions to prospective respondents.

Respondents were asked to answer questions relating to projects where formal Construction Industry Development Board (CIDB) endorsed standard conditions of contract were used.

2.2 Research population and sampling

The research population consisted of public sector clients, consultants and contractors operating in the Gauteng province of South Africa. The three categories also represent the main role-players in the implementation of construction contracts in South Africa. The study was restricted to those individuals that have access to email, as the questionnaire was distributed only by email. The population groups were obtained as follows:

Clients – project/contract managers of national, provincial and local government departments that implement construction contracts in Gauteng. This group also included municipalities and state-owned entities in Gauteng;

Consultants – active members of the South African Institution of Civil Engineering (SAICE) and the South African Institute of Architects (SAIA); and

Contractors – contractors registered with the CIDB that are based in Gauteng. The minimum CIDB grade for contractors was 7. Only contractors registered in the civil engineering (CE) and general building (GB) category of works were included.

The convenience sampling technique was used to select a representative sample for each category. The sample size was made up of 20 client bodies, 450 consultants and 80 contractors.

2.3 Data collection

The data was collected over a period of two months. The questionnaire was distributed by email to all the prospective respondents. However, respondents were at liberty to return the completed questionnaire by email or fax. To address issues of internal validity of the study, the researcher's hypotheses were not disclosed to the respondents (Leedy & Ormrod).

2.4 Data analysis

A total of sixty-two responses were received, fifteen from clients, thirty-six from consultants and eleven from contractors. The statistical analysis of the data was performed with assistance from the Department of Statistics and the results analysed by the researcher. Figure 1 illustrates the breakdown of the responses as a percentage of the total responses.

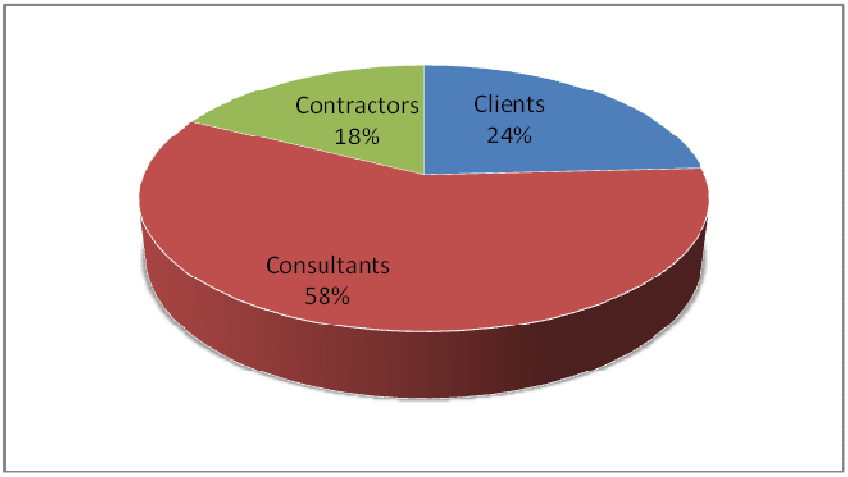

Figure 1: Distribution of responses received

3 RESULTS AND DISCUSSION

3.1 General particulars

Section 1 of the questionnaire sought general particulars of the respondents. Responses were received from a range of professions as shown in Figure 2. The majority of respondents have a civil engineering background, followed by those with an architectural, quantity surveying and project management background. The four professions generally cover most of the civil engineering and building works implemented by the public sector in South Africa. The category of "other" was made up of electrical and mechanical engineers. These two professions mostly work under a principal agent, whose background is normally one of the four professions mentioned earlier. This therefore indicates that the nature of responses will be representative of the majority of work in the public sector.

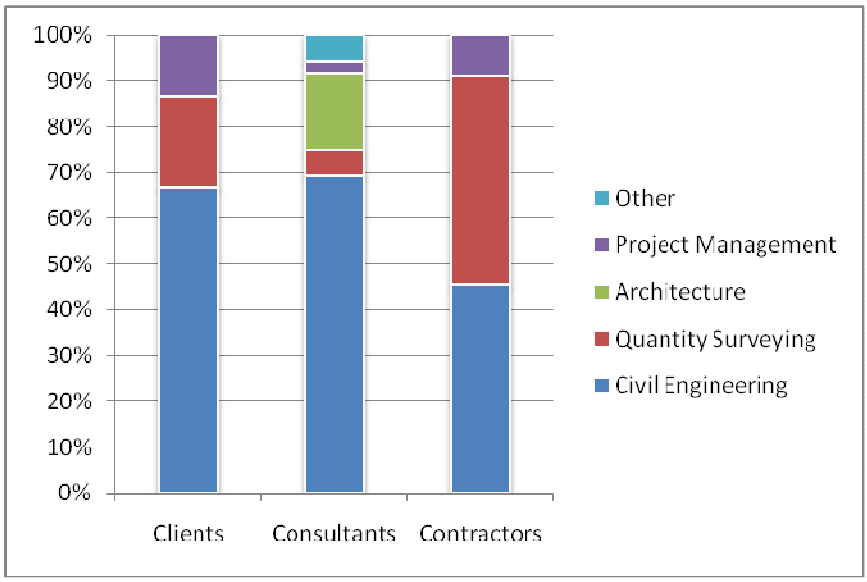

Figure 2: Professional affiliation of respondents

The above indication is confirmed by the distribution of the type of work that the respondents mostly handle, as shown in Figure 3.

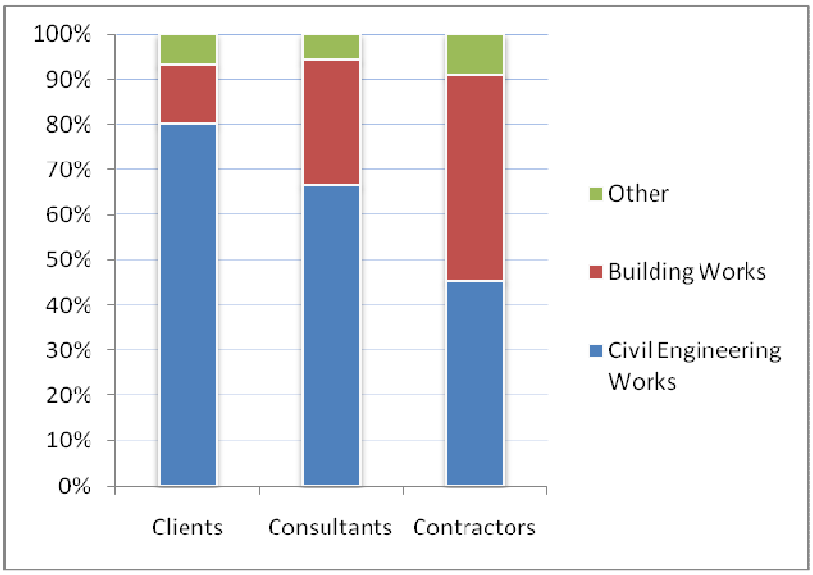

Figure 3: Breakdown of type of works handled by respondents

The respondents were also asked to indicate their levels of experience in the industry. The idea was to assess the quality of the responses as they relate mainly to professional experience in the construction industry. As shown in Figure 4, the responsibility of administering construction contracts in this instance is placed on relatively well-experienced. The average working experience of the respondents is in the bracket of 10 to 20 years. The indicated experience of consultants is not surprising, as these professionals were drawn from SAICE and SAIA. Both institutions require experience in their respective professions, a minimum of five years, for an individual to be admitted as a member. Clients appear to be, generally, the least experienced of the respondents.

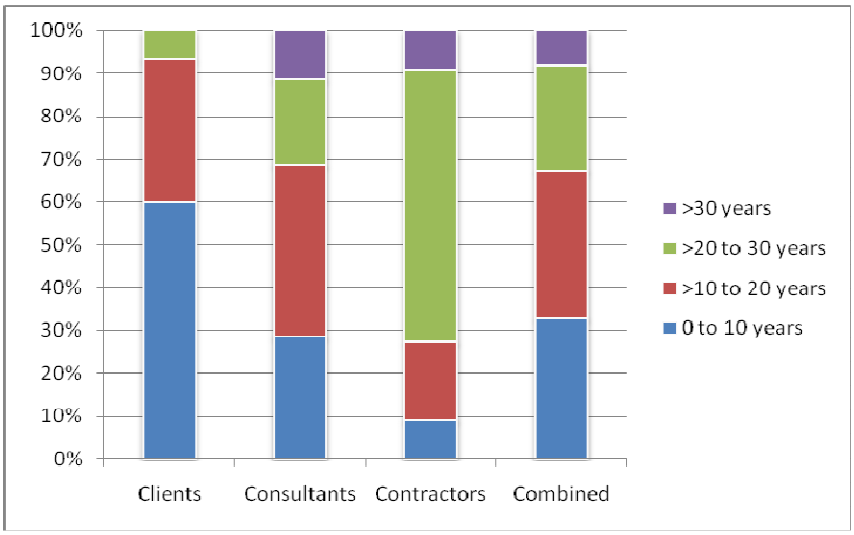

Figure 4: Breakdown of type of works handled by respondents

3.2 Penalties/LAD in construction contracts

The respondents were asked if they are familiar with the CPA. This legislation regulates the enforcement of the penalty/LAD clause in South Africa. Contract administrators are therefore expected to be at least familiar with the provisions of such legislation. How else do they ascertain and enforce a contractual provision whose regulatory provisions they are not familiar with?

However, as shown in Figure 5 a significant proportion of clients (60%) and consultants (50%) are unfamiliar with this Act. Interestingly, most of the contractors indicated that they are familiar with the Act.

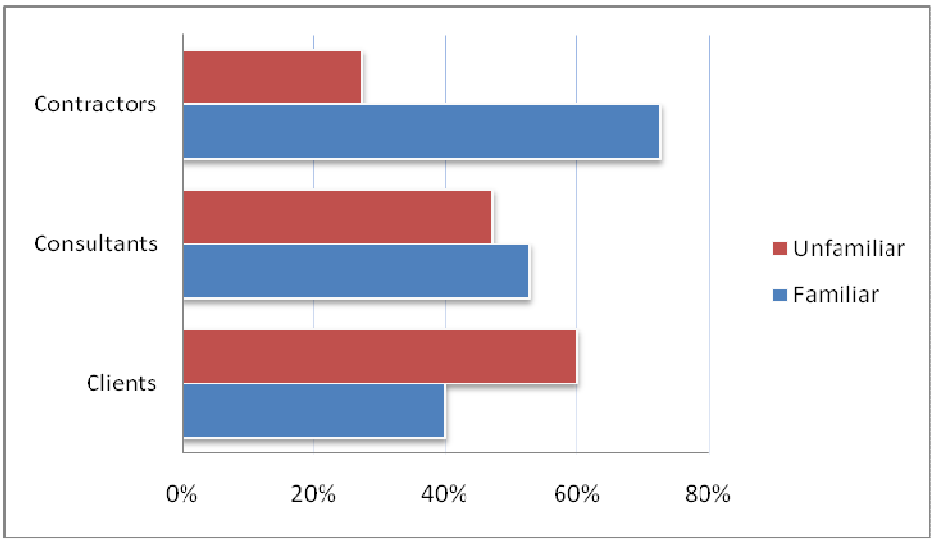

Figure 5: I am familiar with the Conventional Penalties Act

Respondents were asked if they believe that penalty/LAD provisions are still relevant in construction contracts. Binnington (2009) believes that other forms of encouraging the contractors to finish on time, instead of dissuading them from completing the works later than the approved completion date, should instead be used.

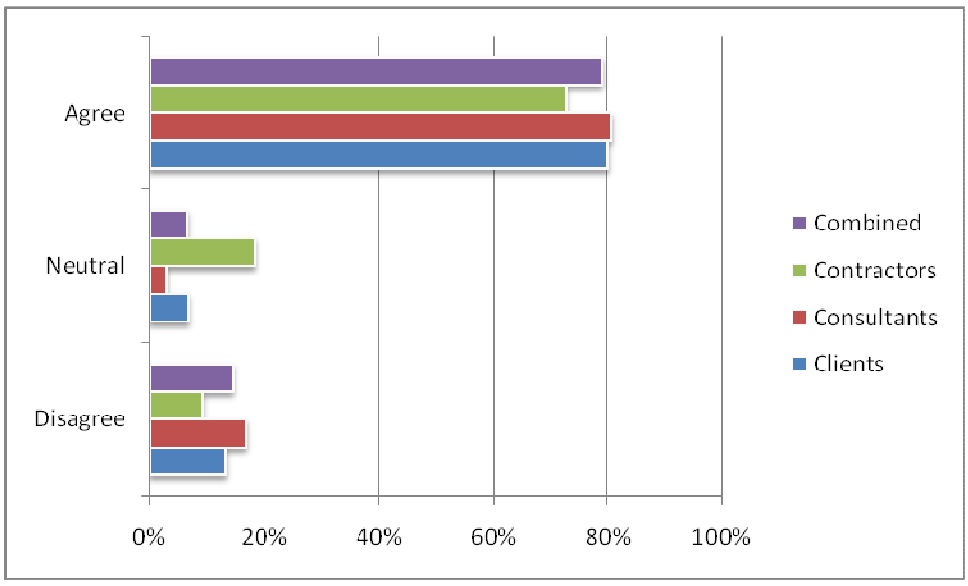

Figure 6: Penalty/LAD provisions are a useful tool to dissuade the contractor

The majority of respondents believe that penalty provisions are still relevant and are a useful tool to dissuade the contractor from completing the works later than the approved date. But are they enforced in the public sector? An enquiry was made as to whether the enforcement of the penalty clause increases the rate of production (work performance) in construction contracts. Brümmer found that building projects implemented by the DPW are generally completed late due to poor work performance by the contractor. The effectiveness of the penalty clause in speeding up the rate of production in construction contracts was, however, not investigated in that study. The respondents are in agreement that the enforcement of the penalty clause (or the threat thereof) increases the rate of production in a construction site.

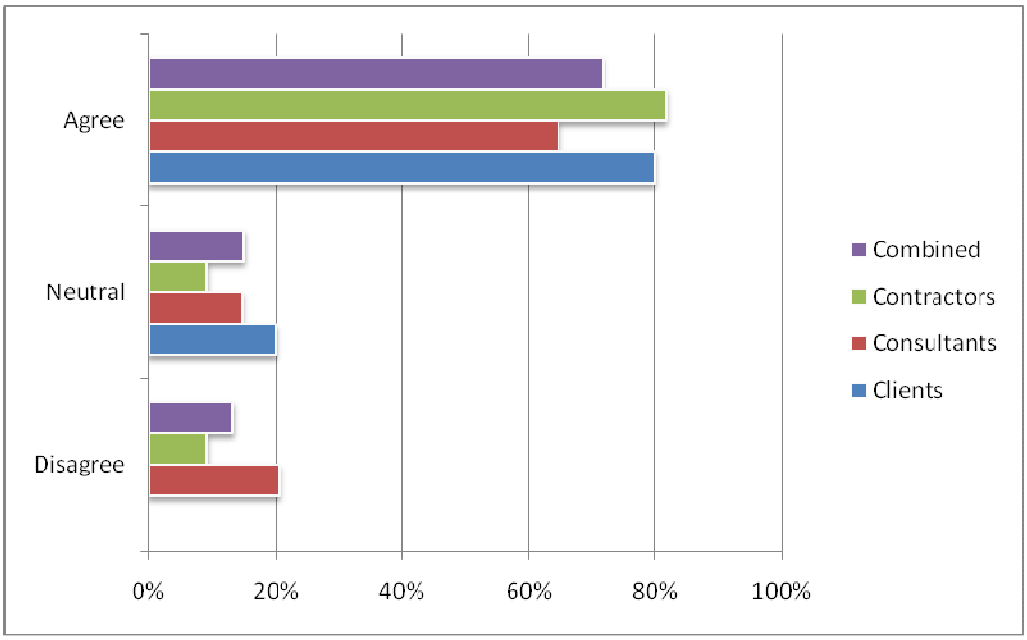

Figure 7: The enforcement of the penalty clause increases the rate of production

Respondents were asked whether there should be a relationship between the penalty/LAD and the likely prejudice, as provided for in the CPA.

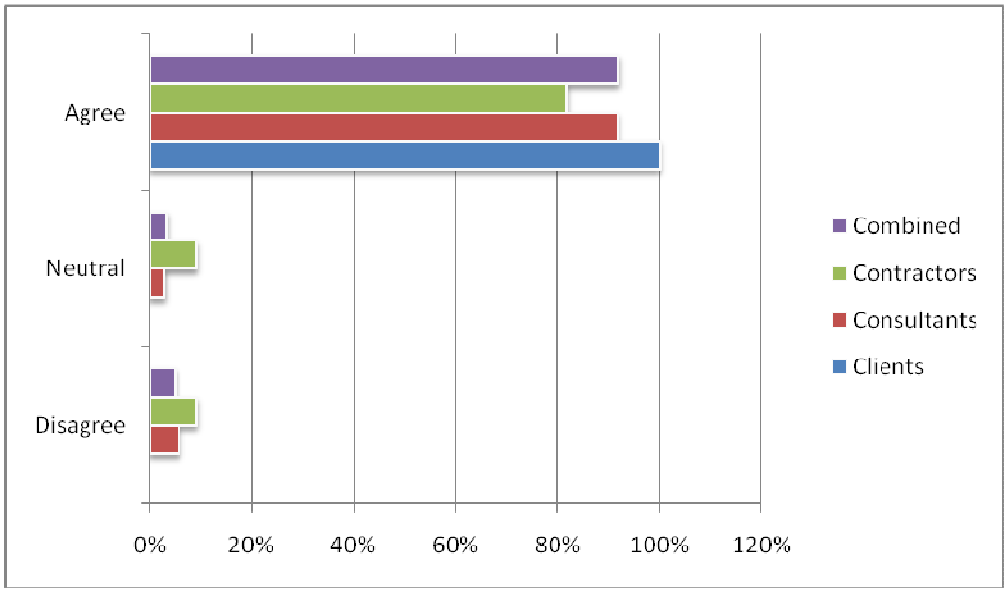

Figure 8: There should be a relationship between the penalty/LAD likely prejudice

There is agreement that there should be a relationship between the penalty and prejudice likely to be suffered by the client. Surprisingly, all clients agree that there should be a relationship between the two. Whether they actually ensure that such a relationship exists would be interesting to see. It is also worth mentioning that a number of respondents are not familiar with the CPA as indicated earlier, but merely provided their opinion as to the relationship between the penalty and prejudice.

Respondents were asked to rank what they consider as the most significant factors in the determination of the penalty/LAD *quantum*. The statistical mean of each category was then determined and the average of all the factors is as shown in Table 1.

Table 1: Ranking of significant factors in determining the *quantum* of the penalty/LAD amount

Description	Clients	Consultants	Contractors	Average of all respondents	Rankings
Potential loss of use of facility	1.27	1.22	1.55	1.35	1
Construction supervision costs	2.87	2.78	2.8	2.82	2
Interest rate on capital invested	3.27	3.06	2.55	2.96	3
A factor of the envisaged contract value	2.93	3.14	3.7	3.26	4
Professional fees	3.87	4.31	4.64	4.27	5

The most significant factor is the potential loss of use of the facility. Unfortunately, Loots (1995) showed that the potential loss of use of the facility is very difficult to assess in public sector projects at tendering stage. By their nature, public sector infrastructure is not primarily income generating. In the circumstances, the second highest ranked factor, the construction supervision costs, can easily be determined and used. Interestingly, the most common factor that is currently used in South Africa's public sector is the estimated construction cost (Brümmer).

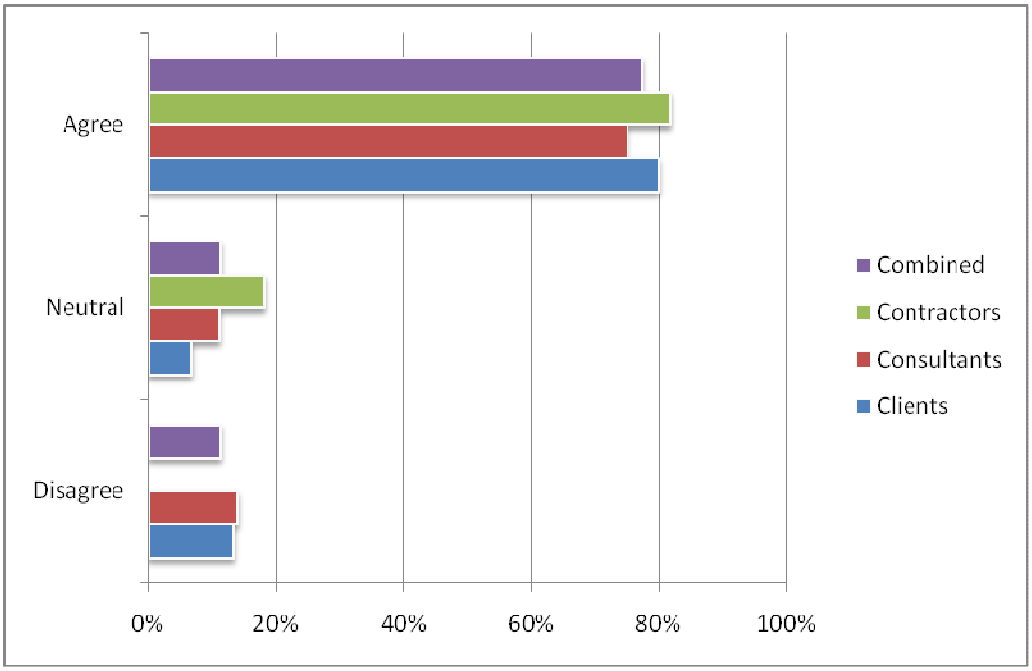

Figure 9: There is a need for a sensible/scientific method to determine penalty/LAD

Eighty percent (80%) of the respondents are in agreement that a scientific or more sensible method should be developed to determine the penalty/LAD *quantum*. Such a method could even make provision for all the significant factors in the determination of the penalty/LAD *quantum*, depending on the nature of the works.

3.3 The extent of enforcement of the penalty clause in the public sector

Respondents were asked to indicate the percentage of their public sector contracts that are completed later than the approved date. Figure 10 shows that 94% of the respondents' contracts are completed late. In fact, about 20% of the respondents indicated that more than half of their contracts are completed late. Figure 11 also shows that public sector construction contracts are generally completed late. This is a very high proportion by any standards. But is the penalty clause enforced, considering that the respondents agreed that the penalty/LAD clause is useful?

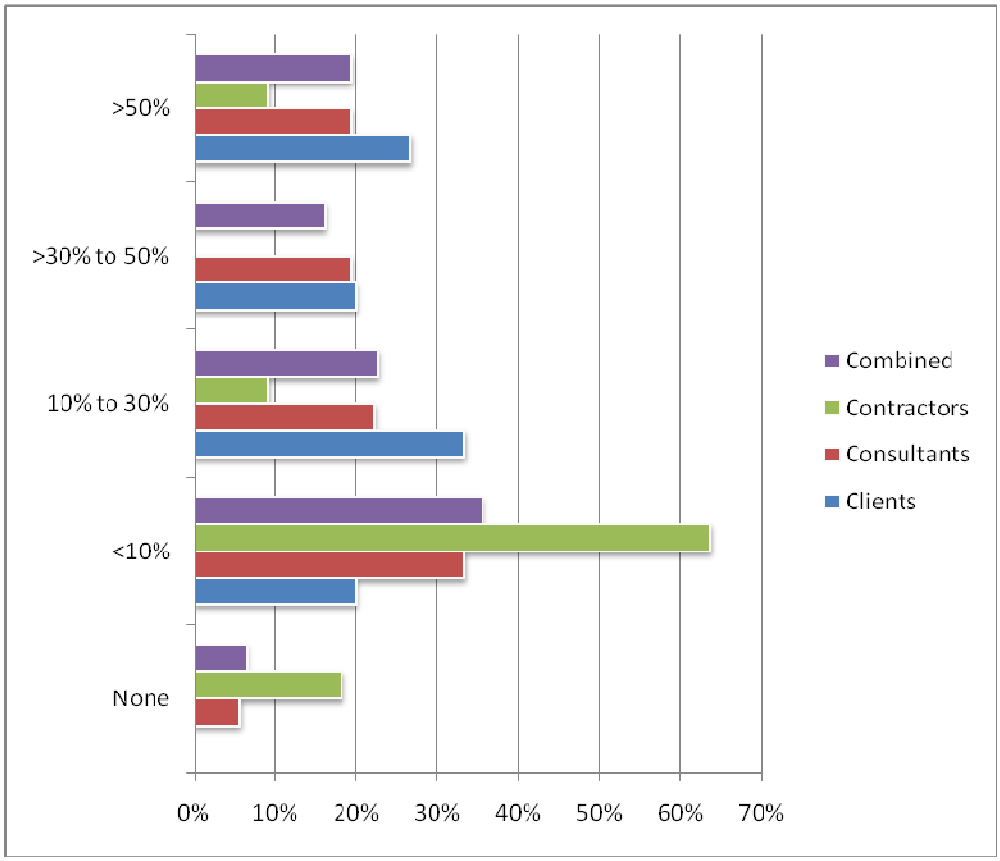

Figure 10: What percentage of your public sector contracts are completed late?

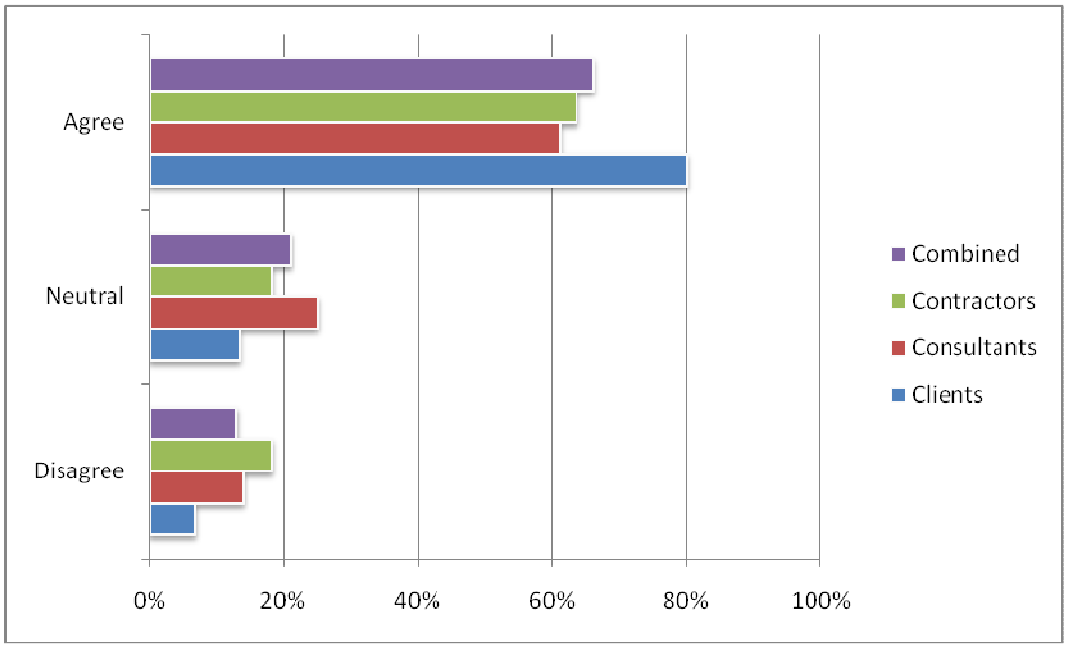

Figure 11: Public sector construction contracts are generally completed late

In the light of the above finding that public sector contracts are generally completed late, and as shown in Figure 12, a high proportion of respondents indicated that they sometimes do not enforce the penalty clause, despite their belief that, firstly, the public sector contracts are generally completed late, and secondly, the penalty is an effective tool to dissuade the contractor from completing late. The responses, however, do not show a general practice of non-enforcement of the penalty clause, as the results show a significant difference of opinion in this regard.

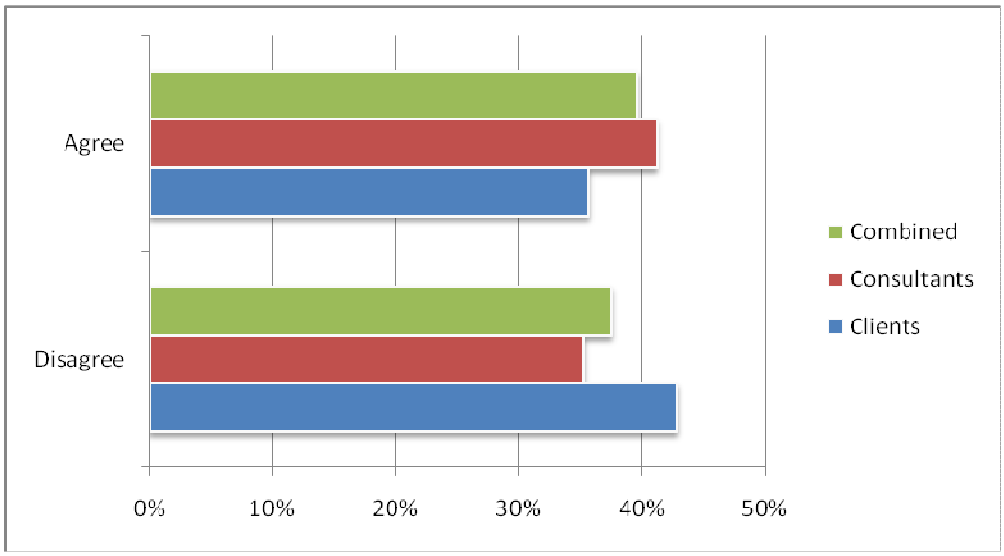

Figure 12: I always enforce the penalty/LAD clause whenever applicable

When asked to state their reasons for non-enforcement, the respondents highlighted the following reasons.

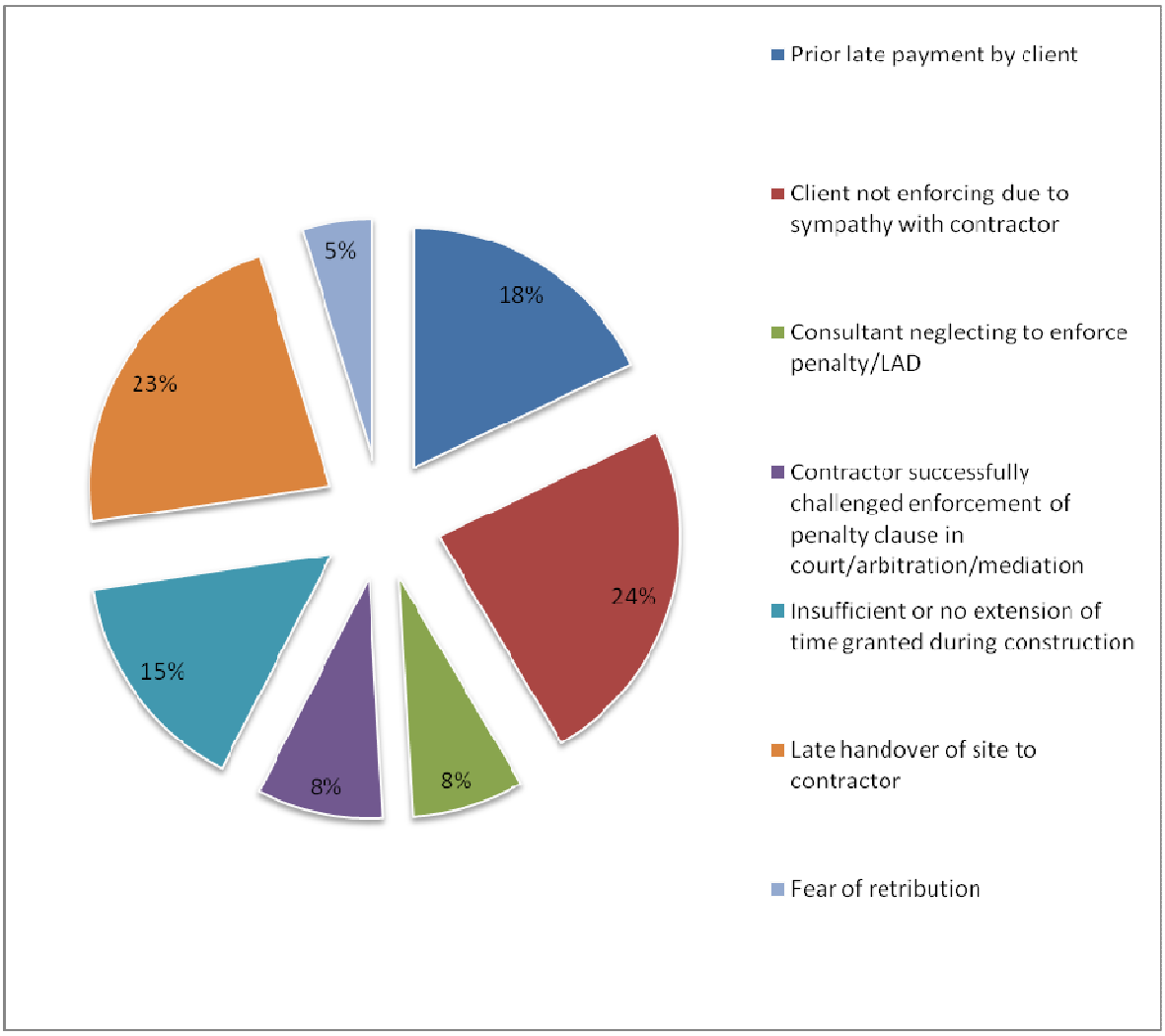

Figure 13: Reasons for non-enforcement of penalty/LAD clause

The prevailing reason for non-enforcement is that clients are sympathetic to the contractor (24%). This is the still the case despite what appears to be a legal duty on public sector clients to recover penalties as provided for in the MFMA and PFMA. It is, however, not surprising that there are fewer instances of non-enforcement due to a successful legal challenge by a contractor of the enforcement of the penalty clause. In South Africa, there is only one reported court judgment where this has happened. It is, however, possible that other challenges may have been

mounted at arbitration proceedings, which, by their nature are private matters and thus not reported. Whether section 3 of the CPA also empowers the arbitrator to reduce the penalty is not clear (Binnington).

3.4 The influence of the type of works on enforcement of the penalty clause

The next enquiry was whether the type of works does affect the extent of enforcement of the penalty clause. The idea was to ascertain whether in civil engineering, for example, the penalty clause tends to be enforced compared to building contracts, or vice versa. Building contracts mostly use the Joint Building Contracts Committee (JBCC) standard contracts, whereas civil engineering contracts tend to use the General Conditions of Contract for Civil Engineering Works (GCC), FIDIC conditions of contract or the NEC suite of contracts. This would therefore give an indication of, amongst others, the strictness of the different contracts. Figure 14 shows that there was a significant difference in opinion as to whether the type of works affects the extent of enforcement of the penalty clause.

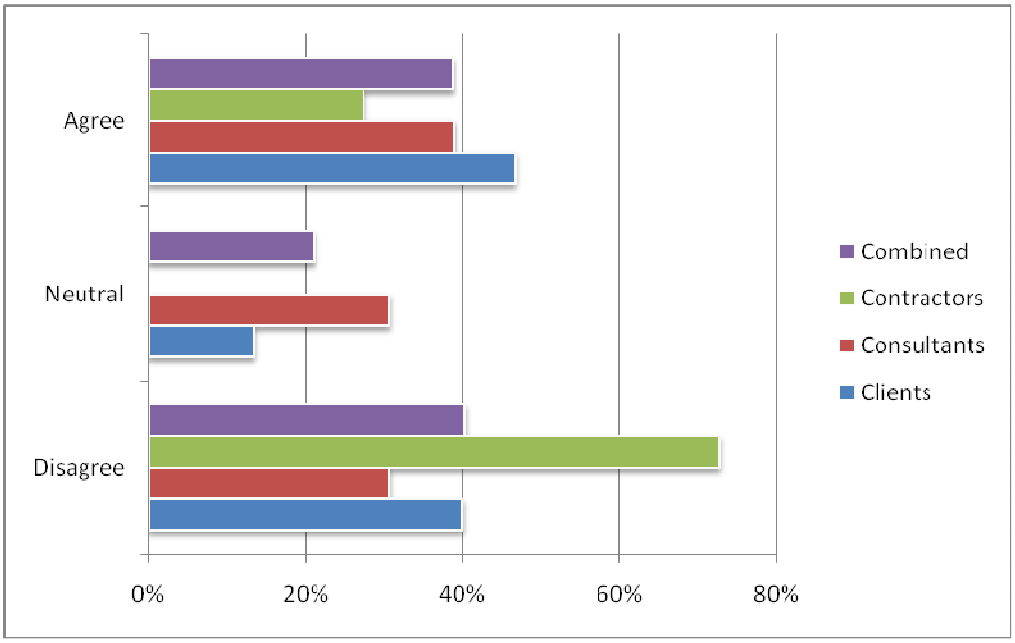

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Figure 14: The type of works affects the enforcement of the penalty clause

3.5 Legal consequences of non-enforcement of penalty clause in the public sector

The respondents were also asked questions about the possible legal consequences of non-enforcement of the penalty clause, as provided for in the MFMA and PFMA. Respondents were first asked if they are familiar with the specific provisions of these legislations, especially public sector clients.

The respondents generally indicated that they are familiar with these provisions. The next question was whether a public entity is in violation of the two laws if they knowingly fail to recover penalties due to that public entity. There is general agreement that a public sector client is in violation of the MFMA or PFMA (whichever is applicable to the entity) if they fail to recover penalties in their contracts.

Figure 15: I am familiar with the responsibilities of accounting officers in terms of the MFMA and PFMA

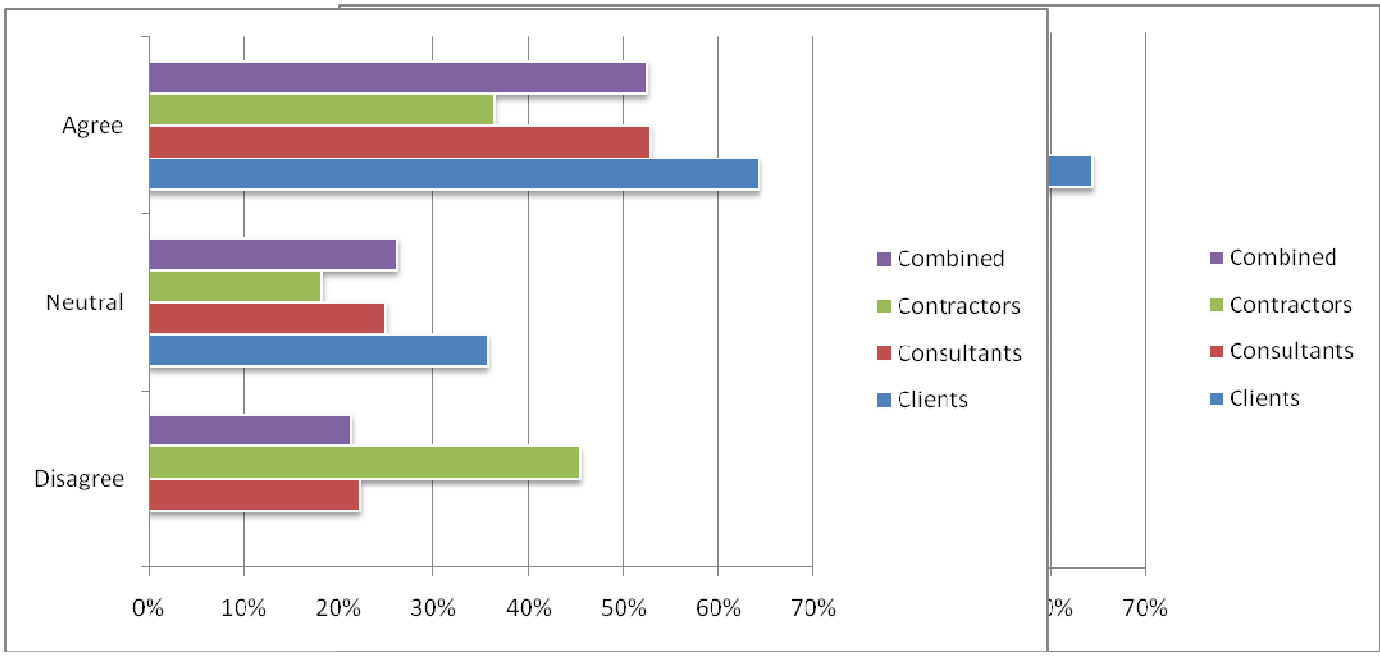
Figure 16: Knowingly failing to recover penalties/LAD by a public entity is a violation of the MFMA and PFMA

In the light of the above finding, it is surprising and disturbing that there are some public sector clients that still do not generally enforce the penalty clause.

4 CONCLUSION

The CPA is a very unique piece of legislation in that it provides the legal framework upon which penalties and LAD provisions can be formulated and enforced. The legislation makes it clear that contractors are not going to find much sympathy in our courts should they attempt to escape contractual provisions that they have willingly accepted. This should serve as a major encouragement for employers/clients to enforce the penalty/LAD provisions. Unfortunately, it was found that very few clients are familiar with the legislation. It then follows that they are less likely to know about the protection they enjoy from that legislation. Interestingly, a significantly higher proportion of contractors knew about the existence of the legislation, significantly more so than the consultants and clients. It may well be that contractors regularly check the CPA provisions in order to escape the enforcement of the penalty clause.

There is general agreement amongst the parties that the enforcement of the penalty clause increases the rate of production on site, which, anyway is what clients want. The clients' sympathy is therefore not a good enough reason not to enforce the penalty/LAD clause, let alone the consequent violation of the MFMA and PFMA, as found in this study.



The study also showed that there is a need to develop a method to determine the penalty/LAD *quantum*, and that there should be a relationship between the penalty/LAD and the likely prejudice. A sensible method that takes into account the main factors should be developed. In South Africa, public sector clients tend to consider a factor of the contract value. This appears to be an "easy-way-out" approach because the value of the contract sometimes bears no relationship to the prejudice that the client will later suffer. Even worse, previous research showed that the penalty clause has been found not to even fully compensate the public sector clients in the event of late completion.

The benefits of the proper assessment and enforcement of penalty/LAD provisions cannot be over-emphasised. This study highlighted the problems associated with the non-enforcement of the penalty clause. Tighter measures need to be implemented by the public sector to ensure that the penalty/LAD clause is indeed enforced. There is a clear positive relationship between enforcement and rate of production. Many other secondary problems surface if public sector construction contracts are not completed on time. These include poor expenditures on government infrastructure grants, reduction in the pace of infrastructure development, deterioration of existing infrastructure as well as other consequences that a developing country like South Africa cannot afford.

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The Management of Construction Agreements in South Africa

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Abstract:

The management of construction agreements within the built environment of South Africa is not properly regulated. The effect of this may be seen in instances such as the poor quality of housing being built for the Rural Development Project, corruption as well as the dismal dispute resolution curently taking place. The Construction Industry Development Board, created in terms of the Construction Industry Development Board Act of 2000, is mandated in terms of section 4(f) to regulate the actions as well as procedures of parties engaged in construction contracts. Unlilke the United Kingdom where the Housing Grants Construction and Regeneration Act 1996 deals with the shortcomings similar to those experienced by the South African Construction Industry; such as dispute resolution and the role of the parties. South Africa introduced the General Conditions of Contract for Construction Works (GCC). The latest edition is GCC 2010. It attempts to provide for guidelines to the construction industry. The GCC 2010 provides for dispute resolution, penalties, risk, the role of the relevant parties, to name but a few. However, there is no obligation on the parties to follow the said guidelines. It is uncertain whether the said measures adequately address the shortcomings experienced in the construction industry and upto now the GCC has not contributed towards the improvement of the situation. The aim of the paper is to critically analyse the GCC 2010 as a tool to manage construction agreements, with particular reference to dispute resolution, and to recommend improvements.

Keywords:

adjudication, construction contract, contract management, dispute resolution, South Africa

1 Introduction

The construction industry in any country, especially in South Africa, plays an 'indispensable role' in the economy thus having a direct impact on the public. It is essential that the industry improves on its effectiveness and efficiency which will inevitably enhance the environmental outcomes, safety, health, productivity as well as quantity and value for money to society' (Construction Industry Development Board Act 38 of 2000). South Africa unfortunately does not have legislation that would greatly assist in the achieving of the aforementioned goals. The

United Kingdom, whom may be seen as one of the forerunners in this regard, is a good example of where legislation positively aids in the regulating of the industry. The English implemented the Housing Grants, Construction and Regeneration Act 1996 (HGRC) which stipulates the *essentialia* of a construction contract and provides for adjudication; amongst others. The justification that has been provided for this intervention by the State is that adjudication will contribute to a more balanced cashflow in construction projects which will enhance the overall performance of the construction industry (Ndekugri & Russell, 2006). This viewpoint has been taken globally as may be evidenced by other states introducing same into their legislation such as New Zealand for example. South Africa is, unfortunately, not one of the States to take such initiative.

The South African construction industry had, for many years, numerous so called 'in house contracts' used by the various parties. However, when new entrants were prevented from competing freely for contracts as well as the lack of discipline that resulted from the confusion of conditions of contract, the South African government decided to take action (SAICE (2010) Management Guide). The Government of South Africa enacted the Construction Industry Development Board Act 38 of 2000 to ensure that leadership and 'active promotion of best practice' in the industry takes place. The regulatory body established in terms thereof is the Construction Industry Development Board, commonly known as the CIDB. In light hereof the CIDB has clearly defined powers and objectives such as to improve on delivery management, to establish as well as promote uniform and ethical standards which regulate the actions of those engaged in construction contracts. The CIDB Act goes on further to compel the CIDB to establish a register of contractors so as to facilitate the procurement process, albeit Public or Private Sector, as well as to obtain data so as to be utilised as a monitoring tool in the regulation of contractors' behaviour. There are 3 main fields of engineering in the construction industry namely mechanical, electrical and civil engineering and as such different contracts are therefore utilised in each field.

Focus shall be placed on how the improvement of contract management may aid in the reduction of disputes between the parties. Focus shall also be placed on the GCC 2010 specifically as to whether the dispute resolution method currently used prescribed therein is effective in resolving disputes arising in terms of the aforementioned contract.

2 The Various Construction Agreements used in South Africa

The Green Paper on Creating an Enabling Environment for Reconstruction, Growth and Development in the Construction Industry highlighted the fact that simplification of the contract documents, streamlining of surety arrangements and those of payment procedures where required. There are currently four standard forms of construction contracts currently being utilised in the South African construction industry namely FIDIC (French acronym for International Federation of Consulting Engineers), The Joint Building Contracts Committee (JBCC Series 2000), The General Conditions of Contract for Construction Works 2010 (GCC 2010) as well as The New Engineering Contract (NEC3). The GCC 2010, NEC3 as well as FIDIC are the standard forms of contract that may be used in all types of engineering and construction projects. The JBCC 2000 is confined to building works. For purposes of this paper focus shall be placed on the GCC 2010. The South African Institute of Civil Engineers (SAICE),

developed a Management Guide to the General Conditions of Contract 2010, as a guideline to assist with the interpretation of the GCC 2010; of which said interpretation should not be seen as a legal interpretation thereof. According to Willie Claassen, the compiler, the aim of the guide is to promote efficient and effective management of construction contracts to which the GCC 2010 applies. He believes that the GCC 2010 will have an influence in the reduction of claims and disputes arising in terms of the GCC 2010 as it improves

> …management techniques in construction projects. It does not only set out legal terms of rights and obligations, but concentrates much more on the conditions for good project management.
>
> (Claassen, W. GCC 2010)

2.1 The GCC 2010

The GCC 2004 was replaced by the GCC 2010. Certain amendments and/or improvements may be seen in the fact that the contract has gone from a 58 clause contract to a contract that comprises of 10 clauses, being the GCC 2010; which is in line with the objectives of the CIDB. The aforementioned contract has been revised to the extent that the parties' responsibilities have allegedly been clearly defined. However, the contract has still remained very subjective in that the engineer has retained all his/her rights and/or powers and the contractor has not been afforded rights and/or protection therein.

2.2 The NEC3

This family of contracts was originally conceived in the mid-eighties after the London Institution of Civil Engineers approved a recommendation provided to it by its Legal Affairs Committee. The reason for the recommendation was in lieu of the fact that the engineering and construction professionals advising that there was an urgent need to approach contracts with a different view; specifically to do that more in line with the approach to project management. The Engineering and Construction Contract (ECC) incorporates three important components namely:

i) Conditions of contract;

ii) Risk management; and

iii) Process / project management

One of the main characteristics of the ECC is that it encourages teamwork as well as elaboration so as to increase the opportunities for partnering to occur. Partnering, according to the CIDB, is defined as

> …working together in a way that suits particular partners and which suits the particular project or service being procured. There is no stable template for partnering. There are, however, key elements which determine whether or not a particular procurement process is likely to yield the benefits from a true partnership. The key words associated with partnering are: co-operation; openness; shared standards; common objectives; respect for each partner's motivation; and trust. Partnering is about sharing costs, risks and rewards.

So in effect this particular construction contract establishes a “real time” contract management process (CIDB Best Practice Guideline C2) requiring cross organisational boundaries.

3 Research Methodology

The author made use of legal research methods. Firstly a literature review was done by referring to various literature comprising of books, journal articles, legislation and case law. It is important to note that there are no updated South African sources relating to the GCC 2010 with the exception of an article or two written by an engineer. After having read through the limited sources available so as to ascertain the theoretical background of what dispute resolution methods are used in the South Africa Construction Industry in particular those specified in the GCC 2010 a comparative study between South African and England was then attended. The purpose was to compare the difference in the manner within which adjudication as a dispute resolution method is applied. Each source was analysed so as to assist in arriving to the conclusion that efficient contract management is imperative and that the South African dispute resolution procedure prescribed in the GCC 2010 is inadequate and should be regulated.

4 Management of the Contract

One of the most underestimated areas in an organisation is contract management. According to the UK Office of Government Commerce, contract management is a process enabling the contractual parties involved to meet their obligations so as to deliver the objectives arising in terms of the contract by proactively managing the contract so as to anticipate future needs and react to situations that may arise (OGC 2002 Contract Management Guidelines). It further entails building a ‘good working relationship’ between the parties that shall, hopefully, continue throughout the life of the contract.

Many organisations are moving towards a more ‘informal’ method of contract management where constructive relationships between the parties are built as well as a more rewarding method called financial incentive management is used as opposed to the formal traditional manner of contract management, where contractor’s were usually at ‘arm’s length’. The contract forms the foundation for the contractual relationship. In light hereof it is essential to have the right contract in order for efficient contract management to take place. Aspects such as quality of service required, allocation of risk, communication methods and/or procedures and resolution of disputes, to name but a few, should be included in the contract. The GCC 2010 is said to make adequate provisions for the aforementioned factors. It is further said to have improved on the defining of the parties’ roles as well as the dispute resolution process.

One of the most common problems experienced by organisations with numerous contracts in place is that they are plagued with paper intensive contracting; of which said contracts are stored electronically and/or manually (De Oliveira, M. 2011). Therefore, emphasis must be placed on developing a sound contract management infrastructure by addressing the essential area of contract lifestyle management. Presently many organisations are establishing contract management departments so as to ensure that proper and effective contract management takes place (Barret, G. & Cummins, T 2011).

Modern day trends of contract management have two main characteristics in common namely to clearly define the parties' roles so as to achieve the agreed main objectives in terms of the contract and to encourage a symbiotic relationship between all the parties involved (Fisher S, *et al* 2009). It may be said that contract management involves the easing and resolving of tensions so as to build a relationship which benefits all the parties involved resulting in a win/win relationship. According to Siyabonga Mbanjwa there seems to be a general consensus that 'contractual arrangements' may improve in achieving the objectives of the client as well as have a huge influence on the failure and/or success of a construction project. (Mbanjwa, S. 2003). Therefore, effective contract management results in the monitoring of delivery performance of the appointed contractors as well as in saving opportunities (De Oliveira, M. 2011).

According to SAICE, the management of the GGG 2010 is the responsibility of the Employer's Engineer and of the Contractor's site agent (SAICE (2010) Management Guide). The SAICE Management guide goes on further to stipulate that a substantial amount of power is bestowed on the Engineer in the GCC 2010. The guide goes on further to stipulate that the

"…time-trusted arrangement of contract management by the Site Agent/Engineer ensures that timeous and well-considered decisions are made, and encourages the parties to take all possible steps to avoid conflict;"

illustrating the point that the resolution of conflicts can be planned for.

5 Dispute Resolution

There are various alternative methods other than litigation to resolve disputes between the parties namely arbitration, mediation, negotiation, adjudication, refereeing. All of these methods have certain characteristics in common in that they are supposed to be cost effective, expedient and presided over by a neutral third party.

The prescribed dispute resolution method in the GCC 2010 may be seen as a three-pronged process: first the parties attempt to resolve it amicably amongst themselves failing which a notice of dispute must be furnished to the engineer. Secondly the engineer is to make a ruling and should either party be dissatisfied with the ruling the matter may be referred to adjudication which forms the third leg. Adjudication is seen as a combination of mediation and arbitration where a third party adjudicates on the matter and provides a ruling which may be final should the parties agree thereto. According to SAICE, the GCC 2010 has been updated so as to include the 'latest thinking of dispute resolution' (SAICE (2010) Management Guide). However, is it really the latest thinking? If one has reference to the English construction industry for example, it will be noted that the English have been utilising adjudication for many years and have gone so far as to include the procedure as well as the contents of the contract in legislation, of which said legislation is specific to the construction industry and deals with the day to day obstacles encountered. Northern Ireland, as small as it may seem, has also developed a Construction Act. South Africa is extremely behind in that there is nothing regulating contracts let alone the construction industry.

Furthermore the whole point of alternative dispute resolution is the fact that it is said to be more expedient and cost effective. If one refers to the procedure found in the GCC 2010 it is

somewhat lengthy as well as costly. The reason for this is that that each stage involved in the adjudication process is 28 days meaning that a dispute is resolved within 90 to 100 days; resulting in the process being substantially drawn out. The impression created by the GCC 2010 is that 28 days is a reasonable time. Whilst this may allow for the individual tasked with resolving the dispute to assess the matters, the nature of the construction industry does not always allow for such a prolonged period. Clause 10 deals with claims and disputes. Clause 10.1 specifically deals with the contractor's claim relating to the extension of time and/or additional payment/compensation. The contractor has to submit a written claim to the engineer within 28 days of the occurrence substantiating the reasons for the extension and/or variation. The engineer is to furnish the employer as well as contractor with his written recommendations within 28 days of receipt of the written notice. If the contractor disagrees with something in the contract he is to first attempt to resolve it with the engineer amicably; should this not resolve itself then the aggrieved party must furnish the other with a dispute notice (clause 10.3 GCC 2010). If one had to monitor the process more efficiently the amount of disputes that take place would in all likelihood reduce. Adjudication in South Africa is becoming costly as well as lengthy and the way within which it is applied in South Africa it defeats the purpose of alternative dispute resolution.

As a result more non-traditional mechanisms have been introduced to resolve disputes; namely:

Private Judging in which participants hire a third party judge to make a decision

Neutral Expert fact-finding in which a third party with specialised knowledge makes a recommendation

Mini-trial in which legal summaries of the participants' position are presented to a jury comprising of principals of the affected parties.

(Civil Engineer)

6 Conclusion and Recommendations

Conflicts between parties are inevitable. That having been said, it is blatantly obvious that South Africa needs to do something so as to circumvent the ever increase of disputes arising between the parties due to various factors; the one being poor contract management as well as to make the chosen method of alternative dispute resolution more efficient. The English took the initiative and regulated their construction industry which can be seen as successful. South Africa should learn from its English counterparts and attend to the regulating of its construction industry. Greater emphasis must be placed on regulating the construction industry, focusing primarily on the contract used as well as the dispute resolution method, so as to allow for efficient contract as well as project management to take place and for the occurrence of disputes to reduce alternatively to be dealt with expeditiously.

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SAICE Management Guide to General Conditions of Contract 2010

Sustainable Building Contracts: Hidden Damage Potentials

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Abstract:

Sustainable building is becoming ever-more popular in the U.S. and around the world. Historically, sustainable building practices have ebbed and flowed with the cost of energy. As energy prices go up, a heightened awareness is placed on sustainable building; as energy prices go down, the industry goes back to its traditional building practices with sustainability being a "footnote". In the past few years a number of associations have championed the topic and are making headway towards governmental requirements and keeping the topic in front of the general public so as to not let the strides made in the past few years subside as they have in the past.

As sustainable building practices become more mainstream, owners are requesting, and sometimes requiring, that the design and construction contracts contain some language that addresses the sustainability goals of the owner. This can be as simple as achieving a certain rating by one of the accrediting (or certifying) associations or as nebulous as reaching some level of efficiency.

However, what happens if the goals set by the owner are not achieved? Who carries the liability if this is the case? In addition, the certification process is normally carried through at the completion of the project (if a new construction) and there is typically little to no follow-up required to ascertain or verify that the expected efficiencies are indeed being met.

This study will examine the potential damages that may exist if sustainability objectives fall short of their expectations. In addition, the authors will look at model design and construction contracts and the potential damage theories that have evolved over the years. While conclusions of law can only be made by the courts, we will discuss how sustainable contract language fits within the traditional theories of damage and how it does not. Where conclusions of law have been reached by the courts we will include them with our discussion. The goal of this paper is to uncover the different measures of damage that are utilized when a construction team fails to meet its sustainability goals.

Keywords:

consequential damages, contracts, green, law, sustainability

1 Introduction/Background

When owners begin planning a project, they typically assemble a program to guide their project's design; this can include numerous criteria such as a space needs assessment, preliminary layout, and their desired level of finish. Increasingly in this early planning stage owners identify the sustainability objectives that they want their building to achieve. These objectives may include performance goals such as energy efficiency measures, and/or it may include a third party certification such as LEED®, BREEAM, Green Star or Green Globes. Whatever their sustainability objective may be, if the owner wants to make it more than just an aspiration, they will include it within their contract documents. The question then becomes who is responsible if the contracting parties do not meet this objective and what measure of damages should be assessed.

In the United States a number of organizations provide the construction industry with model contract documents. These organizations tend to be forward thinking and are relatively quick to adapt their model contract documents to procedural and technological changes within the industry. The three primary organizations which provide this service include: 1) American Institute of Architects ("AIA"); 2) ConsensusDOCS®; and 3) Design Build Institute of America ("DBIA"). Their model contract documents can be adopted by a project team and easily tailored to a specific job. Many owners and developers use these documents or at least consult them when forming their agreements between project team members. Since these model documents are regularly consulted when forming agreements they carry a great deal of influence within the industry as it relates to how contracts are drafted and the general rights of the contracting parties.

Each of these three organizations has produced a separate guide to enable a project team to successfully navigate and achieve a certain sustainability goal. There are some commonalities between each organization's framework for assigning responsibilities and resolving issues, but there are also some notable differences.

The AIA contribution to sustainable construction is AIA D503. This document is not so much a model contract as it is a guide with selected contract language intended to modify their other agreements. The hallmarks of the guide's suggestions include the project team developing sustainability objectives; then creating sustainability measures and a plan to achieve the sustainability objectives. The guide goes on to suggest specific language it would incorporate with its governing agreement between the architect and owner and it suggests the same for the governing agreement between the contractor and owner. An excerpt from the AIA D503 follows:

The Owner and Architect acknowledge that LEED® Certification is awarded by the Green Building Certification Institute (GBCI), an independent third party organization, and is dependent on factors beyond the Architect's control, such as the Owner's use and operation of the Project; the Work provided by the Contractor or the work or services provided by the Owner's other contractors or consultants; or interpretation of credit requirements by GBCI. Accordingly, the Architect does not warrant or guarantee that the Project will be granted LEED® Certification by the GBCI.

For both the architect and contractor the guide suggests that these parties should include a mutual waiver of consequential damages which is intended to insulate them from consequential damages flowing from their failure to meet a sustainability objective. As illustrated below, D503 goes on to provide another layer of protection from potential liability flowing from a failure to meet sustainability objectives. This liability limitation is a type of umbrella coverage for the contracting parties.

Neither the Contractor, Contractor's consultants, nor their agents or employees shall be jointly, severally or individually liable to the Owner in excess of _____ ($_____), for any failure to perform a Sustainable Measure or failure of the Project to achieve the Sustainable Objective, including breach of contract or negligence not amounting to a willful or intentional wrong.

Add the following Section 15.1.6.3 to A201–2007:

The ConsensusDOCS® organization addresses sustainability through an addendum to ConsensusDOCS® 310. As with the AIA publication this addendum is not intended to operate on its own; but is to be used to modify the underlying governing agreements. ConsensusDOCS® sustainability goals are referred to as green measures. These "measures" are similar to what was defined as sustainability objectives in the AIA documents. The ConsensusDOCS® make the "green measures" the general responsibility of the project team with ultimate responsibility resting with the Green Building Facilitator ("GBF"). The documents allow the drafter to select the "GBF" from among the architect, engineers, contractor, or presumably a third party such as a sustainability consultant.

The ConsensusDOCS® 310 does a great job of allowing the contract drafter to specifically define the "green measures" as either a certain "elected green status" meaning a third party certification (LEED, BREEAM, Green Star, Green Globes) and/or some performance based criteria such as a specific energy efficiency level.

After the ConsensusDOCS® 310 sets the table for the project team in regards to goals, roles and responsibilities, it discusses liability. In a fashion similar to its other provisions, it allows the drafters to elect how best to transfer the risks between the project team members. It first tries to define any damages resulting from a failure to meet green measures as consequential damages and then subjecting those damages to applicable mutual waivers of consequential damages in the governing contract. See language below from section 8.2

> Owner's loss of income or profit or inability to realize potential reductions in operating, maintenance or other related costs, tax or other similar benefits or credits, marketing opportunities and other similar opportunities or benefits, resulting from a failure to attain the Elected Green Status or intended benefits to the environment, shall be deemed consequential damages subject to any applicable waiver of consequential damages in a Governing Contract unless specifically excluded from such a waiver in the Governing Contract.

Under the ConsensusDOCS® addendum the default protection applies to all parties except the GBF. See language below.

> Unless otherwise expressly provided in a Governing Contract, no Project Participant other than GBF shall be liable or responsible for the failure of the Elected Green Measures to achieve the Elected Green Status or intended benefits to the environment or natural resources. This Paragraph 8.3 does not relieve any Project Participant from any obligation to perform or provide Elected Green Measures as required by its Governing Contract.

The DBIA is another organization that provides model contract documents to the construction industry. Like the AIA and ConsensusDOCS®, the DBIA has created an addendum to be used as a guide with its governing document. The DBIA addendum has a provision for defining sustainable project goals but allows the drafters to select from three remedies in the event that any of these goals are not met. The three remedies are: 1) the parties can agree to a waiver of claims, such that the failure to achieve the desired sustainable goals (including the targeted level of certification) will not be deemed a breach of contract and will nullify any such claims; 2) the parties have the option to agree that the failure to meet the sustainable goals for the project will cause the Design-Builder to be liable for liquidated damages in an amount agreed to at contract formation; and 3) the parties can agree that the Design-Builder has an obligation to cure any failure to achieve the desired sustainable goals through the addition, replacement or correction of materials, configurations, systems or equipment in order to obtain the third party certification or certain sustainable performance measure (Kelley & Vornehm, 2009).

2 Contract Damages

A brief review of the common law of contract damages would be instructive as to potential liabilities facing the project participants who are responsible for the success or failure of a sustainability objective. These are the typical contract damages that a breaching party may be liable for if they fail to achieve a sustainability goal. As stated in American Jurisprudence 2nd, under a general allegation of damages resulting from a breach of contract, a plaintiff may recover those damages that naturally and necessarily result from the alleged breach. The plaintiff must show a compensable injury resulting from the alleged breach.[227] In a breach-of-contract action, a plaintiff may recover the amount of damages necessary to place him in the same position he would have occupied had the breach not occurred. This is measured by a combination of 1) direct damages; 2) consequential damages; and 3) any offset for not having to perform.[228]

Direct (or "general") damages are those that are the natural and necessary result of the wrongful act or omission. Said another way, direct damages are those which are traceable to, and the probable and necessary result of, the injury. They are the direct, natural, logical, and necessary consequences of the injury, or usually flow from the breach.[229]

Consequential (or "special") damages, denotes damages that arise from the special circumstances of the case, which, if properly plead, may be added to the direct damages which the law presumes or implies from the mere invasion of the plaintiff's rights. Consequential damages are

[227] 22 Am. Jur. 2d Damages § 624
[228] Restatement 2nd of Contracts, §347 "Measure of Damages in General"
[229] 22 Am. Jur. 2d Damages § 38

the natural, but not the necessary, result of an injury. Thus, they are not implied by law, and while they need not be the necessary and usual result of the wrong, they must be a proximate result thereof.[230] This rule is generally derived from the holding in Hadley vs. Baxendale.[231]

In a more modern interpretation of this rule within the construction environment, the Supreme Court of Virginia weighed in on the difference between direct and consequential damages and found for the plaintiff on the issue of whether extended interest cost related to a job being finished late was a direct damage.[232] In that same case the Supreme Court of Virginia found that some interest expenses were consequential damages.

Many owners choose to pursue a green building for a variety of reasons, including the fact that they wish to capitalize on higher rents and asset value that are perceived to derive from third-party green building certification, as well as potentially lucrative financial incentives offered by state and local governments. If the party responsible for attaining third-party certification fails to accomplish the goal as required by contract, the damages that flow from that breach may be deemed both direct and consequential damages (Prum & Del Percio, 2010). Because of the green building arena's novelty, courts have yet to set a precedent as to whether the damages should be considered direct or consequential (Prum & Del Percio, 2010).

3 Case Law

Looking at reported case law to establish the legal precedent can help to conclusively answer some of the questions that have been referred to above. Unfortunately reported cases on this aspect of green building law are sparse to non-existent. In the course of researching the current legal precedent some initial pleadings and factual background were uncovered on a state trial court case which is related to this subject and provides some insight. This case is Shaw Development vs. Southern Builders. The following set of facts concerning the lawsuit were uncovered by a blogger working at gbNYC magazine. The lawsuit in question relates to the construction of a $7.5 million condominium complex in coastal Maryland. From what can be gleaned from the initial pleadings it appears that the specifications included a stated goal for the project to achieve a LEED silver certification issued by the United States Green Building Council. The owner's interest in this LEED silver rating was not purely altruistic, as there were state tax incentives related to new buildings achieving LEED certification. In this case the state of Maryland was offering tax credits up to 8% of the total project costs for projects which achieved a LEED certification. These tax credits were not specifically mentioned or claimed in the contract but the LEED certification was clearly stated in the specifications as a sustainability objective. As it turns out the performance of the project team delayed the receipt of LEED certification which subsequently disqualified the owner from receiving the tax credits; and, as such, the owner pursued a cause of action against the builder based partially on these lost tax credits (Del Percio, 2008).

Unfortunately for legal commentators and academics this case never proceeded to trial and was settled out of court. But the facts of the case illustrate the types of disputes and claims that will

[230] 22 Am. Jur. 2d Damages § 40
[231] Hadley v. Baxendale (1854) 156 ER 145.
[232] Roanoke Hospital Association v. Doyle & Russell, Incorporated (1975) 215 Va. 796

undoubtedly be seen in the future related to one party's failure to achieve a sustainability objective.

4 Discussion

Without established legal precedent some common threads may be uncovered from the model contract documents and the basics of contract law. It appears that contract drafters are managing their risk using a few common strategies. It is also clear that owners are looking for ways to ensure their project participants meet the sustainability measures.

The first and most desired risk avoidance strategy for contractors and architects is a waiver of consequential damages. Most of the sustainability guides attempt to define damages related to the failure to meet a sustainability objective to be consequential, then further rely on the waiver of consequential damages in the governing contract to absolve the parties of liability. It appears that some of the damages flowing from a failure to meet a sustainability objective would be considered a consequential damage (i.e. decreased rents, decreased asset value, failure to acquire lucrative financial incentives offered by state and local governments). However, the danger with relying on this risk avoidance strategy is that some damages related to a failure to achieve a sustainability goal may be deemed direct damages; and the line is often blurred between direct damages and consequential damages. The AIA has added some umbrella coverage for possible direct damages by adding a limitation of liability provision in addition to the mutual waiver of consequential damages.

The other type of risk sharing strategy which has been mentioned in both the ConsensusDOCS and DBIA addendums is some sort of liquidated damage provision relating to a parties failure to meet a sustainability objective. This may be the most reasonable and balanced approach considering the interest of all parties. It is clear that in these cases, harm has been done to the owner if a sustainability objective is not met. And it further stands to reason that if the owner feels strongly about the sustainability objective that message can be conveyed clearly by putting a price tag on it in the form of a liquidated damage clause when the contract is initially negotiated. This type of liquidated damage would be subjected to the typical legal challenges and as such would have to be drafted carefully. According to the Restatement 2nd of Contracts, "Damages for breach by either party may be liquidated in the agreement but only at an amount that is reasonable in the light of the anticipated or actual loss caused by the breach and the difficulties of proof or loss. A term fixing unreasonably large liquidated damages is unenforceable on grounds of public policy as a penalty."[233]

With respect to liquidated damages, no court to date has interpreted a green building-related liquidated damages provision. As a result, a provision that imposes liquidated damages on a party for failing to earn the owner's desired level of LEED certification may in some jurisdictions, be deemed a penalty and thus an unenforceable condition of the contract (Prum & Del Percio, 2010).

A third option addressing this issue has recently been brewing in Washington D.C. In 2006, the city of Washington D.C. passed legislation that would require green performance bonds to be

[233] Restatement 2nd of Contracts, §356 "Liquidated Damages and Penalties"

used on construction projects beginning in 2012. This legislation was a bit confusing to industry participants who had never heard of a green performance bond and where uncertain how to acquire one (Cheatham, 2011). According to section 6b of the act:

> On or before January 1, 2012, all applicants for construction governed by section 4 shall provide a performance bond, which shall be due and payable prior to receipt of a certificate of occupancy.
>
> The bond, which could be worth up to $3 million, would be forfeited if a building should fall short of expected green building standards (such as LEED certification) outlined within the act.

It is anticipated that Green performance bonds would function similarly to a normal construction performance bond, with the primary difference being that it covers harm specific to a projects sustainability objectives. Performance bonds guarantee the performance of the principal ("contractor") to their obligee ("owner"). In the event of default under the terms of a performance bond the obligee will require the surety to step in the shoes of the principal and fulfill the obligation or surrender the penal sum of the bond. It is assumed that a green performance bond would function in a similar same way (Cheatham, 2011).

When it comes to green performance bonds, the bond would offer a financial guarantee that the principal will adhere to certain green building objectives. If the contractor should fail to do so, the surety would be accountable for making sure the principal fixes the problem (Cheatham, 2011). It is unclear whether the standard performance bond would cover the failure of a contractor to meet an explicit sustainability objective, or if a separate bond device will have to be created to address this risk.

Lastly, in the United States there is a groundswell of momentum behind green building and that has caused regulators and code drafters to take notice. In the near future regulators and code drafters will convert these sustainability goals from a voluntary system enforceable only under the laws of contract, to a mandatory system which becomes part of building codes subject to enforcement by local municipalities and governments. In the event that sustainability objectives become part of building codes; then in addition to the contract damages, violators could face fines and other remedies imposed by governmental authorities. This will add an additional level of risk for project participants to consider and plan for.

5 Conclusion

It is clear that sustainable construction isn't going away anytime soon, so project participants will have to familiarize themselves with this new reality to navigate its pitfalls and risks. It seems that since the risk of failing to meet a sustainable objective is somewhat new, owners are not rigidly enforcing these conditions and contractors and architects have received a temporary reprieve. As this type of expectation becomes more common place and owners become more sophisticated it seems that owners will become less likely to ignore these provisions and allow project participants to waive all liability related to them. The next logical step for owners seeking some assurances beyond a handshake on their sustainability objectives is to include specifically tailored liquidated damage provisions in the governing contract. A properly drafted liquidated damage provision could serve the dual purpose of putting the project participants on

notice of the owner's serious intent to achieve their sustainability objectives and provide the contractor and architect some certainty as to their potential liabilities.

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Defect in Building Construction Contracts. A case of liability and contractual risk

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Abstract:

This paper aims to compare the regulations of the defects in building construction of the DCFR, Spanish Law and contracts of sale of goods on the Directive 199/44/EC, to check how the rules about defects and risks are and must be closely connected because the liability for defects depends on them. The connection shows two things which are also the conclusions. One, you cannot establish as general rule on the construction contract that the constructor could not be liable of defects caused by an event which he could not avoid or overcome. It is a risk matter. Therefore, the risk has some influence on liability for defects. Two, as a consequence of the last, the liability of constructor for defects is a hypothesis of strict liability that not require of the construction fault. This is to all remedies for defects except enforcing damages because those require the fault.

I would like to warn you this piece of work is a first draft as result of my previous publications on the subject of defects in building construction and of the sale of goods. For this reason this paper needs more profundity and should be looked at in contrast to other authors, which will explain the absence of bibliographical notes.

Keywords:

construction contract, risk, liability for defects, conformity.

1 Introduction

This paper aims to compare the regulations of the defects in building construction and contracts for the sale to check how the rules about defects and risks are and must be closely connected because the liability for defects depends on them. To achieve this goal we are going to exam three regulations. One is the Directive 1999/44/EC of the European Parliament and the Council on certain aspects of the sale of consumer goods and associated guarantees. In my opinion this is the best legal text elaborated on the subject of defects. Secondly, we will examine Spanish Law regulations on the liability for defects in building constructions. And, thirdly the Principles, Definitions and Model Rules of European Private Law also known as the Draft Common Frame of Reference (DCFR) about the similar subjects.

A general view of the regulations of defects on those legal texts show some interesting contrasts.

The Directive 1999/44/EC has broad regulations on the sale of defective goods that this legal text calls “non-conformity” instead of “defect” which is a distinctive change of name. This Directive also applies to contracts for the supply of consumer goods to be manufactured or produced which in other words means that it applies to contracts on the construction of movable things (for instance, the construction of kitchen or any furniture). The Directive does not directly establish any rule about the risk but it does indirectly and is therefore very important. With regard to Spanish Law Parliament dictated in 1999 an Act which established some extensive rules of liability for defects in building construction and a simple rule about the risks that in my view is probably wrong, as we will see. The DCFR regulates the construction contract which rules apply to the construction of buildings and movable things, but it hardly dictates any rules about the specific subject of the defects. So, it does not establish the types of defects -a very important issue-, neither the remedies for defects nor the deadlines that the client can rely on for the remedies of the defect. However, it dedicates a long article to the contractual risks.

2 The Directive 1999/44/EC on certain aspects of the sale of consumer goods and associated guarantees

I will refer to only the more relevant aspects of this Directive for the purpose of this paper. It establishes all rules that govern the defects subject for the sale of goods to the contracts signed between businesses and consumers. First of all, we have to underline that the Directive is inspired by the UN Convention on Contracts for the International Sale of Goods of Vienna 1980. It means that those rules which were drawn up to be applied to contracts between businesses but are now being applied to contracts between businesses and consumers, which, in theory require more protection. A proof of that is that the German BGB was modified in 2001 and adopted most of the rules of Directive to apply to all contracts for sale, business to business, consumer to consumer and of course business to consumer.

With regard to the Directive objective scope, as I said before, it is the contract for the sale of goods but also the contracts to construct some movable things. That is the conclusion of reading Article 1. 4. It stipulates: Contracts for the supply of consumer goods to be manufactured or produced shall also be deemed contracts of sale for the purpose of this Directive. It means that the rules of the defects to sales are also relevant for the construction contract, at least to the construction contract of movable things, because this directive only applies to the sales (constructions) of movable items.

Moreover, as already stated, in this Directive the former meaning has been changed by the use of words the “non-conformity”. This is a significant change of meaning because in European Civil Law countries the defect regulations and all that entails come from Roman law, in which the liability for the defect was dissociated from the non-performance of the seller obligations. But now the Directive follows the UN Convention the new name “non-conformity” which involves things like seller non-performance.

With regard to the types of non-conformities or lack of conformity they can be deduced by the requirements of conformity with the article 2 Directive. It establishes: The seller must deliver to the buyer (consumer) goods which are in conformity with the contract of the sale. The conformity depends on different circumstances, for instance, if they fit the description given by the seller or any particular purpose for which the buyer requires or the purposes for which goods of the same type are normally used, etc. I cannot entry go into all the extensions of this Article[234]. Article 2.3 Directive has some importance which declares there shall be deemed not to be a lack of conformity if, at the time the contract was concluded, the consumer was aware, or could not reasonably be unaware of, the lack of conformity. This rule is traditional in the subject of defect. It is the knowledge or not of the defect by the buyer at the conclusion of the contract which would be equivalent to a reasonable awareness.

Another aspect that I would like to refer to is about the deadline (limit?) within which the seller is liable for a lack of conformity. Article 5 establishes that the seller shall be held liable where the lack of conformity becomes apparent within two years from the delivery of the goods. This period is very important because it is in fact the legal and mandatory guarantee expiry date. In Civil law countries this period was very short[235]. Nevertheless, in the cases of second-hand goods the Directive allows member States to provide that the seller and consumer may agree a shorter term than two years, but such a period may not be less than one year.

Finally, the most important issue for us in this work is the rule of risk that Article 3.1 establishes. It says: "The seller shall be liable to the consumer for any lack of conformity which exists at the time the goods were delivered." At first this rule is obvious: the seller will be only liable for any lack of conformity which exists before the delivery, never a lack of conformity (defect) caused after it (for example, caused by the buyer). It is the traditional defect requirement by doctrine: liability for defects is only when the defect is original. As for the risk, this rule involves that it is passed to the buyer at the time of the goods delivery. But I would like to call attention to the fact that the seller will be liable for defects if the goods suffers some deterioration (defect or lack of conformity) before the delivery to the buyer although the defect would have been caused between the time that the contract was concluded and the delivery. Of course the seller would be liable despite the lack of conformity due to an event of which the seller cannot be held accountable. In addition I like to add that Directive establishes a rule about the burden of proof

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[234] Article 2. Conformity with the contract

1. The seller must deliver goods to the consumer which are in conformity with the contract of sale.

2. Consumer goods are presumed to be in conformity with the contract if they:

(a) comply with the description given by the seller and possess the qualities of the goods which the seller has held out to the consumer as a sample or model;

(b) are fit for any particular purpose for which the consumer requires them and which he made known to the seller at the time of conclusion of the contract and which the seller has accepted;

(c) are fit for the purposes for which goods of the same type are normally used;

(d) show the quality and performance which are normal in goods of the same type and which the consumer can reasonably expect, given the nature of the goods and taking into account any public statements on the specific characteristics of the goods made about them by the seller, the producer or his representative, particularly in advertising or on labeling.

[235] French Civil Code in the article 1648 only refers to a short time, but does not establish something concrete; the Italian Civil Code the article 1495 establishes one year; the German BGB before the reform of 2001 established in paragraph 477 six months, like the Spanish Civil Code (article 1490).

on this aspect to profit the consumer, so if the lack of conformity becomes apparent within six months of the delivery time it is presumed to have existed at that time.

Of course the strict liability is to resort all remedies for defects except enforcing damages which will require the fault of the seller.

That is the seller liability for lack of conformity (or defect) is a strict liability or to say the same, the seller liability for defect does not need the requirement of the fault as I have said. It has always been that even from the Roman law and doctrine has never disagreed about it. However, doctrine and jurisprudence in Civil law countries like Spain have hardly ever connected the defect subject with the risk rule. This is the issue. But the Directive has served to enhance than important issue that shall serve to clear the defect liability in other contracts, like for example the construction contract.

I would like to stress a novelty rule of the Directive to Civil law countries, about the delivery time when the risk is passed to the buyer, mandatorily applied at least to the consumer contracts. The reason is that rule was absolutely contradictory to the traditional risk rule coming from Roman law: *"periculm est emptori"* in Latin. In Spain and most countries of Civil law the traditional risk rule continues to be applied to the other contracts that are between businesses and between consumers.

3 Spanish regulations of Building defects

In Spain the subject defects on construction contracts is regulated in a Act of 1999 called the Building Regulation Act -in Spanish Ley de Ordenación de la Edificación (from now the acronym LOE)-, despite its name it does not regulate the construction contract totally but one smale part only. The construction contract in general is regulated in the Civil Code with very old rules coming from XIX Century. On the contrary LOE basically establishes the rules of liability for defects in building construction. But also take advantage to dictate a rule about risk which is contradictory to the general rule risk established in the Civil Code. The result is confusion about the requirements of defects liability and a big mistake.

The LOE establishes the list of people and companies who make the building, called building agents and of course the domains of each one. Basically they are the promoter, the architects and the constructor. Architect and constructor do not need any explanation or definition but the promoter probably yes. A promoter is the business developer of buildings that normally is a company, who as owner of a plot, manages, decides, contracts the other agents, invests, finances and finally sells the different houses, apartments, etc. getting the main profit. The LOE establishes the domain of each building agent in detail. Each domain is very important to distribute and determine the liability of each agent in case of any defect. This, in my opinion is not a fault issue; it is only a criterion for knowing which agent has the scope of domain, because in case of defect he could allege the defect is out his domain. If the defect is inside his domain he could never allege it was not his fault. I will come back to this. In addition we have to refer to the people who can claim liability for defects in building. They can be of course the client, but also third parties like buyers from the developer or last purchasers from the first buyer. Also the LOE allows all people refer to sue all building agents (architects, constructors, etc.).

With regard to the types of defects the LOE states three[236] and at the same time establishes the different periods of building agent liability. So it distinguishes structural defects, functional defects and finished defects. The periods are ten years for the first, three years for the second and one year the last. These rules have a similar function to the sale of goods which signifies that the seller shall be held liable where the lack of conformity becomes apparent within two years to be counted from the delivery of the goods. We could enter into detail in the three types of building defects but it is a subject of singular cases which I think is not important for the aim of this paper. Only add that the time to start to count the periods is the handover of the structure.

But the main issue is how to determine the liability for defects in building or more specifically, the question would be if it is a requirement to claim the agent being at fault. Before LOE and until now it has been discussed by jurisprudence and doctrine in Spain, because some authors have held that it is a necessary the requirement of the agent fault and the courts not always have held some secure criteria about it. In addition the matter is not only in Spanish Law because in France the modification of Civil Code of 1978 established in article 1792 a exception of liability of the constructor if he proves that the damage was caused by an alien cause. That panorama has should influenced lawmakers to establish in article 17.8 LOE a similar rule of French Civil Code. It says: The liability will not be due by building agents if it is proved that the defect was caused by any event which the agents could not avoid or overcome. In my opinion this is a big mistake to form such a generalization. That would not be correct if this event had happened before the handover but if that had happened after it. Why, because it is a risk matter. So in the first case the agents still have the risk, whereas in the second the risk has passed to the client through the handover. If we would admit the agents could not be liable in the first hypothesis LOE would be absolutely contradictory with the traditional and much known risk rules in construction contract and of course in Spanish Civil Code.

In effect if we read the articles 1589 and 1590 of Spanish Civil Code about the risk in construction contract, they establish that the constructor suffers the loss or the damages and cannot claim payment of the price of the contract if they happen before the handover. In the same way, the constructor still has to perform (if it is possible) or as the case may be, perform again.

Consequently with this risk rule the agent is liable for all defects which exist in the structure at the time when it was handed over. Obviously not for the defects caused after that. In this way the client will only have to prove the defect existed at that moment, the same thing happens in the contract of sale. And of course the constructor shall be held liable where the defect becomes apparent within periods ten, three and one year from the handover of the structure stated above.

In any case these rules about defects in the construction contract are similar to the traditional defect rules of the contract of sale. As I said before doctrine has always affirmed the requirement of the original feature of defect so the seller would be liable to the buyer for it.

But the most important consequence of the primary considerations is the absolutely clear strict feature of contractual liability for defects in building construction contracts. I insist, the same thing has always happened in the sale contract dating from Roman law.

[236] Like similar way French Civil Code which in this subject of liability for defect in building, in 1978 was modified in its articles 1792 and following.

In addition the same thing similarly happens in sales contracts, in construction contracts they will be deemed not to be a defect if the client was aware, or could not reasonably be unaware of, the defect. But whereas in the sale the time concerned is when to aware is when the contract was concluded, in the construction it cannot be that but the handover time. In the handover the client has the burden to inspect, supervise and accept the structure or refuse it when the structure has a defect or does not conform to the contract. Also the client can accept with an assurance cure by the constructor. On the other hand if the client accepts the structure, the constructor is relieved of liability for apparent defects although not for other defects.

4 4 The rules of the Draft Common Frame of Reference

The DCFR regulates the construction contract on articles IV.C.3.101 to IV.C.3.108 and its scope is building or other immovable structure and movable things. The DCFR only dictates an article about the specific subject of defect. It is the IV.C.3 that like the Directive 1999/44/EC uses the words “non-conformity” instead of the word defect. As I said above DCFR dictates hardly any rules about the specific subject of the defects. So, it does not establish the types of defects nor the remedies for defects or the deadlines that the client can rely for the remedies of the defect.

With regard to the remedies for non conformity, some are characteristic of all specific contracts in the DCFR. Here all the remedies for non conformity are established in general rules of the contract, inside remedies for non performance. In my opinion it is suitable. However, I do not have a favorable opinion about the lack of periods where the client can rely on a defect (“non-conformity”) and the types of non conformities because in the construction contract they are absolutely necessary. The same thing happens in the regulations of the contracts of sale. All these lacks of previsions could be resolved applying the general period of prescription of three years of DCFR article III.-7:201. But this solution would be suitable for the contract of sale and for the construction of movable things. Not for building construction because there have different types of non conformity. In relation to that, there is an overlap in DCFR between the regulations of the contract of sale and the contract of construction. In the first is a rule which, like the article 1.4 of Directive refers to the above saying “A contract that one party undertakes to manufacture or produce goods is to be considered as a contract for the sale of goods”. But if we remember the contract of construction regulation covers the movable thing, you cannot have security about what regulations apply.

With respect to the risk the article IV.C.- 3:108 DCFR establishes the rule of the risk to the constructor if the event occurs before the handover. In this case if it still possible to perform, the constructor has to perform or, as the case may be, perform again. Only in this case is the client obliged to pay for the constructor’s performance. In the case where it is no longer possible to perform the client does not have to pay for the services rendered. Finally, when an event happens after the handover the constructor does not have to perform again and the client remains obliged to pay the price. That is applied to non conformities (or defects) it will mean that the client would only have to prove that the defect already existed when the control of the structure was transferred and the constructor could not allege that it was by an alien cause. The conclusion is in any case that the liability for defects in building construction is a case of strict liability in accordance with the traditional rules of risk in the construction contract. These rules are also similar to the contract of sale as we saw before. And of course as I said to sales, the strict liability

is to resort all remedies for defects except enforcing damages which will require the fault of the constructor.

To finish I would like to do refer to the handover of structure. The article IV.C.- 3:106 DCFR regulates the handover of structure declaring that acceptance by the client of the control of structure does not relieve the constructor wholly or partially from liability. It is obvious that the acceptance does not relieve him from liability for non conformities hidden at this time. But the constructor could be relieved to apparent non conformities which the client had refused to accept. I do not understand why in this article the DCFR does not distinguish those two possibilities as it does in the regulations of sale. So in a similar way as we saw before in the Directive, Article IV.A.-2:307 declares that the seller is not liable (for non conformities) if, at the time of the conclusion of the contract, the buyer knew or could reasonably be assumed to have known of the lack of conformity. It is clear in the construction contract that the relevant time cannot be the conclusion of contract but the handover of the structure.

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Global claims: a cost effective way of disposing of construction disputes?

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Abstract:

This paper uses traditional doctrinal methodology to evaluate judicial statements on the merits of global or rolled up claims where it is said to be impractical or impossible to demonstrate the links between certain causes of action and the monetary value to be attached to each cause. The paper reviews key authorities from a number of jurisdictions. The key authorities are then summarised with key ingredients of the global claim authorities being identified as: impossibility, impracticability, conduct of the claimant and defendant, balance between excessive particularity and basic information, the keeping of records, the costs of claim preparation and apportionment. The Jackson Review of the costs of litigation are considered and, in that context, the paper proposes that global claims can be a cost effective way of disposing of complex construction disputes without necessarily jeopardising the basic proposition of the claimant being required to prove that to which he believes he is entitled so that the defendant knows the case he has to meet.

Keywords:

causation, cost benefit analysis, global claims, litigation

1 Introduction

Construction disputes can be very costly to resolve by litigation. Global claims are probably significantly less costly to advance than traditional claims but carry a greater risk of failure. This paper uses traditional doctrinal legal methodology to evaluate judicial statements on global claims, drawing on key authorities from a number of jurisdictions and from the realms of health and safety law and professional negligence. The paper also considers the Jackson Review of litigation costs and concludes that if a cost benefit analysis is conducted in respect of claim preparation, this paper proposes that global claims, if advanced correctly, could significantly reduce the costs of litigating complex construction disputes.

2 The Starting Point

The general rule as regards a claimant being compensated in damages for breach of contract was set out by Lord Blackburn in these terms:

'*in settling the sum of money to be given for reparation of damages you should as nearly as possible get at that sum of money which will put the party who has been injured, or who has suffered, in the same position as he would have been in if he has not sustained the wrong.*'[237]

In other words, the wronged party, so far as money can do it, should be placed in the same position as if the contract had been performed.

Contractors may find themselves in the position of having suffered a loss on a particular project and consider the whole of that loss is attributable to breaches of contract by the client. Contractors may then proceed, in a seemingly generalised and simplistic way, to present a claim for the total "loss" as a measure of damage which should compensate them for the harm suffered.

The claimant's right to be compensated for harm done should also be balanced up with the rights of the defendant as set out by Lord Justice Saville:

'The basic purpose of pleadings is to enable the opposing party to know what case is being made in sufficient detail to enable that party properly to prepare to answer it.'[238].

3 Review of the global claims authorities

Global or 'rolled up claims' occur when the claimant presents a claim with no breakdown in the sense that, rather than showing how each individual event has caused delay together with the monetary loss attached to each delay, the claimant provides a single claim lumping each alleged cause together without itemisation. Such an approach under normal circumstances:

'is the antithesis of a claim where the causal nexus between the wrongful act or omission of the defendant and the loss of the plaintiff has been clearly and intelligibly pleaded.'[239]

Lord Humphrey LLoyd QC also indicated 'that nexus need not always be expressed since it may be inferred. '[240]

Awards given on a global basis have, however, been supported in the context of

'an extremely complex interaction .....[where] it may be **difficult or even impossible** to make an accurate apportionment of the total extra cost between the several causative events'[241]. (emphasis added)

[237] Livingston v Rawyards Coal Co (1880) 5 App Cas.25, 39
[238] British Airways Pension Trustees Limited (Formerly Airways Pension Fund Trustees Limited) v Sir Robert McAlpine & Sons Limited & ORS [1994] 72 BLR 26, CA
[239] Bernhard's Rugby Landscapes v Stockley Park Consortium (1997) 82 BLR 39 para. 131
[240] Bernhard's, note 3
[241] Crosby and Sons Ltd v Portland UDC (1967) 5 BLR 121, QBD

The arbitrator in Crosby v Portland also used the word "impractical". Similar words were used by Vinelott J, where he indicated:

> a rolled up award can only be made in a case where the loss or expense attributable to each head of claim cannot in reality be separated and . . . . where apart from that **practical impossibility** the conditions which have to be satisfied before an award can be made have been satisfied in relation to each head of claim'[242] (emphasis added)

Awards made by both arbitrators and adjudicators on a global basis have been supported by the courts[243]. There have however been notable failures. An argument commonly cited against the global approach is that it amounts to an abuse of process, such an argument usually being presented at an interlocutory stage in the form of an application to strike out the claim. The abuse can be categorised as where the claimant provides no particularisation to a claim such that the defendant does not know what he is defending himself against. In *Wharf v Cumine Associates*[244], the claimant had submitted a four hundred page document without stating their exact position and without identifying the key cause of delay. In responding to an application to strike out, the claimant averred '*It will be necessary at trial to consider all variations instructed in order to establish which of them are unnecessary'*.[245]

The court then concluded;

'The failure even to attempt to specify any discernable nexus between the wrong alleged and the consequent delay provides, to use Mr Thomas's phrase [counsel for the defendants] "no agenda for the trial".'[246]

While Wharf could be argued to be the low point for global claims, in *Mid Glamorgan v Devonald Williams*[247] the court reiterated the view that global claims were permissible in situations where there were issues of impossibility or impracticability:

> Where however a claim is made for extra costs incurred through a delay as a result of various events whose consequences have a complex interaction that renders specific relation between event and time/money consequence **impossible or impracticable**, it is permissible to maintain a composite claim.[248] (emphasis added)

From Wharf onwards we can see the courts reluctance to strike out global claims purely because they were presented as global claims.

The District Court of Western Australia (2007) defines the nature of a Scott Schedule as being a form of pleading which allows the court to have before it a single document. That document conveniently providing a full description of each element of claim together with the adopted positions of each party (in terms of admission or denial and quantum/evidence) to each element.

[242] London Borough of Merton v Stanley Hugh Leach Ltd (1985) 32 BLR 51 pp. 102-103
[243] Crosby, note 5 and Shell Refining (Australia) Pty Limited v AJMayr Engineering Pty Limited [2006] NSWSC 94
[244] Wharf Properties Ltd v Eric Cumine Associates [1991] 52 BLR 1
[245] Wharf, note 8
[246] Wharf, note 8
[247] Mid Glamorgan County Council v J Devonald Williams (1991) 8 Const LJ 61, QBD (OR)
[248] Mid Glamorgan, note 11

In *ICI v Bovis* the claimant produced four volumes to present its case in the form of a Scott Schedule.

'The objectives sought to be achieved by the Court in orders made relating to Scott Schedules are to ensure that when the action is entered for trial: each individual item claimed is particularised ... the amount asserted by both parties ... the contentions of each parties ... areas of agreement relating to the description of the item and quantum ... the aggregate of the claims and areas of admissions of each party are known.'[249]

The global claim in *ICI v Bovis* was still found to be deficient in many respects but permitted to proceed without further and better particulars being required. Global claims have also been permitted to proceed subject to further and better particulars being require where; the claimant's claim was seriously defective[250] and; where the pleadings showed no nexus between the events claimed of and the loss and damage alleged[251].

Consideration was given as to how far the claimant must go in particularising his claim in the case of *Bernhard's Rugby Landscapes v Stockley Park*[252]. Judge Humphrey LLoyd, restated the principles of a global claim and, while maintaining the proposition that the claimant is entitled to present its case as it thinks fit, the court must ensure a party spells out its case in sufficient particularity in order to ensure fairness and observance of the rules of natural justice. Judge Humphrey LLoyd went on to say:

> What is **sufficient particularity** is a matter of fact and degree in each case, with a balance being struck between excessive particularity and basic information. The approach must also be **cost effective**.[253] (emphasis added)

The Court of Appeal concluded that the core dispute, over pleadings and case management, in *Petromec Inc v Peroleo Brasileiro SA*[254] concerned the degree of particularity with which *Petromec* must plead its case. The dispute raised questions of fairness, practicality and the appropriate means of enabling the court to define and decide issues between the parties. The court concluded that '*it would not be fair to Petrobras, nor a practical way of the court proceeding, if Petromec were not required to give* ***adequate particulars*** *of their claim.*'[255] (emphasis added)

Lord Woolf and Lord Justice Otton heard an appeal against the refusal of a late strikeout application of a poorly pleaded global claim in the case of *GAB Robins v Specialist Computer Centres*[256]. The appeal was refused. Lord Woolf acknowledged that the case should have taken a different direction. He also expressed some sympathy for the trial judge and expressed hope that the judge would take into account the contribution the poor pleadings may have had on whether, to use the earlier words of Lord Justice Otton (citing with approval Judge LLoyd in *Bernhard's*

[249] ICI Plc v Bovis Construction (1992) 8 Const LJ 293
[250] British Airways . note 2
[251] Holland Construction and Engineering Pty Ltd v Kvaerner RJ Brown Pty Ltd (1996) 82 BLR 83
[252] Bernhard's Rugby, note 3
[253] Bernhard's Rugby, note 3 para. 138
[254] Petromec Inc v Petroleo Brasileiro S.A. Petrobras & ors [2007] EWCA Civ 1371
[255] Petromec, note 18 para. 31
[256] GAB Robins Holdings Ltd v Specialist Computer Centres Ltd [1998] EWCA Civ 924 (8 June 1998)

Rugby Landscapes v Stockley Park), the court's fundamental concern that the dispute should be determined "***expeditiously and economically***"[257] had been addressed.

There are warnings against the danger of a global claim failing completely if any significant part of the delay is not established and the court finds no basis for awarding less than the whole (Furst and Ramsey, 2006).

In *John Doyle v Laing*, Lord McFadden indicated that "*advancing a claim for loss and expense in global form is therefore a risky enterprise*"[258]. The risk being the global claim is undermined if either the claimant fails to prove that a material event was the fault of the defendant or, the defendant is able to prove that a material contribution to the global loss was attributable to other factors not attributable to him. Lord McFadden mitigated his analysis by providing two considerations:

'The first of these is that while ..... the global claim as such will fail, it does not follow that no claim will succeed. ..... but there may be in the evidence a sufficient basis to find causal connections .... or to make a **rational apportionment** of part of the global loss....

The second factor ..... is that **causation must be treated as a commonsense matter**.'[259] (emphasis added)

In terms of awarding less than the whole, Lord McFadden made it clear that "if a lesser claim is to be made out, that must be done on the basis of the evidence which is properly led within the scope of the existing pleadings."[260]

The American courts have considered total cost claims and awarded less than the whole. In *Servidone v the United States*, the claimant:

'presented evidence under the total cost method. Servidone, 19 Cl.Ct. at 384. Under this method, the contractor must show: (1) the impracticability of proving actual losses directly; (2) the reasonableness of its bid; (3) the reasonableness of its actual costs; and (4) lack of responsibility for the added costs.'[261]

In finding that the claimant's bid (*Servidone*) was unreasonable, the Claims Court applied a modified total cost method and '*substituted a reasonable bid amount for Servidone's original estimate.*' The court also considered the effect on contractor's costs of '*performance inefficiencies.*'[262]

[257] GAB Robins, note 20
[258] John Doyle Construction Limited v Laing Management (Scotland) Limited Outer House, Court of Session [2002] Scot (D) 23/4 para. 37
[259] John Doyle, note 22 paras. 38 and 39
[260] John Doyle, note 22 para. 41
[261] Servidone Construction Corporation v the United States [1991] 931 F.2d 860 United States Court of Appeals, Federal Circuit paras. 9 and 10
[262] Servidone Construction, note 25 paras. 9 and 10

Judge Thornton asked a number of questions in *How Engineering v Lindner* as to how the Lindner claim could be scaled down if some of the causative events alleged had been eliminated or to take account of defects, inefficiencies or events at *Lindner's* risk[263].

Support for an apportionment process may be found in the words of Mr Justice Donaldson in *Crosby* who supported the arbitrators strategy in recognising that a claim does not need to be fully global or fully detailed but, that the contractor should particularise where possible and then ascertain his losses through a global claim where it was not possible by saying;

'I can see no reason why he [the arbitrator] should not recognise the reality of the situation and make individual awards in respect of those parts of individual items of the claim which can be dealt with in isolation and a supplementary award in respect of the remainder of those claims as a composite whole.'[264]

Winter argues that this type of approach reverses the burden of proof (Winter, 2007).

In order to prevent the burden of proof being reversed the claimant may be required to ensure evidence is led to indicate what his own failings might be so that the court can attribute quantum to those failings. The claimant may also be required to lead similar evidence to indicate other issues not the fault of the defendant so that, again, the court can attribute quantum to those liabilities.

A rational apportionment of the global claim or a reasoned deduction from the whole can then be made without, necessarily, reversing the burden of proof.

This paper now discusses key elements arising from the global claims authorities and considers whether a cost benefit analysis has a part to play in the advancement of global claims as being a '*commonsense approach*'[265].

4 Impossible or impractical to particularise

The Oxford English Dictionary defines impossible, impractical and impracticable respectively as follows:

'Not possible; that cannot be done or effected; that cannot exist or come into being; that cannot be, in existing or specified circumstances.'

'Not practical; unpractical. Also = impracticable'

'Not practicable; that cannot be carried out, effected, accomplished, or done; practically impossible.'

The meanings apparently being interchangeable and absolute.

[263] How Engineering Services Ltd v Lindner Ceilings Floors and Partitions plc unreported (QBD (OR), 17 May 1995
[264] Crosby, note 5
[265] Commentary by the editors of the Building Law Reports on Lord McFayden's decision at [2002] BLR 396

It is worth noting that the definitions of impossible, impractical, impracticable can shed some of their absolute meaning if the meaning of impractical is taken to include the words '*not sensible or realistic*' as may be found within the 2nd Edition of the New Oxford American Dictionary.

In their Delay and Disruption Protocol, the Society of Construction Law (2002) consider the starting point with any claim is for the claimant to maintain accurate and complete records during the project so that it should be able to establish causal links between events and the loss complained about without need to resort to a global claim. In any event, with or without such records at what point does the question of impossibility arise? Is it at advancement of the claim or at trial? This question may be answered by the words of Lord McFadden in *John Doyle*:

'The rigour of that analysis is in my view mitigated by two considerations. The first of these is that while, in the circumstances outlined, the global claim as such will fail, it does not follow that no claim will succeed. The fact that the pursuer has been driven (or chosen) to advance a global claim because of the difficulty of relating each causative event to an individual sum of loss or expense **does not mean that after evidence has been led it will remain impossible** to attribute individual sums of loss or expense to individual causative events.'[266] (emphasis added)

In some cases, the courts have balanced up the needs of the claimant to add to his case by serving further and better particulars in order to assist the defendant to understand the case he has to answer[267].

In considering whether the claimant advances a global claim or not, it should also be recognised that such a claim is '*a risky enterprise*'[268] particularly if absolute definitions are given to phrases such as impossible, impractical and impracticable as may be found in various judicial statements made in considering global claims. But we also see some relaxing of the absolute terms when the court uses words such as '*adequate*'[269] or '*sufficient*'[270] particularity.

5 Sufficient or adequate particularity

The seemingly absolute requirement of impossibility could be assimilated with an obligation to use best endeavours. To that end, should a claimant use his best endeavours and '*leave no stone unturned*'[271] either before he presents his claim or at any time through to trial? Or should he be required to use reasonable endeavours to produce adequate or sufficient particularity?

Although Judge Flaux was not convinced the distinction between best and reasonable endeavours made much difference on the facts of the case before him in *Rhodia v Huntsman*, he nevertheless addressed his mind to the distinction and appeared to conclude that best endeavours equated to all reasonable endeavours and that reasonable endeavours was a lower requirement. Some

[266] John Doyle, note 22 para. 38
[267] See ICI, note 13, British Airways note 2 and Holland note 15
[268] John Doyle, note 22
[269] Petromec, note 18 para. 31
[270] Bernhard's Rugby, note 3 para. 138
[271] Sheffield District Railway Co v Great Central Railway Co (1911) 27 TLR 451 at p. 452.

consideration as to the cost consequences of each was not considered except in terms of sacrificing and/or acting against the parties' own commercial interests[272].

Time, trouble and expense are factors to be taken into consideration when weighing up whether statutory defences in health and safety law are proven (see *Coltness Iron Co v Sharp*[273] and *Edwards v National Coal Board*[274]*).*

Here we see some discussion of a balance being struck and a question of proportionality (albeit "gross proportionality"). The health and safety authorities and published guidance do not appear to define what constitutes the distinction between proportionality or gross proportionality. What is clear in relation to the duties of a designer under the Construction (Design and Management) Regulations 2007 is that those duties to perform "so far as is reasonably practicable" are qualified by having to take:

'due account of other relevant design considerations"[275] and, according to CDM ACOP (Managing Health and Safety in Construction, 2007), in doing so the designer should "weigh the various factors and reach reasoned, professional decisions'[276]

6 The striking of a balance

Direct guidance is provided by the Health and Safety Executive (2007) in their Policy Statement on Enforcement as to their approach of proportionality in the enforcement of health and safety law in particular:

'11. Proportionality means relating enforcement action to the risks ....

14. Deciding what is reasonably practicable to control risks involves the exercise of judgement.'[277]

Even though the obligation appears to be akin to an absolute obligation in health and safety law i.e. to comply so far as is reasonably practicable, there appears to be an element of proportionality and the exercise of judgement.

The standard to be expected of a professional in exercising judgement may be found in the widely recognised direction to the jury set out by Judge McNair in *Bolam v Friern Hospital Management*[278] such that where a professional is required to exercise the ordinary skill of a competent respected practitioner in his field he will not be:

[272] Rhodia International Holdings Ltd. Rhodia UK Ltd. v Huntsman International Plc [2007] EWHC 292 (Comm) at para. 35
[273] Coltness Iron Company v Sharp (1938) AC 90, 94.
[274] Edwards v National Coal Board (1949) 1 KB 704 p. 712
[275] The Construction (Design and Management) Regulations, 2007. SI 2007 No. 320. HMSO, London. Regulation 11
[276] Managing health and safety in construction, 2007. Construction (Design and Management) Regulations 2007. CDM Approved Code of Practice. L144, HSE Books. para. 124
[277] see page 3
[278] Bolam v Friern Hospital Management Committee [1957] 2 All ER 118

'guilty of negligence if he has acted in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art'[279].

The Bolam test was modified by the House of Lords in *Bolitho v Hackney Health Authority*[280] such that the court is required to ask whether '*the body of opinion relied on can demonstrate that such opinion has a logical basis*'. In particular, the House of Lords also concluded that there must be a '*weighing of risks against benefits, ... the Judge .... will need to be satisfied that .... the experts have directed their minds to the question of comparative risks and benefits and have reached a defensible conclusion on the matter.*'[281]

This paper proposes that even where there are seemingly absolute definitions, the court leans towards a cost benefit analysis. Specifically with regard to global claims, Judge Thornton stipulated that the approach to providing sufficient particularity must be '*cost effective*'[282].

7 The Jackson Review

Judge Thornton considered *Amec's* behaviour as against the overriding objectives of the Civil Procedure rules in determining whether its costs were reasonable or unnecessary[283].

Building on the principles of access to justice enshrined in the Civil Procedure Rules, The Jackson Review (Jackson, 2009) linked access to justice, proportionate costs and practicable coming to the conclusion that:

'Proportionate costs make access to justice practicable. Access to justice is only practicable if the costs of litigation are proportionate.'[284]

Lord Justice Jackson set out guidelines to help the Rules Committee to formulate a definition of proportionate costs which, he hoped, would bear a reasonable relationship with such matters as: the sums in issue; complexity; any additional work generated by the conduct of the paying party[285]. He also considered that oppressive conduct by wealthy litigants in putting their opponents to excessive and disproportionate costs should be sanctioned by indemnity costs with the proposed definition of proportionate costs protecting a receiving party even where indemnity costs are not awarded[286]. What is also important to consider is that Lord Justice Jackson went on to say:

'The policy which underlies the proposed new rule is that **cost benefit analysis** has a part to play, even in the realm of civil justice.'[287] (emphasis added)

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279 Bolam, note 42

280 Bolitho v City and Hackney Health Authority (1997) UKHL 46

281 Bolitho v City and Hackney Health Authority (1997) UKHL 46

282 Bernhard's Rugby, note 3 para. 138.

283 Amec Process and Energy Ltd v Stork Engineers & Contractors BV (No 3) [2002] All ER (D) 48 (Apr) para. 26

284 see Part 1 Chapter 4 para. 2.5

285 see Part 1 Chapter 3 para. 5.15

286 see Part 1 Chapter 3 para. 5.21

287 see Part 1 Chapter 3 para. 5.17 (citing AB v John Wyeth and Brothers Ltd, CAT 13 December 1996)

So both a claimant and a defendant are required to conduct a cost benefit analysis as to the detail and extent of their pleadings and evidence. This is particularly relevant to construction claims which can be voluminous especially where Scott Schedules are required.

8 Conduct

This paper closes on the discussion of a proposed framework by providing a reminder of what happened in *Wharf* and the effect of conduct on the outcome of proceedings in global claim cases. *Wharf* had been ordered to, and agreed to provide further and better particulars using Scott Schedules, which they did not do. To that extent, it could be argued that the failure of the global claim in this instance was not a matter of principle in respect of global claims but procedural failure and a matter of conduct of the claimant.

Conduct of the claimant was also considered in *Merton v Leach*:

'at the time when loss or expense comes to be ascertained it is impractical to disentangle or disintegrate the part directly attributable to each head of claim, then **provided that the contractor has not unreasonably delayed the making of the claim and so has himself created difficulty** the architect must ascertain the global loss directly attributable to the two causes'[288] (emphasis added)

The courts also commented positively on the claimant and his advisors in *ICI v Bovis*[289] to the extent that there was '*a total lack of any contumelious behaviour on the part of ICI or its advisors.*'[290]

It would appear the Judge had certain sympathy to *ICI*'s situation however, despite *ICI*'s considerable work the defendant was still not fully aware of the case they had to meet. *Wharf* was reconsidered; their Lordships commented that if a pleading was to embarrass the fair process of trial, it could not be considered in isolation from the litigation history and to that extent, *ICI* were allowed to proceed with their claim.

The courts criticised the behaviour of the defendant in *Inserco v Honeywell Control Systems* both at first instance[291] and in the Court of Appeal[292]. The conduct of the defendant also came under scrutiny in the case of *Amec Process v Stork Engineers*[293]. Judge Thornton dismissed *Stork's* procedural objections and concluded "*a fair trial was both possible and manageable.*'[294].

Amec were ultimately successful with their largely global claim. On the question of costs, Judge Thornton criticised '*Stork's continuous and obstructive obfuscation*'[295] as being at the heart of its failure to produce evidence which contributed greatly to the time and costs *Amec* expended in presenting and defending the case. This case was considered to fall within '*one of those*

[288] London Borough of Merton, note 6
[289] ICI v Bovis Construction and others (1992) 32 ConLR 90
[290] ICI, note 53
[291] Inserco v Honeywell Control Systems (1998) CILL 1368, CA
[292] Inserco, note 55
[293] Amec Process and Energy Ltd v Stork Engineers & Contractors BV [2002] All ER (D) 98 (Feb)
[294] Amec, note 57
[295] Amec note 47 para. 84

exceptional cases where indemnity costs should be awarded even if there is no disapproval of Stork's conduct.'[296] Judge Thornton nevertheless, disapproved of the manner in which *Stork's* overall case was presented and awarded indemnity costs to *Amec* in addition to being successful with their global claim.

The criticisms levelled at the defendants in *Inserco v Honeywell*[297] and *Amec v Stork*[298] are arguably at the heart of the Jackson Review's discussion on prolix pleadings (with specific reference to TCC proceedings) which centred around re-pleading and/or disallowing costs at the end of the case[299]. Lord Justice Jackson suggested amendments to the TCC Guide be amended to give power to the court to disallow costs in certain circumstances[300].

9 Conclusion

The basic premise for presenting a claim in whatever form, whether it be a global claim in whole or in part, is that the defendant needs to know the case he has to meet so that there may be a fair trial of the issues.

The following ingredients for a global claim can be distilled from the authorities: impossible to particularise; impractical/ impracticable to particularise; material contribution; adequate particularity; sufficient particularity (a matter of fact and degree); striking of a balance; approach must be cost effective; dispute determined expeditiously and economically; dispute resolved fairly; causation a commonsense matter and; rational apportionment.

The global claim authorities therefore appear to indicate that the claimant need only present his claim in sufficient or adequate particularity providing a balance is struck between a claimants' right to be compensated and a defendants' right to be able to respond. Those authorities also indicate that the claim needs to be dealt with expeditiously and economically and in a cost effective manner. Cost benefit analyses are supported in decision making in health and safety law and in the law of professional negligence. The recent Jackson Review supports cost benefit analysis to civil justice.

This paper concludes that a cost benefit analysis requires a claimant to present his claim with sufficient particularity. Where that cost benefit analysis is defensible and can demonstrate the advancement of a global claim is cost effective so that the trial would be fair, a global claim should be the norm for all claims. This is particularly so where it can be demonstrated that all the events complained of are the fault of the defendant.

It may be cost effective to present even a claim that can be particularised as a global claim provided the claimant leads evidence in order to ensure an apportionment and/or appropriate deduction can be made from the globally claimed amount without compromising basic principles and/or reversing the burden of proof. The Jackson Review should also provide sufficient safeguards to protect against unreasonable conduct.

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[296] Amec note 47 para. 85
[297] Inserco note 55
[298] Amec note 57
[299] Part 5 Chapter 29 para. 2.2
[300] Part 5 Chapter 29 para. 6.1

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Perception of the UK industry on 'the new 2009 Construction Act': An empirical study

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Abstract:
It is generally recognised that the UK construction industry is associated with low profit, delay in payments, cash flow concerns, insolvency, and short-term relationships compared with the other industries. In particular, claims and disputes have proliferated in the construction industry due, largely, to unfair payment practices. Therefore, to allow swift and a cheaper method of resolving construction disputes by way of adjudication, the 'Housing Grants, Construction and Regeneration Act 1996' (HGCRA) was introduced in the UK. The Act, however, has its strengths and weaknesses. To ensure the Act is more effective in achieving its intended objective, amendments have been proposed. This Paper will present the existing HGCRA 1996 Act, along with the "new" 2009 Construction Act. The Paper, based on literature review and online questionnaire survey, will discuss the level of awareness on the new Act, the perception of the UK industry on the abolition of 'contracts in writing' rule, and the key reasons for amending the HGCRA 1996 Act. The Paper concludes that the new Act is percieved as being more effective at improving cash flow in the construction supply chain and is expected to encourage parties to resolve disputes by adjudication. However, the process of integrating the proposed changes into existing dispute resolution processes is often a complex issue.

Keywords:
adjudication, Construction Act, cash flow, dispute resolution, HGCRA 1996 Act

1 Introduction

Construction industry in the United Kingdom (UK) is an important industry which accounts for approximately 9% of national gross value added and employs around 2 million people (Chappel and Wills, 2011). However, It is generally recognised that the UK construction industry is associated with low profit, delay in payments, cash flow concerns, insolvency, and short-term relationships compared with the other industries. In particular, claims and disputes have proliferated in the construction industry due, largely, to unfair payment practices. As documented in the Egan (1998) and Latham (1994) reports, the construction industry compares badly with other industries in terms of capital cost, product quality, and client satisfaction.

Furthermore, in its report on improving public services through better construction, National Audit Office (NAO, 2005) recommended that 'unfair payment practices, such as unduly prolonged or inappropriate cash retention, undermine the principle of integrated team working and the ability and motivation of specialist suppliers to invest in innovation and capacity'. Therefore, in order to ensure prompt cash flow, improving efficiency and productivity and to allow swift resolution of disputes by way of adjudication allowing projects to be completed without wasted profit and time in litigation, the 'Housing Grants, Construction and Regeneration Act 1996' (HGCRA) was introduced in the late 1990s. The 'HGCRA 1996' is also commonly known as the 'UK Construction Act 1996'. This Act has played an important role in improving the efficiency of construction supply chains in the UK.

The paper aims to report findings of research into perceptions of the UK industry on 'the new 2009 construction Act'. The paper is based on literature review and an online questionnaire survey. This paper discus the existing 'HGCRA 1996' Act, along with 'the new 2009 Construction' Act. Further, the paper will explore the level of awareness on 'the new 2009 Construction' Act, the perception of the UK industry on the abolition of 'contracts in writing' rule, and the key reasons for amending 'the HGCRA 1996' Act.

2 The Housing Grants, Construction and Regeneration Act 1996 (HGCRA 1996)

The 'HGCRA 1996' Act came into force in 1998 to reduce confrontation, facilitate better cash flow and fair play through allowing swift resolution of disputes by way of adjudication. The 'HGCRA 1996' Act achieves this through (CIOB, 2008): (1) providing a statutory right to refer disputes to adjudication. The adjudicator's decision is binding until it is finally determined by legal proceedings or arbitration; (2) providing the right to interim, periodic or stage payments; (3) requiring that contracts should provide a mechanism to determine what payments become due and when, and a final date for payment; (4) requiring that the payer gives the payee early communication of the amount he has paid or proposes to pay; (5) providing that the payer may not withhold money from the sum due unless he has given an effective withholding notice to the payee; (6) providing that the payee may suspend performance where a sum due is not paid in full by the final date for payment; and (7) prohibiting pay when paid clauses which link payment to payments received by the payer under a separate contract.

Kennedy (2006) noted that in the UK, adjudication is now being used more extensively than anticipated. Various industry surveys indicated that poor payment practices are a major issue for many in the construction industry (CIOB, 2008). The 'HGCRA 1996' Act has generally improved cash flow and dispute resolution under commercial construction contracts, however, it is ineffective in certain key regards (DCLG, 2008). For instance, the original objectives of the 'HGCRA 1996' Act are being undermined by: exploitation of 'loop-holes' stopping the flow of money through the supply-chain; lack of clarity relating to payment resulting in adverse effects on cash flow; increased litigation; and disputes under construction contracts were threatening the viability of individual businesses and eventually would undermine the long-term health of the construction industry (DCLG, 2008). Therefore, due to some of the above inadequacies and extensive consultation with the UK construction industry and its clients, the Government has

developed proposals, which it believes will address many of the industry's concerns, particularly those of sub-contractors.

3 The new 2009 Construction Act

The main reason for amending the 'HGCRA 1996' Act was to improve the performance of the UK construction industry. The amendments (contained in Part 8 of the 2009 Act) result from concerns in the construction industry about unreasonable payment delays, and a desire to improve access to adjudication (Brampton and Hayward, 2010). The legislation including the proposed changes (The Local Democracy, Economic Development and Construction Act) received Royal Assent on 12 November 2009 and is therefore officially on the statute book (CIArB, 2010). However, it is unlikely changes to payment notice procedures and adjudication through amendments to the 'HGCRA 1996' Act will come into force in October 2011.

The new 2009 Construction Act aims to address a number of issues in the 'HGCRA 1996' Act to make the legislation more effective at improving cash flow in construction supply chains (e.g. reducing unfair payment practices such as unduly prolonged or inappropriate cash retention in the construction industry) and to encourage parties to resolve disputes by adjudication (e.g. reducing restrictions or disincentives). However, the new Act seeks to address some of the issues and grey areas raised by a decade of case law on the 'HGCRA 1996' Act. However, critiques argue that many of the 'HGCRA 1996' Act grey areas had already been addressed by the common law and therefore the new Act adds nothing new.

4 Research Methodology

The main aim of this research was to produce a valuable insight into some of the key issues and challenges do the UK industry facing with the abolition of 'contracts in writing' rule in Section 107 of the 'HGCRA 1996' Act. In order to achieve the aim of this research, a robust methodology is essential. According to Hughes and Sharrock (1997) research is defined as the process of discovering something that is not already known. It is a reasoned process done with scrupulousness, with rigour, with careful weighing of evidence and the arguments, with some methodology. According to Dainty (2007), the choice of research methodology is a crucial and difficult step in the research process. Hussey and Collis (2003) define methodology as the overall approach to the research process, from the theoretical underpinnings to the collection and analysis of the data. Therefore, research methodology in social enquiry refers to far more than the methods adopted and encompasses the rationale and philosophical assumptions that underlie a particular study. These, in turn, influence the actual research methods that are used to investigate a problem and to collect, analyse and interpret data.

Given the relatively new and unexplored nature of the research problem, quantitative research method was adopted to collect and analyse data. A web-based, an online questionnaire survey method was employed to collect data. This method of data collection have many advantages including low cost, speed, and ability to reach respondents anywhere in the country, according to Punch (2005). The sampling technique used for data collection for this survey was a convenience sample, rather than random sampling. This is because there is no comprehensive, nor any standard, database of UK organisations involved in construction dispute resolution.

Survey invitations were e-mailed to respondents requesting to submit their views via an online survey hosted at http://www.survey.bris.ac.uk/uclan/construction which was live from 06/12/10 to 08/04/11. Using this method of data collection, a total of 102 fully completed and usable questionnaires were received. Of them 71% (72 of the 102 respondents) were from Small and Medium Sized organisations (SMEs) (employee size between 1 and 250) and 29% (30 of the 102 respondents) were from large organisations that have employee size of 251 and above. The survey respondents include: arbitrators, main contractors, construction lawyers, adjudicators, claims consultants, project managers, delay experts, sub-contractors, and quantity surveyors. Saunders et al. (2003) argue that a minimum number (i.e. effective responses) for statistical analysis should be 30. Therefore, the statistical analysis of 102 responses collected in the current study is seen as reasonable and effective, especially for a survey of this kind.

5 Findings and Discussion

Analysis of online survey responses suggests the following insights.

5.1 The level of awareness on the new 2009 Construction Act

It is possible that having an awareness of 'the new 2009 Construction Act' contributes highly to the development of a successful implementation strategy. As shown in Figure 1, at the aggregate level, 88% of the survey respondents indicated that they had some awareness of the new Act.

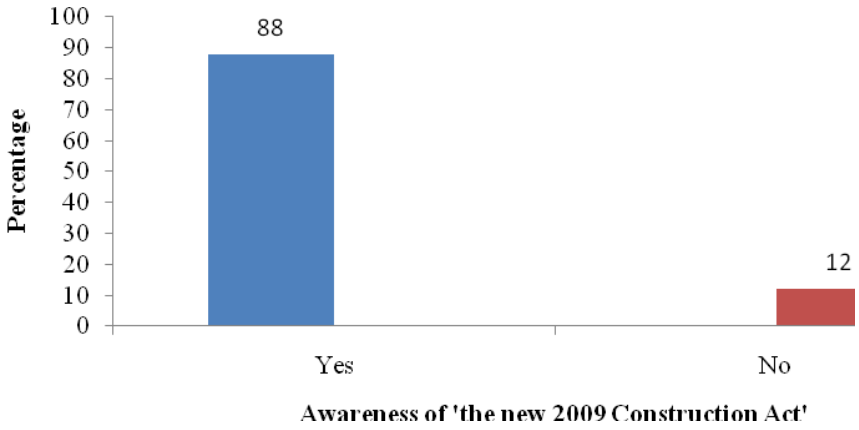

Figure 1. Awareness among respondents of 'the new 2009 construction Act'

However, 12% maintained that they had no understanding of the new Act. Indeed, the current survey results clearly show that there is a relatively high level of awareness among the UK industry regarding the new Act. This is a 'welcome progress' made by the UK industry.

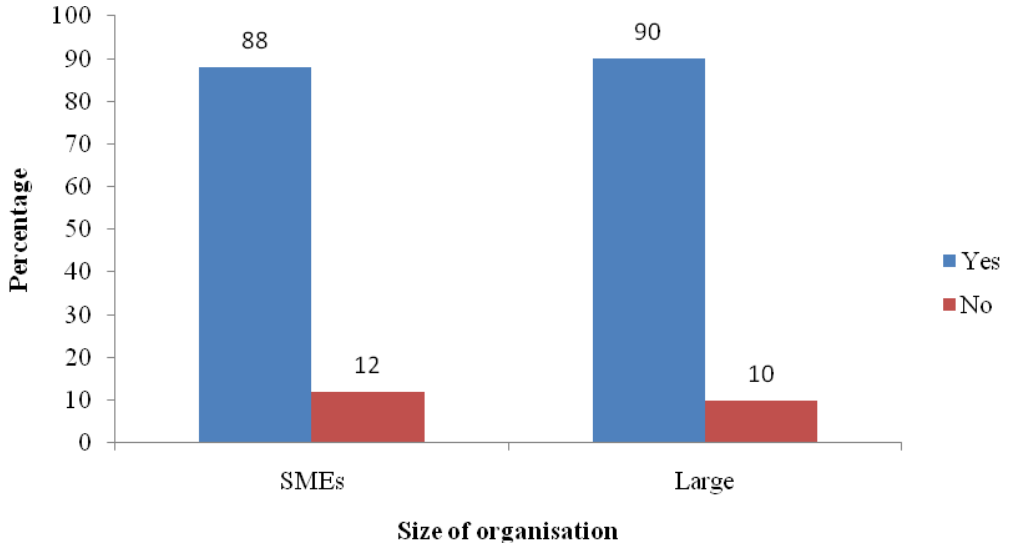

Figure 2.
Awareness of 'the new 2009 construction Act' among respondents based on organisations size

Figure 2 shows the dis-aggregated responses from SMEs and large organisations awareness of the new Act. A comparative analysis has shown that between SMEs and large organisations the differences are very minor. Furthermore, in this study, through online survey, respondents were asked to indicate the level of awareness of 'the new 2009 Construction Act' on a four-point Likert scale ranging from 'very well informed'; 'fairly well informed'; 'little informed'; and 'not at all informed'.

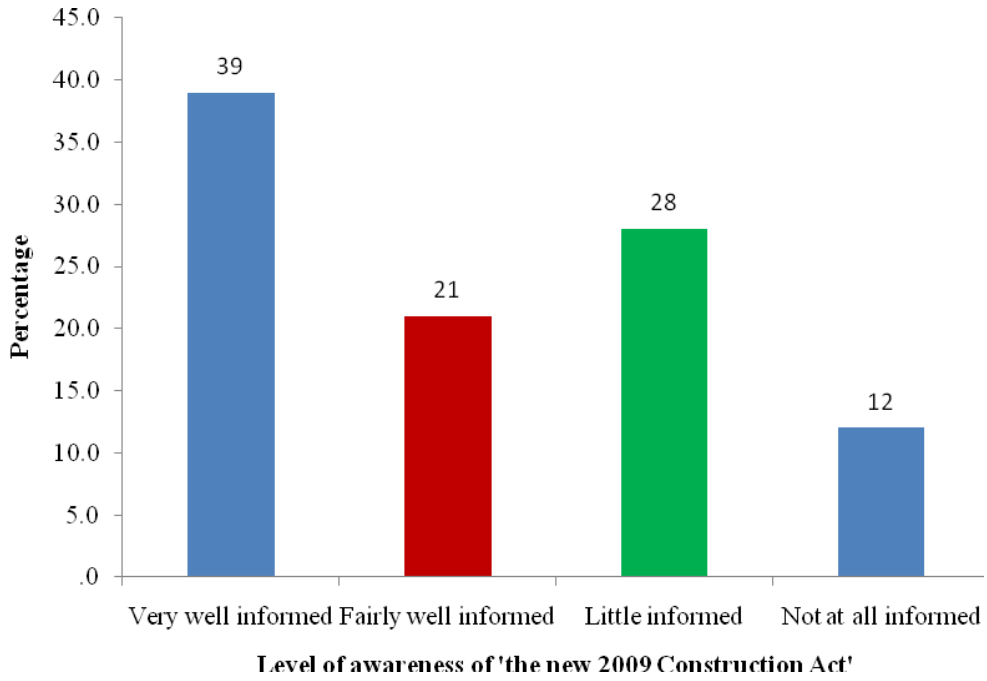

Figure 3. Level of awareness of 'the new 2009 Construction Act' among respondents

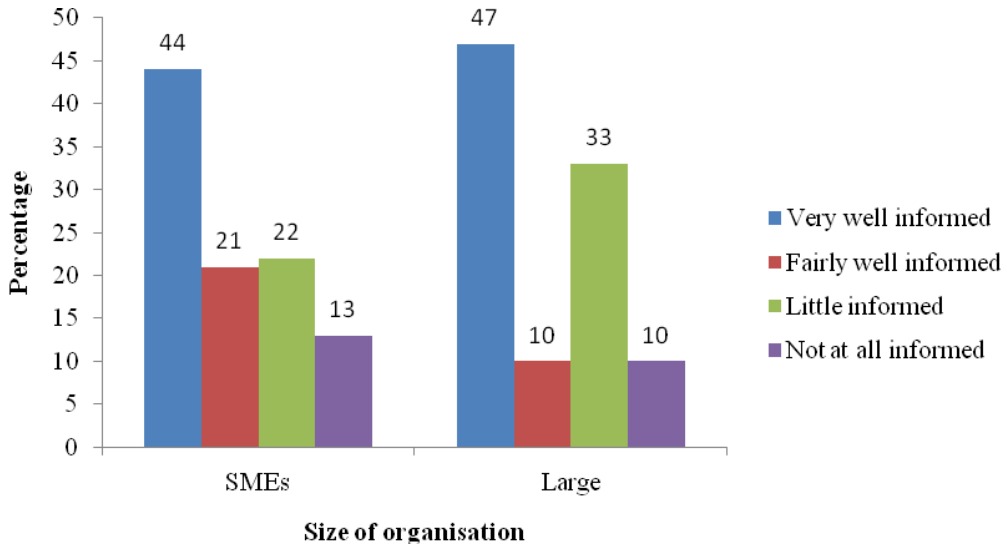

Figure 4.
Level of awareness of 'the new 2009 Construction Act' among respondents based on organisations size

As shown in Figure 3, at the aggregate level, 39% of the survey respondents indicated that they had very well informed of the new Act. However, 21% claimed that they had fairly well informed of the Act while 28% of the respondent indicated that they had little and 12% claimed that they had not at all informed. From the above results, it appears that there is well informed of the new Act among the survey respondents. However, still 40% of the survey respondents believe that they had little or not at all informed of the new Act.

Figure 4 shows the level of awareness of the new Act between the SMEs and large organisations. A comparative analysis has shown that between SMEs and large organisations, the level of awareness of the new Act varies. For instance, 35% of the respondents from SMEs and 43% from the large organisations indicated that they had little or not at all informed of the new Act. For successful implementation of the new Act, wider awareness-raising across organisations is critical. For those members who are not yet familiar with the new Act and for those companies are not yet prepared, it is strongly recommended that contractors and employers begin the process of updating their existing contract precedents and schedules of amendments to bring them in line with the new Act as soon as possible. It is also important to be familiar with the intended changes that will impact on contracts once the new Act comes into force.

It is therefore advised that an industry-wide awareness-raising programme on the 'new 2009 Construction Act' needs to be developed and deployed. Guidance and awareness-raising can combat some of the practical difficulties in implementing the new Act to an extent. However they cannot eliminate them completely. Furthermore, the existing education and training programmes need some reorientation; the syllabuses should cover aspects of reasons for amending the 'HGCRA 1996' Act, affect of the proposed changes to the 'HGCRA 1996' Act on the adjudication process, key challenges to the adjudication process with the abolition of 'contracts in writing' rule and the impact of the abolition of 'contracts in writing' rule has on the adjudication process in the UK construction industry. The challenge, therefore, is for construction law related schools and adjudication consultants to bridge the gap in the market

place. Continuing Professional Development (CPD) programmes and executive training programmes are valuable ways to raise awareness of the new Act.

5.2 The perception of the UK industry on the abolition of 'contracts in writing' rule

One of the most important proposed amendments to the 'HGCRA 1996' Act is the repeal of Section 107 of the 'HGCRA 1996' Act, which provided that only construction contracts made 'in writing' or 'at the very least evidenced in writing' could be adjudicated (CIArB, 2010). As shown in Figure 5, at the aggregate level, 84% of the survey respondents indicated that they had aware of the abolition of 'contracts in writing' rule in the new Act. However, 16% indicated that they had not aware of it. These findings suggest that the UK construction industry organisations are well aware of the abolition of 'contracts in writing' rule in the new Act.

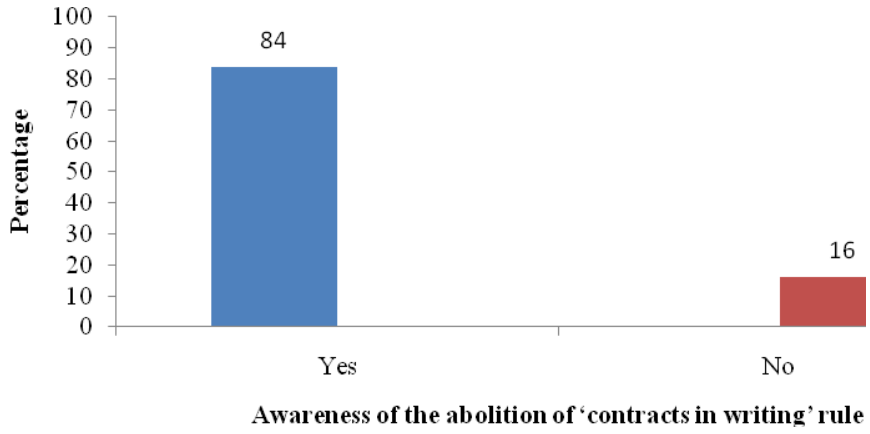

Figure 5. Awareness among respondents of the abolition of 'contracts in writing' rule in 'the new 2009 Construction Act'

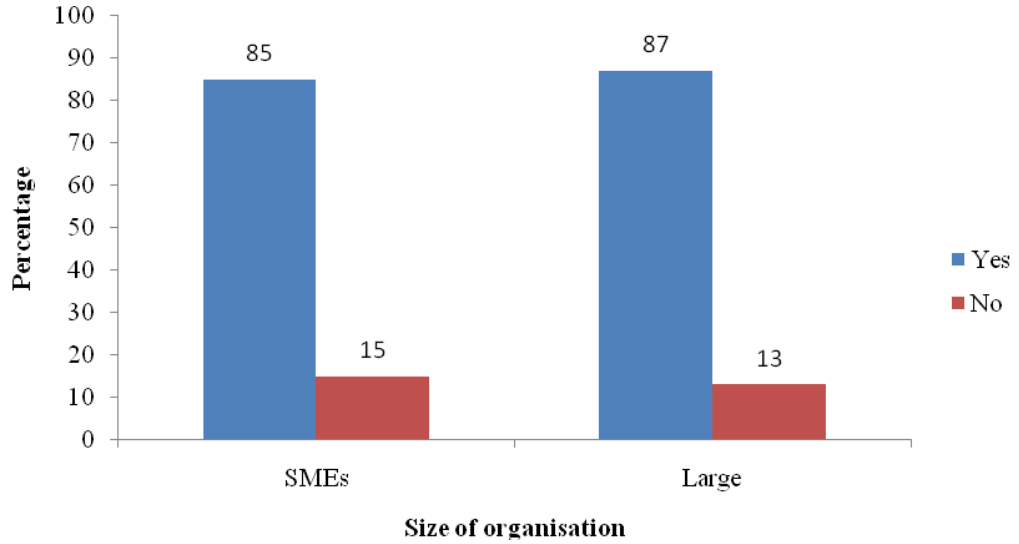

Figure 6.
Awareness among respondents of the abolition of 'contracts in writing' rule in 'the new 2009 Construction Act'

From Figure 6, it is clear that the level of awareness of the abolition of 'contracts in writing' rule in the new Act between SMEs and large organisations is less. Furthermore, in this study, respondents were asked to indicate their perception of the abolition of 'contracts in writing' rule in the new Act is good, or bad, or of little insignificance/relevance for their businesses.

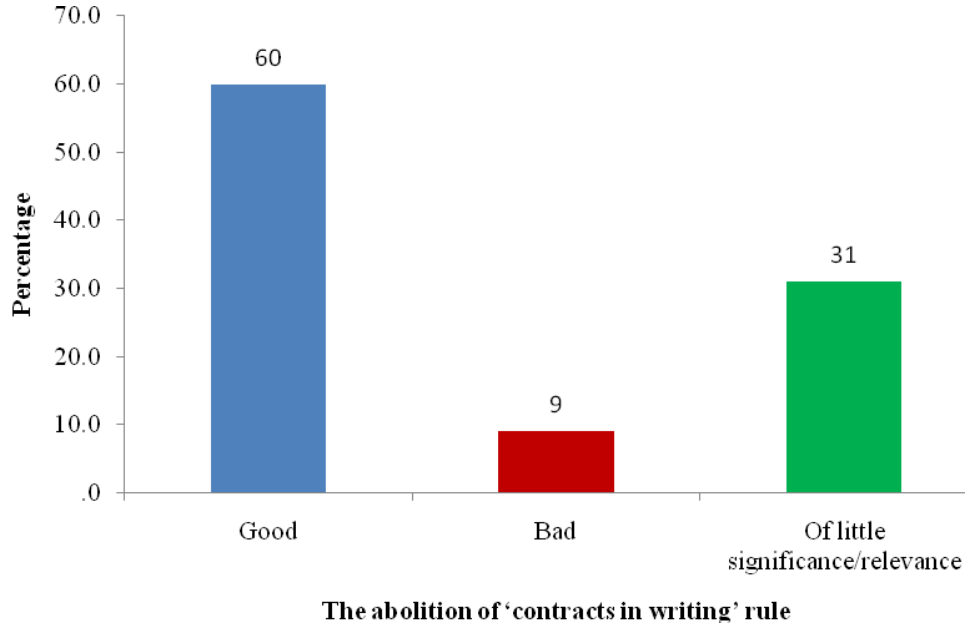

Figure 7. Perception among respondents of the abolition of 'contracts in writing' rule in 'the new 2009 Construction Act'

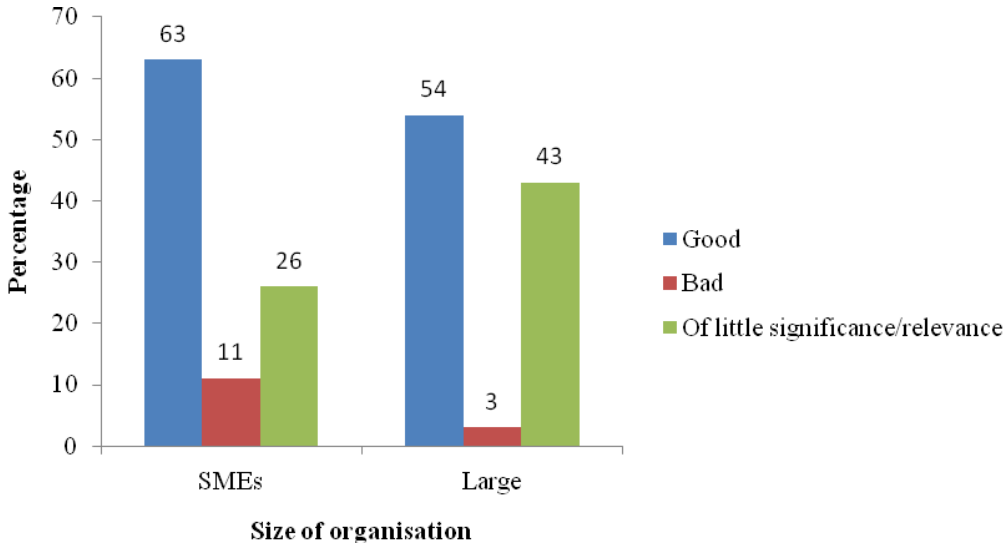

Figure 8. Perception among respondents of the abolition of 'contracts in writing' rule in 'the new 2009 Construction Act' based on organisations size

As shown in Figure 7, at the aggregate level, 60% of the survey respondents indicated that the abolition of 'contracts in writing' rule in the new Act is good for their businesses. However, 40% of respondents perceive that the abolition of 'contracts in writing' rule in the new Act is of little significance/relevance or bad to their business.

Furthermore, from Figure 8, 63% of the respondents from SMEs believe that the abolition of 'contracts in writing' rule in the new Act is good, 11% believe it bad and 26% percent believe it of little significance/relevance to their businesses. While 54% respondents from large organisations perceive that the abolition of 'contracts in writing' rule in the new Act is good, only 3% perceive it bad and 43% percent perceive it of little significance/relevance to their businesses. Form the above analysis it is clear that the perception of SMEs and large organisations of the abolition of 'contracts in writing' rule in the new Act varies.

Lal (2008) noted that, Section 107 of the HGCRA 1996 has 'wasted money, wasted adjudicator and court time' and has lead to 'jurisdictional attacks on adjudicators that have nothing to do with the merits of the referring party's case'. The requirement for construction contracts 'in writing' as a precondition for adjudication has been repealed in full from the new Act. Therefore, it is good for the industry. However, Phillpott (2009) noted that adjudicators will be faced with the difficult task of trying to sort out what the contract terms were that were agreed and will pose challenges to the Adjudicator in the assessment of witness evidence because it is likely that hearings will become more common.

5.3 Key reasons for amending the 'HGCRA 1996' Act

Various amendments have been proposed to the 'HGCRA 1996 Act' to improve the efficiency and productivity of the UK construction industry (BERR, 2008). Through the online survey, respondents were asked to indicate the level of importance they attribute

Table 1. Key reasons for amending the 'HGCRA 1996' Act

Key reasons	All respondents		SMEs		Large	
	Mean values	Rank	Mean values	Rank	Mean values	Rank
To allow swift resolution of disputes	1.55	1	1.58	2	1.50	1
To improve the enforcement of the adjudicators' decisions	1.65	4	1.63	4	1.69	4
To encourage parties to resolve disputes by adjudication	2.02	8	2.06	9	1.93	7
To make the legislation more effective at improving cash flow in construction supply chains	1.59	3	1.62	3	1.53	2
To improve the right to suspend performance under the contract	1.99	7	2.01	8	1.90	6
To abolish 'contracts in writing' rule	2.13	9	1.98	7	2.50	9
To reduce unreasonable payment delays	1.57	2	1.54	1	1.66	3
To improve access to adjudication	1.85	6	1.80	6	2.00	8
To reduce unwarranted litigation	1.81	5	1.79	5	1.86	5

to each key reason for amending the 'HGCRA 1996 Act' on a four-point Likert scale ranging from "very important (1)", "important (2)", "fairly important (3)" and "not at all important (4)". Their responses have been averaged, and are presented in Table 1.

It is apparent from Table 1 that, with a mean value of 1.55, 'to allow swift resolution of disputes' is the single most important reason for amending the 'HGCRA 1996' Act. 'To reduce unreasonable payment delays' placed second as a key reason to amend the 1996 Act. It was followed closely by 'to make the legislation more effective at improving cash flow in construction supply chains' and 'to improve the enforcement of the adjudicators' decisions'. However, to abolish 'contracts in writing' rule and to encourage parties to resolve disputes by adjudication are the least important reasons for amending the 'HGCRA 1996' Act.

It is evident from the above results that to allow swift resolution of disputes by way of adjudication allowing projects to be completed without wasted profit and time in litigation is a key reason for amending the 'HGCRA 1996' Act. According to Uff (2009) speed is an important criterion for an effective dispute resolution system. Speed ensures that the overriding objective of expediting the recovery of payment debt is not defeated. Therefore, the timescale afforded to resolve a particular dispute must be reasonable.

Further analysis of Table 1 reveals that the key reasons for amending the 'HGCRA 1996' Act varies between SMEs and large organisations. For instance, for SMEs 'to reduce unreasonable payment delays' is the key reason for amending the 'HGCRA 1996' Act while 'to encourage parties to resolve disputes by adjudication' is the least important reason. It is understandable that in an environment where the economy is volatile, large banks which are dominant sources of capital for projects would have little appetite for whole-sale-type financing. This might make it difficult for SMEs to secure funding. According to Davis (1991) for SMEs cash flow problems are a major source of insolvency. Therefore, in this study respondents from SMEs believe that amendments to the 'HGCRA 1996' Act could reduce unreasonable payment delays. Whereas for large organisations 'to allow swift resolution of disputes' is the single most important reason and 'to abolish 'contracts in writing' rule' is the least important reason for amending the 'HGCRA 1996' Act. Building and preserving long term relationship with customers and suppliers is of paramount importance, according to Latham (1994). Prompt and fair payment practice throughout construction supply chains to better enable the industry to adopt integrated working culture. Therefore, amendments to the 'HGCRA 1996' Act is sensible. However, it is difficult to justify the costs and uncertainty that will come with the changes. Costs can mean legal/expert costs as well as adjudicator's fees.

6 Conclusion and Further Research

The proposed 'new 2009 Construction Act' aims to address a number of issues in the 'HGCRA 1996' Act to make the legislation more effective at reducing unfair payment practices such as unduly prolonged or inappropriate cash retention in the construction industry and encouraging parties to resolve disputes by adjudication. If the new Act comes into force, there will be significant impact on the adjudication and payment method in the UK construction industry.

The paper is based on literature review and quantitative data obtained from 102 completed online survey questionnaires. This paper has explored the existing 'HGCRA 1996' Act, 'the new 2009 Construction Act' as well as the level of awareness of 'the new 2009 Construction Act'. Further the paper explored the perception of the UK industry on the abolition of 'contracts in writing' rule and the key reasons for amending the 'HGCRA 1996' Act. The study reveals that that there is relatively high level of awareness among the UK industry of the new Act and it appears that

the industry is well informed about the new Act. Difference in the level of awareness of the new Act between SMEs and large organisations is minor. This is a 'welcome progress' made by the UK industry. However, it is going to be very challenging for the industry to understand amendments to the 'HGCRA 1996' Act. Furthermore, the study results suggest that the UK Construction industry is well aware of the abolition of 'contracts in writing' rule in the new Act and the industry perception is that is good for their businesses. Difference in the level of awareness of the abolition of 'contracts in writing' rule in the new Act between SMEs and large organisations varies. As revealed by this study, the three key reasons for amending the 'HGCRA 1996' Act include: to allow swift resolution of disputes, to reduce unreasonable payment delays and to make the legislation more effective at improving cash flow in construction supply chains. The key reasons for amending the 'HGCRA 1996' Act varies between SMEs and large organisations.

The paper concludes that the new Act will be more effective at improving cash flow in construction supply chains and to encourage parties to resolve disputes by adjudication. However, the process of integrating the proposed changes into existing dispute resolution processes is often a complex issue. The construction industry employers, main contractors, sub-contractors and their respective advisers will need to adopt and become accustomed to quite significant changes on the adjudication and payment practices. It is therefore advised that an industry-wide awareness-raising programme on the new Act needs to be developed and deployed. Furthermore, the existing education and training programmes need some reorientation. Given that the research reported in this paper is based on small sample, hence, the results presented here are only tentative. Therefore, it is advocated that additional research should explore the complex issues associated with amendments to the 'HGCRA 1996' Act. The nuances, which should focus on capturing the critical tensions and the impact on the adjudication process in the UK construction industry.

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Investigating the Relationship between Construction Contract Documentation Incompleteness and Project Transaction Characteristics: The Frequency Characteristic

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Abstract:
The results presented in this paper have been produced as part of an ongoing study to model the impacts of construction documentation incompleteness on claims management. The research project examines both the antecedents (primitive project characteristics of interorganizational relationship (IOR) governance mechanisms, i.e. Uncertainty, Asset Specificity, and Frequency of trade between parties) and consequences (Claims Management, in this case) of governance structure. There is a need to understand governance structure antecedents and consequences to better assist modern project management. This paper reports on development of measures of: the Frequency antecedent and its impacts on the corresponding IOR governance mechanisms developed to manage projects.

Due to the sensitive nature of the information required for this research, data collection has been a primary concern throughout. Also, given the dynamism and practical concerns (confidentiality, ease of collection or provision, cost, time, etc.) of the research process, careful consideration has been given to acquiring an appropriate data set which would permit rigorous testing and analysis to address the research questions. Throughout, the aim has been to maximize response rates and quality of data obtained. Therefore, an effort is also made to outline the considerations behind development of clear and precise questions to elicit data and information about the Frequency antecedent and its impacts that was readily available to the respondents (a professional body of construction lawyers).

Keywords:
frequency, measurement, construction interorganizational relationship governance mechanisms

1 Introduction

Research examining the way in which construction contract design and structure shape interorganizational dispute resolution processes is currently underway. Ultimately, the research aim is to understand how reliance on contractual governance will impact dispute resolution processes and outcomes. Overall, the research explores how the degree of construction documentation incompleteness influences interorganizational behaviours after conflict has arisen (i.e. when a primary objective of interorganizational relationship (IOR) governance fails) and

when and how contracts will be effective in reducing destructive interorganizational conflict. Relevant to this endeavour is an examination of antecedents of UK construction industry IOR governance structures and their outcomes, in order to control for various attributes of the IOR and of the resulting conflict and disputes. Therefore a useful place to start when evaluating the efficacy of contractual governance in resolving disputes would be to develop a thorough understanding of the influence of the antecedents on governance design. This article aims to refocus the study on these antecedents and resulting governance structures with a particular focus on how a prior relationship based on the Frequency of trade between contracting parties affects the resulting contractual governance structure; while raising questions about implications for research design. A professional body of lawyers has been consulted to provide the necessary data in the form of responses to survey questions. With this understanding, suitable practical data acquisition strategies have been devised.

2 Literature Review

Reviewing the extant literature on design of IOR governance structures, we see that there is a wide variety of mixed forms of contracts, in between the two hierarchical and market governance extremes. Winch (2010), building on Macneil's (1974) groundbreaking contribution to the theory of contracting, explains that governance has two distinct aspects: the contractual (capturing the legal basis of the relationship), and the relational (which captures interpersonal and interorganizational aspects). Contractual and relational governance are not mutually exclusive and theorists (Poppo and Zenger, 2002; Gulati and Nickerson, 2008) have argued that parties should, ideally, rely on both mechanisms to manage relationships. However, more often than not, there is evidence of relational considerations in the written documentation that embodies the legal basis of the relationships. For this reason, our research depends on the evidence presented by the written documentation to detect both contractual and relational considerations.

From the literature, we also see that contract documentation packages vary in their intent and detail (Macauley, 1996). The process by which construction industry firms choose from among the variety of governance designs available to them has been the object of numerous studies in strategy and organizational theory (Williamson, 1985; Pisano et al., 1988; Gulati, 1995; Winch, 2010). Lumineaux and Malhotra (2011) provide a good summary of how IOR antecedents influence governance structures. They explain that firms rely on a variety of governance mechanisms to mitigate risks of opportunistic behaviour and promote cooperation. Therefore, some documentation packages contain large numbers of provisions, while others seek to codify as little as possible. Others focus heavily on the need to mitigate the risk of opportunism and include many provisions, the aim of which, are to control parties' behaviours (Williamson, 1985). Additionally, contracts may focus on ensuring that parties have a shared understanding of the relationship so that they can optimally coordinate their efforts (Salbu, 1997; Mellewigt et al., 2007). Also, the research recognizes that contracts are inevitably incomplete (Grossman and Hart, 1996; Williamson, 1996). Some are incomplete due to bounded rationality (BR) (parties not knowing precise conditions under which contracts will be executed (Winch, 2010) – making it impossible to delineate all potential future contingencies (Simon, 1961; Malhotra and Murnighan, 2002). Others may be incomplete by design: some parties will choose to limit their reliance on contractual governance even when greater contractual detail is possible. (Lumineaux and Malhotra (2011) outlined three reasons why parties may choose to limit their reliance on

contractual governance. First, parties may want to minimize contract development, monitoring, and enforcement costs (Williamson, 1985). Secondly, parties may wish to allow for greater strategic flexibility, recognizing that additional information regarding each party's needs, interests, and capacities will be uncovered over time (Bernheim and Whinston, 1998; Malhotra, 2009). Third, parties may wish to encourage development of mutual trust and cooperative norms which can be 'crowded out' when too much emphasis is placed on contractual governance (Sitkin and Roth, 1993; Tenbrunsel and Mesick, 1999; Malhotra and Murnigan, 2002).

There is broad coverage of the antecedents' influences, however, the literature has not devoted attention to analysis of the material presented to provide practical guidance for designing instruments for eliciting the necessary information to achieve general research objectives. Therefore, we propose a framework for instrument design for our research endeavours. We draw inspiration from Furlotti (2007) to devise a systematic approach for reviewing the literature to identify recurring themes for antecedent impacts to guide instrument design and content, and operationalize our constructs for acquiring the data to populate our overall research model.

Our overall model incorporates Oliver Williamson's (1975, 1985) model of transaction costs and governance structures, as Winch (2010) has applied it to IORs in the construction industry. Winch (2010) explains Williamson's (1975, 1985) arguments that the most efficient relationship governance mode for interorganizational transactions is determined by three main transaction characteristics: Uncertainty, Asset Specificity, and Frequency. Uncertainty, affects IORs because it creates BR for decision-makers. BR makes writing complete and unambiguous contract documentation impossible because of uncertainty about precise conditions under which contracts will be executed, and makes it impossible to fully measure contract performance. Asset Specificity describes the degree to which investments are specialized to a particular transaction and results when either the buyer or the supplier is limited in their choice of transaction partner because of the specific nature of the resources to be supplied. Asset Specificity may exist pre-contract (*ex ante*) (market monopoly or monopsony), or may be generated post-contract (*ex post*) because of specific investments made by either party. This generates the possibility of opportunism, where one party tries to exploit the other's disadvantage – often by withholding information from the other party. Through threats to terminate the relationship, opportunistic partners can seek to re-negotiate the transaction terms to their advantage. Frequency affects transaction governance because one-off transactions provide no opportunity to learn about the other party, while repeated transactions allow learning and in some cases, trust generation (Munns, 1995; Munns, 1996; Mellewigt et al., 2007; Winch, 2010). Thus, the most efficient governance mode can be thought to occupy a three-dimensional space (*See Figure 1a*) and therefore, in our model, the IOR governance design, embodied in the contract documentation package can be represented as being directly influenced by these primitive interorganizational transaction characteristics (inter-firm governance antecedents) (*See Figure 1b*).

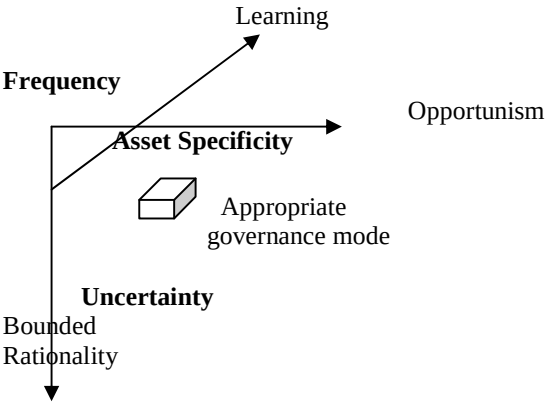

Figure 1a The Governance Level (Source: Winch 2010, Fig. III.1)

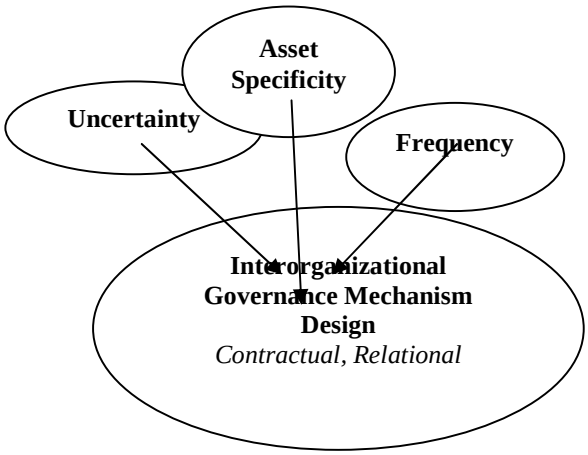

Figure 1b The Inter-firm Relationship Governance Design

2.1 A Note on the Frequency Characteristic

The economics literature on Uncertainty and Asset Specificity impacts on contractual governance design is extensive and comprehensive (Klein, 2006). Conversely, testing of the Frequency antecedent to indicate how past transactions affect inter-firm relationship governance is rather scarce (Klein, 2006; Furlotti, 2007). Klein (2006) explains that Frequency appears in three distinct, and seemingly incompatible, forms: a) Frequency of Trade Between Specific Trading Partners; b) Frequency of Trade Among Many Trading Partners; and c) Frequency of Disturbances in the Environment. This research explores the first form – Frequency of Trade Between Specific Trading Partners. This is the repeated-game notion of Frequency (Klein, 2006), as described by Williamson (1985, p. 62) and Baker et al. (2002) and hereinafter, will be referred to simply as Frequency.

The relative rarity of encountering empirical evidence of Frequency impacts on governance design, has prompted some theorists (Casciaro, 2003) to argue that the research agenda seems to be less concerned with the Frequency contribution of trust, learning, and evolution to IOR relationship governance. However, anecdotal information provided by a prominent economic theory academic suggests that this lack of treatment and exclusion from analyses may actually be due to the fact that theory of contract researchers are still unsure of the exact way in which Frequency influences IORCG design. Review of this status of understanding of the Frequency contribution provides the impetus for this research direction on this particular occasion. Moreover, we are unaware of any comprehensive reviews of the state of understanding of Frequency impacts from evidence generated through study of Frequency impacts on construction industry project transactions. This allows us to uncover considerable, but unevenly distributed evidence of Frequency impacts on a number of overlapping contractual dimensions (measurable contractual attributes that are separate and distinct from individual contract terms) as described by different fields of IORCG theory. It also enables description of contracts in a larger number of dimensions than is commonly appreciated. Consequently, we believe that our decision to restrict our focus here to the Frequency antecedent makes an important contribution.

3 Research Methodology

The research methodology entails a literature review of empirical studies of formal contract design in IORs. Due to the complex nature of construction contracts (resulting from Asset Specificity in all but the simplest projects) systematic analysis of their dimensions is necessary for thorough understanding of Frequency impacts. This analysis draws inspiration from and extends the contribution to the legal and economic theories of contract made by Furlotti (2007), who proposed a general and tentative framework for relational contract design by summarizing empirical evidence on contracts. The review considers evidence presented in the Organizational Theory, ICT, TCE, Agency Theory, and Strategic Management literatures on interorganizational relationships (IORs). Through this summarizing process, Furlotti (2007) explained how contracts operate in practice. This was achieved by highlighting the multi-dimensional character of contractual incompleteness while emphasizing extra-contractual governance devices that complement formalized contract documentation.

Therefore, the considerable thrust imparted by Furlotti (2007) to our analysis is in the form of a systematic methodology for assessing impacts of Frequency on the structure and content of formalized contract documentation, as well as on some associated extracontractual governance devices presented in the evidence from the empirical studies reviewed. Our methodology and sampling criteria is similar to that deployed by Furlotti (2007) in that we focus our search, on articles written in the last decade, only making exceptions when we feel that particular contractual design processes are underrepresented in recent literature. Also similar to Furlotti (2007), our review focus will only be on empirical studies of formal contract design in IORs; i.e. studies based on observation of real-world contracting, either by means of documentation analysis, or by case studies, interviews, or questionnaire survey. Rather than reviewing studies that take contract terms for granted, we focus on studies wherein the parties are responsible for designing their own agreements. We review only those studies that have been cited more than 3 times in high-impact journals by recognized theorists on the subject. By reviewing only empirical studies of IORs, we do not review tests or exploratory investigations of contracting theories based on experimental approaches, nor does our review cover other fields such as employment contracts. Also, by selecting only studies published in high-impact journals, we ensure that our review subjects are topical and influence the current thinking on Frequency. Although achieving comprehensiveness is not our preoccupation at this stage, we trust that not many important articles strictly fulfilling the above-stated criteria have escaped our search.

Our review isolates specific Frequency impacts on some identified IOR contractual governance (IORCG) dimensions, in turn, and discusses the associated implications for research instrument design and survey instrument content. We build on Furlotti's (2007) work by reviewing literature excluded from Furlotti's (2007) analysis – mainly due to non-existence at the time of his review. In presenting our review of Frequency impacts, we are guided by Furlotti's (2007) explanation of contractual dimensions and his approach to assessing how the dimensions are sensitive to the primitive project characteristics (antecedents).

4 Findings and Discussion

Interestingly, the few studies that have investigated this Frequency form have been largely drawn from technological industries (IT, high technology, and biotechnology R&D). A summary of the results from our review are presented in Table 1 (*in the Appendix*).

4.1 Theoretical Perspectives on IOR Contractual Governance Design

This review uncovered a number of accounts of the processes encompassed by relational contracts and their associated theoretical perspectives on IOR governance design, namely: Strategic Management, Organizational Theory (OT), Incomplete Contract Theory (ICT, and Agency Theory. Review of these theories should prove instructive, fostering better appreciation for our rationale for contractual design evidence categorization and systematic analysis.

4.1.1 Theoretical Perspectives of Frequency Impacts supported by Empirical Evidence

Our review also, indirectly exposes the genealogy of this understanding of Frequency impacts and the theoretical perspectives that underpin them. (*See Table 1*). The main empirical evidence contributions that fit our criteria described above for explaining how contracting parties' working history influences IORCG design is provided by scholars who examine: the way in which firms learn to develop governance arrangements (Mayer and Argyres, 2004); the effects of prior alliance experiences with the same partner, or with any partner, on the management of the collaboration (Hoang and Rothaermel, 2005); impacts of prior experiences on the choice of strategic alliance type (Gulati, 1995), on contract changes (Argyres et al., 2007; Mayer and Argyres, 2004; and Reuer et al., 2002) and on alliance structure and outcomes (Sampson, 2005; Zollo et al.; 2002). Mellewigt et al. (2007); Vanneste and Puranam (2010); and Dekker and Van den Abbeele (2010) also provide other compelling post-Furlotti (2007) evidence of ways in which firms learn and acquire knowledge to inform governance choices.

Dekker and Van den Abbeele (2010) adopt a Strategic Management perspective on IORCG design and noted the seemingly paradoxical nature of Frequency impacts. Some scholars (Gulati, 1995; Gulati and Nickerson, 2008; Zollo et al., 2002) report that firms with prior ties use less extensive governance structures for new exchanges, compared to firms without joint histories. This is attributed to familiarity and trust generated during prior interactions that reduce the need for control. Conversely, others (Ryall and Sampson, 2009; Argyres et al. 2007; Mayer and Argyes, 2004; Poppo and Zenger, 2002) have observed that interactions over time with an exchange partner and increasing relational governance entail important learning effects that facilitate (cost-efficient) development of control structures. The most recent Frequency evidence suggests that by facilitating both trust development and learning, partner experience thus can have opposite offsetting effects on IORCG design.

We were guided in our measurement of Frequency by Vanneste and Puranam (2010), who noted that obtaining the precise number of prior interactions in survey-based studies is difficult. We, therefore, relied on respondents' estimates of the number of times they interacted with their co-disputant in the past on a six-point scale ranging from 'never' to 'many times'. The response to this item is corroborated with another survey item designed to capture estimates of the volume of business in prior transactions with the co-disputant.

4.1.2 Strategic Management Theory view of Contracts

Mellewigt et al. (2007) highlight the two prominent theoretical perspectives recurring in the recent Strategic Management literature on IORs, namely: TCE, and the Resource-Based (RB) view. TCE and RB perspectives primarily assign a control and coordination function, respectively, to contract design, and therefore, it is important to recognize the dual function of contracts bestowed by Strategic Management theory. TCE is motivated by efficiency considerations and mitigation against opportunism and (mis)appropriation of value by counterparties. The general consensus is that transaction characteristics translate into exchange hazards, which might be managed by drawing more complex contracts (Williamson, 1975, Nooteboom et al., 1997). If firms make specific investments, they put themselves at risk of value appropriation by potentially opportunistic counterparties (Klein et al., 1978) since the specific asset is of little use outside of the relationship. Essentially, contracts incorporate safeguards to control against opportunism risks that may result from transaction hazards, such as Asset Specificity. This is manifested through more contractual details and stipulations. Formal contractual provisions protect against self-interested counterparty behaviour and function as controlling devices.

Methods to measure usage of Outcome and Behaviour Control mechanisms can be based on those used by Dekker and Van den Abbeele (2010) who followed precedents set by Jaworski and McInnis (1989) and de Mortanges and Vossen (1999). Outcome Control functions without interference in suppliers' processes and is measured by five items about the extent to which the buyer, during transaction management, engaged in target-setting, evaluation and rewarding of outcomes, and provision of feedback to the supplier. Behaviour Control is measured by six items about the procedures specified and used to achieve certain goals, not necessarily focusing on the extent to which the buyer monitored the supplier's use of procedures, required reports, provided feedback, and shared in costs if guidelines were followed.

From the RB perspective, an IOR enables two organizations, to attain some mutually beneficial outcome through sharing and combining resources in a manner that they could not attain on their own (Madhok and Tallman, 1998). Here, the challenge is organizing value creation processes by coordinating respective resources across organizational boundaries and contracts serve as coordinating devices. For instance, contracts clarify mutual expectations, enable goal congruence, and establish bases for shared common ground (Das and Teng, 1998). More specifically, delineation of roles, rules, programs, and procedures enables coordination of interfaces that are often necessary for joint endeavours to successfully accomplish collective goals (Mayer and Argyres, 2004). There is a change between perspectives - from value appropriation under TCE, to value creation under RB. Whereas contractual control mechanisms tend to mitigate relational risks, coordination mechanisms tend to address performance risks (the probability and consequences that alliance objectives are not achieved, despite a satisfactory cooperation among partner firms (Das and Teng, 1996)). IOR performance risks and their associated coordination requirements vary systematically, with the extent and importance of the shared resources (Borys and Jemison, 1989; Kumar and Seth, 1998), because execution of activities involving more strategically important resources and services directly influences other organizational services and resources as well as the partnership's collective goals. Contracts incorporate various types of coordination mechanisms to handle heightened concerns of strategic importance in IORs. Contract clauses can precisely enumerate the tasks to be accomplished,

define procedures to be used and lay out quality standards to be fulfilled. Alternatively, contracts can specify the decision rights in IORs and may structure communication flows in a decisive way. With construction projects becoming increasingly valuable and complex endeavours that entail greater interdependence, the coordinating role is correspondingly, becoming increasingly important to the IORs formed. This has important implications for design of contractual governance structures for the effective management of IORs.

According to Lumineaux and Malhotra (2011) the first two terms of Parkhe's (1993) eight-term index developed for evaluating formal contract provisions relate to Coordination between contracting parties, and may be used as a proxy for the degree to which the parties focus on coordinating their expectations and behaviours. (Interested readers should consult Parkhe (1993) and Lumineaux and Malhotra (2011) for the complete list.) Coordination focus is, therefore, measured as the ratio of coordination-related clauses included in contracts, i.e. clause categories about i) Periodic written reports of all relevant transactions and/or ii) Prompt written notice of any departures from the agreement, to the total number of provisions in the contract. By controlling for the total number of clauses, the ratio measure mitigates concerns that coordination provisions were included incidentally (due to institutional factors that promote greater contractual detail), rather than deal with coordination issues. Moreover, by assessing the percentage of the contract devoted to coordination, the measure captures the extent to which the contracting process is motivated by a focus on coordination.

4.1.3 Organizational Theory View of Contracts

Furlotti (2007) provides a good explanation of the Organizational Theory perspective on IORCG choice. In developing Stinchcombe's (1985) hypothesis that contracts are an organizational phenomenon, Furlotti (2007) identified a number of IORCG processes and dimensions and reviewed regularities uncovered. He set out from the observation that contracts (usually regarded as market transactions) were observed in some situations when TCE would expect integrated structures (in-house procurement routes). For those situations, his central premise was that contracts perform the same functions as integrated structures. Here, contracts incorporated similar mechanisms more frequently observed in organizations, such as: norms, rules, negotiation, voting, authority, etc. In turn, as these mechanisms are of a different type, and perform different functions, they need not correlate with a single contractual dimension (e.g Completeness). Thus, contracts act like complex organizations. IORCG involves coordination and procedural aspects well-known to the organizational literature and Furlotti (2007) saw it necessary to study project antecedents under which procedural coordination becomes a significant component of IORCG.

Now, the genealogy of the legal and economic theories of contracting also sheds light on the rationale for IORCG choice and, in turn, the rationale for this research methodology. (Interested readers may refer to Walker and Pryke (2009) for a more detailed treatment of the evolution and expansion of the economic theory of contracts and methodological shift for incomplete contract (IC) analysis resulting from the failures of general equilibrium theory.) To summarize, the original contracting theory models were created for equilibrium studies and therefore, did not demonstrate how contracts worked in practice. Later there were calls from both economists and legal theorists to demonstrate, rather than assume, how contracts work in practice (Saussier, 2000). Furlotti (2007) observed that early economic theory's reliance on a highly unrealistic

depiction of real-world contracting resulted in disregard of the temporal dimension of contracts and the multidimensionality of incompleteness as a measure of contractual heterogeneity. This is why Furlotti (2007) deemed it important to demonstrate how contracts can perform similar functions to integrated structures using evidence from real-world contracts. By this, he was able to observe the general structure of contracts and the heterogeneity of IORCG design. He found that contracts span over non-negligible time periods and that incompleteness is conceptualized and operationalized (developed internally by an economic model) in different ways.

Due to the assumption that courts work in 'informed, sophisticated and low cost ways' (Williamson, 1983), under the traditional notion, contracts were not conceptualized as spanning over non-negligible time periods, with a potential need for adjustment. Because court adjudication is considered to be costly and imperfect, contracting parties try to shift the locus of decision-making and adjustment from the courts to the transactors. This is why contracts contain enforcement mechanisms. These enforcement features are also captured by the relational contracting concept which emphasizes the extra-contractual governance means complementary to those that have been specified by the formalized contract.

We used Furlotti's (2007) observed general contractual content, heterogeneity, and sensitivity analysis of the antecedents influences to guide our review of the literature on the Frequency impacts from an OT perspective. We will present Furlotti's (2007) propositions about contractual content and heterogeneity, in the next section and highlight the Frequency impacts identified.

Furlotti (2007) proposed that contracts consist of *transactional* and *procedural* elements. Parties use *transactional* elements to commit to undertaking specific performance in exchange for reciprocal undertakings of the counterparty. Therefore, the transactional part contains: commitments on tasks, resources, outputs and remuneration provisions. Remuneration provisions are regarded as a substantive aspect of contracts (the core, in effect) because through these, many goals, such as: sharing the quasi-rent (the difference between the value in use in which the investments are committed and the next best use (Klein et al., 1978)) of the collaboration, provision of incentives for adoption of efficient behaviour, risk allocation, and promotion of efficient adaptation and balance of different types of hazards are pursued. Where price adjustments are carried out during the life of the contract, the process is rarely formulaic, due to the zero-sum nature of such adjustments. Therefore, essentially, actual remuneration, rather than the provisions are subject to adaptation. Furlotti (2007) found support for the idea that Behavioural and Task Uncertainty affect flexibility in remuneration specification. Corresponding flexibility in specification of task obligations is required. Within the *procedural* elements Furlotti (2007) classified the rights and processes intended to serve purposes of: dynamic adaptation, integration, and preservation of a shared understanding. There is: *decision-making*, to discover the actions parties must undertake to produce or adjust the quasi-rent; *restraints* (rules) – to prescribe specific behaviour and ensure relationship predictability; rights underpinning *enforcement* of promises through payoff manipulation; and *monitoring*, which is instrumental to decision-making and enforcement. Goal statements and term definitions, which delineate the meaning shared by the parties, may also be included here.

4.1.4 Decision-Making

The requirement for decision-making is another consequence of non-negligible contract duration. Decision-making is also required because contract subjects may be so uncertain that performance

requirements cannot be defined *ex ante*, and substantial *ex post* planning mechanisms must be established. Furlotti (2007) observed various patterns of allocation of decision rights, namely: to either party unilaterally; to both parties, jointly or separately; and, also, to third parties (as is the case for construction projects). There were other observations of antecedents' influence on decision-making and its allocation. Joint decision-making for contractual adjustment usually results with greater contract rigidities, higher task uncertainty, and lower history of parties' past litigation. Contractual assignment of unilateral decision rights is more generous the less consequential those decisions for the party subject to them are. Parties to whom enough control rights are assigned can exercise actual control, regardless of asset ownership. Actual allocation of control is influenced by parties' respective bargaining power at the time of entering the agreement and fewer rights are assigned to the party with a conflict of interest. Finally, the assessment of decision rights to one party seems to be complementary with the simultaneous assignment of means of enforcement to that party. Furlotti (2007) did not comment on the sensitivity of decision-making elements to Frequency, and our analysis did not seek to measure decision-making elements nor detect such Frequency impacts in the literature reviewed.

Enforcement

As mentioned previously, contractual Enforcement mechanisms (self-help) serve to reduce reliance on enforcement by court adjudication. Furlotti (2007) concluded the following: i) the probability of non-performance can be reduced through greater contractual formalization; ii) where formalization is not feasible, assignment of certain decision rights or hostages (such as construction performance bonds) may be used to deter non-performance; iii) as dependence of one party upon another increases, so does the intensity of either form of enforcement. Second-party termination rights are another type of Enforcement mechanism proposed by Klein and Leffler (1981), who argued that the existence of a flow of quasi-rent, coupled with the threat of termination, is sufficient to assure performance if the parties perform repeat transactions. This can be regarded as a forward-looking ('Shadow of the Future') perspective of Frequency.

Lumineau and Malhotra (2011) explained how deadlined vs open-ended contracts might also be expected to affect IORCG choice. They stated that parties with short-term contracts may envision a short Shadow of the Future and may choose to rely more extensively on contractual provisions (Poppo et al., 2008). In our review, Shadow of the Future (expected future interactions) was measured by taking note of special arrangements that increase the likelihood of cooperation and reciprocity in future interactions. According to Vanneste and Puranam (2010), expected future interactions may lead to less reliance on contractual detail for ensuring cooperation (Axelrod, 2006; Heide and Miner, 1992), however, longer futures may make it worth investing more heavily in additional safeguards (Williamson, 1985). Thus we noted that the literature had not yet decided on the aggregate effect of expected future interactions. Three items were used to measure Shadow of the Future. One item asked: 'To what extent future actions were expected at the time of contract execution?' The extreme categories of the five-point answer scale were: 'not likely' and 'very likely'. The aim of the second item was to detect the existence of special arrangements such as Framework agreements. The third item asked whether the contract in question specified a pre-defined length of time or whether it described an open-ended relationship (Reuer and Ariño, 2007).

Rules and Restraints

Furlotti (2007) cites Klein and Murphy (1988) who refer to restraints as 'a series of practices that are commonly referred to as such'. He also cites Lafontaine and Slade (2005) generic definition as 'any restriction that is imposed by one member (…) on the other member of the relationship.' In relational contracts, the prescription of specific behaviour through rules increases with the level of externalities. Overall, the role of rules in contractual governance has been the focus of very little investigation. Yet, the evidence available indicates their use in contracts is influenced by contextual factors that deserve further analysis. Therefore, this research did not seek to detect Frequency impacts on the Rules and Restraints found in the construction IOR contracts reviewed.

Monitoring

Furlotti (2007) is of the view that Monitoring may be considered as an integral part of the enforcement apparatus. Agency Theory (the branch of financial economics that looks at conflicts of interest between people with different interests in the same assets), views Monitoring as a cure to conflicts of interests. However, Monitoring may be useful to prevent non-performance that is simply accidental or caused by insufficient skills. Thus, there are numerous reasons to analyze it as a process not entirely explained by the same factors as Enforcement. In sum, several of the authors reviewed see a role for Monitoring in contracting. Empirical evidence confirms that Monitoring is a relevant process addressed by relational contracts. Furlotti (2007) felt that the little evidence supported hypotheses based on Agency Theory and ICT. Nevertheless, the findings suggest that enhanced supervision and monitoring by principals are required when financial adversities render mistakes more costly and when short track records make it more difficult to assess counterparties' revenues at the time of financing of venture capital contracts (Arruñada et al., 2001). Ryall and Sampson (2006) also provided further empirical evidence that Frequency (in the form of prior deal experience) positively and significantly affects the level of Monitoring. In this light, we depended on Ryall and Sampson (2009) for our measure of the extent of Monitoring provided for in the contracts under review. The categories of the seven-point answer scale, increasing in the extent of Monitoring provided for were: i) Project reviews 'required' (including documentation development and construction progress) ii) reviews of the completed works (including documentation development and site work) only required iii) discretionary reviews of production information are to be permitted iv) Timing of reviews specified v) Content of reviews specified vi) Physical Audits of completed work required v) the principal may reject the end products of the contractor if they materially fail to meet requirements.

4.1.5 Contract Duration and the Multidimensionality of Contractual Completeness

Furlotti (2007) organized the contract dimensions, according to: Duration, Complexity, Contingency Planning, and Specificity.

Duration

Economists and business scholars observed that the heterogeneity of contracts could be measured in terms of Duration. Therefore, it is a dimension on which antecedents' canonical TCE dimensions of transactions effects should be tested. Duration is recognized as a fundamental design variable for IORCG under conditions of transaction-specific investment, and has been investigated empirically. The study results indicate that in some contexts, parties use Duration as

a safeguarding device to protect reliance (the interest of a party to a breached contract in being compensated for detriments suffered (as expenses incurred) in reliance on the agreement) in a variety of contexts. Duration benefits (savings on bargaining costs of repeat negotiations) must be traded off against the associated costs (potential for maladaptation). The effectiveness of Duration is enhanced by simultaneous use of mechanisms that define admissible dimensions for adjustment. In other situations, such as manufacturing, long-term contracting is less well-suited to project-specific investment.

The Multidimensionality of Contractual Completeness

In recalling the genealogy of the economic theory of ICs and reflecting on positive economic theorists' attempts to model Incompleteness, Furlotti (2007) reminded that incompleteness should be understood as 'the possibility to improve efficiency ex post'. Endogenizing (internally developing an economic model parameter) Incompleteness in this way prompted a stream of research deploying a variety of denominations and operationalizations for Incompleteness constructs. It then became apparent that all the virtues of the contractual ideal type could not be achieved by increasing only one specific contract dimension. Also, as a result of the review being restricted to drawing conclusions about dimensions on which empirical investigation had actually been conducted, Furlotti (2007) regrouped the dimensions often encountered and referred to as Incompleteness, under three labels, namely: Complexity, Contingency Planning and Ambiguity/Specificity. These correspond to three contractual strategies that are said to be effective in fulfilling the competing requirements of reducing risk of contractual non-performance and ensuring the possibility of harmonious ex post adaptation.

Complexity (CD)

The reasoning behind Complexity as a measure of Completeness is based on the view that real-world contracts approach the complete archetype when there is higher language stringency and greater exertion in foreclosing possibilities of misbehaviour. Therefore, the studies regarded more complex contracts as being longer, including a higher number of clauses, and providing for larger arrays of enforcement mechanisms. Thus the evidence on Complexity is in the form of studies that empirically investigated relationships between Complexity and transaction strategic importance; and between Complexity and contractual hazards created by cooperative venture Size and Frequency in inter-firm strategic alliances, international joint ventures, information services, dyadic alliances, IT and biotech R&D, and IT products and accompanying services contexts. After reviewing this evidence, Furlotti (2007) concluded that: the risk of project hold-up is better captured by Size, which proves to be the most significant antecedent of Complexity; however, he found no strong indications that more efficient contracts ought to be more complex as Frequency increases or when there are greater contractual hazards.

Furlotti (2007) made no observations of the impact of Frequency on CD, but outlined measurement approaches encountered in the studies reviewed. For the contract set under study, number and stringency for the CD can be evaluated, using the Walker and Pryke (2009) operationalization, which is based on the Parkhe (1993) 'contractual safeguards' operationalization. This is an assessment of strength of explicit contractual opportunism deterrents. Parkhe (1993) examines contracts for the presence of provisions embodying the specific contractual enforcement apparatus for the type of agreement in question. Once identified in the contract set, with the help of practitioners, the provisions can be ranked in order of

'increasing stringency' to facilitate a stringency score assignment. Next, these scores can be summarized into an 'index of deterrents' (IOD). For each contract, an IOD can be determined by arranging safeguards in order of increasing stringency and assigning each its corresponding value. e.g. the first-ranked safeguard would be assigned a value of 1, the third – 3, etc. The composite IOD would then be computed as ∑(number of safeguard used)/Σ(number value of all possible safeguards). Higher IOD values are expected for large, important contracts with heightened perceptions of opportunistic proclivities.

Contingency Planning (CPD)

Contingency Planning measures the intensity of use of one particular strategy to achieve efficient adaptation, e.g. it can measure the degree to which parties use a strategy of developing explicit response rules for specific classes of events. The general consensus is that parties generally resort to this strategy, as *ex ante* conflicts of interest increase and as costs of specifying contingencies decreases (Furlotti, 2007). Using the Mayer and Bercovitz (2003) evidence, Argyres et al. (2007) find that CP is positively affected by prior relationships between the parties. While the result is open to the interpretation that a history of frictions advises the adoption of greater safeguards under the form of stricter CP, Argyres et al. (2007) subscribe to the view that repeat interactions allow the partners to develop relation-specific routines, and lower the cost and effort of explicitly planning for contingencies. Mayer and Argyres (2004) also favour this interpretation.

Respondents were expected to grade contracts on: 'degree to which parties develop explicit response rules for specific classes of events', using the Mayer and Bercovitz (2008) three-point CP scale:

- 0 if there is no CP for the project
- 1 if there is CP to accommodate 'any' kind of change
- 2 if there is more specific and detailed CP

Ambiguity and Specificity (ASD)

Introducing Ambiguity (broadly stating requirements, without restricting parties to specific actions, i.e. failing to specify verifiable obligations of parties) is a common strategy for increasing the adaptability of a contract. For example, in the construction industry, fixed price contracts can be arranged in increasing order of Specification Ambiguity as follows: fixed design, scope design, and cardinal points' (Turner, 2004). Furlotti (2007) reviewed evidence for this relevant dimension gathered from empirical studies that investigate 'contract specificity' or 'contract detail' because the studies do not generally address the opposite issue of 'Ambiguity'. In sum, the findings indicated that Contract Specificity decreases with Uncertainty and increases with behavioural hazards. Also, in certain settings, the existence of relational reinforcement mechanisms also favoured greater contractual detail (Furlotti, 2007).

The Ryall and Sampson (2006) database, already mentioned for its implications for measuring Monitoring, was cited by Furlotti (2007) to illustrate that contracts can be more detailed when organizations have prior detail experience, and have engaged in prior deals with the same partner. The implication is that there is a learning effect and the capacity to draft detailed contracts increases with experience. Argyres et al. (2007) also find evidence of complementarity

between task description detail and CP due to learning spillovers from prior relationships. Corts and Singh (2004) was regarded as evidence that contracts based on more ambiguous term specification (in that they fail to specify verifiable obligations of the parties) are increasingly opted for when previous experience with the same partner assuages moral hazard fears.

To operationalize ASD, we depended on the procurement route indicated by the respondent for the project in question. Similar to Crocker and Reynolds (1993), we consider the more fully-specified contracts to be procured via the traditional route, using fixed price contracts and the least fully-specified contracts to be the fee-based (cost reimbursable) contracts

5 Conclusion and Further Research

This study provides insight into the motivation for and design of IORCG mechanisms based on primitive transaction/project characteristics. The question of how the Frequency primitive project characteristic impacts IORCG design has, surprisingly, received relatively less attention in prior research, in comparison to Asset Specificity and Uncertainty, despite it being identified alongside them as one of the principal TCE dimensions for characterizing transactions (Williamson, 1985).

Our focus on the Frequency of trade between organizations differs from prior studies in that we do not limit ourselves to evidence of relationships and influences put forward by any specific theoretical perspective. Rather, our study represents a consolidation of different theoretical perspectives on IORs to develop a comprehensive framework for assessing the contribution of prior transaction history on general IOR governance mechanism design. Our findings indicate that the IT and IT Services, High Technology, and Biotechnology fields are leading the charge on investigation into the Frequency impacts. As this study applies the general findings and approaches uncovered from our review to the design of IORCG mechanisms in the UK construction industry, it will add specific dimension here.

Our findings also indicate that initially, the general consensus was that the relationship between IORCG mechanisms and Frequency was moderated by the trust, generated from repeated interactions between the same trading partners. This would imply that that IORCG would become less complex, (as the need for control is reduced) with increased levels of experience with the same transaction partner. However, as the evidence began to indicate otherwise, alternative explanations were put forward, such as the incorporation of past experience and lessons learned into newer contracts (learning spillovers). There was support for both substitutive and complementary effects of partnering experience that run through different paths. The focus then shifted toward disentangling the trust effect from other consequences of relationship history, such as learning spillovers. The most recent suggestion was for a ‘trust first, learn later’ pattern.

Despite its contributions, there were some limitations. For example, despite identifying a number of features and mechanisms of IORCG, we were unable to find studies providing evidence to indicate the sensitivities of each to Frequency. Specifically, our study made no observation of Frequency impacts on decision-making and rules and restraints. Also, review of impacts on the coordination function, and for monitoring were also quite limited. Therefore, given the significance of these dimensions, in addition to the dearth of research about these issues, we feel

that these missing dimensional sensitivities is an area that warrants further investigation and analysis.

We also noted that the literature was still undecided on the aggregate impact of expected future interactions, though there is some speculation about the effects of open- vs close-ended contracts. For the most part, the notion of Frequency here was basically, an analysis of the 'Shadow of the Past', and therefore, we recommend that future research strive for a more balanced view that would incorporate the 'Shadow of the Future'.

Some more specific measures for construction industry subsectors could also be developed. For the measure of Complexity, we were largely dependent on Parkhe's (1993) operationalization. Specifically, a measure of contract Complexity, that incorporated input from a wide variety of practitioners to develop a similar IOD for a specific subsector would enable greater insight into the Frequency impacts for specific construction subsectors. Also, we used a rather simple measure for the Ambiguity/Specificity Dimension. Our recommendation is for future research to draw inspiration from Ryall and Sampson (2009) to develop frequency and cross-frequency tables presenting incidence of occurrence and co-occurrence of terms across contracts in a set. Such a structural presentation would provide the benchmark, and thus, the upper bound for ASD. In this way, a more objective procedure for checking contracts against this descriptive structure would enable determination of how 'fully-specified are contracts within particular subsets. Contractual content can be measured by examining the number of terms within each broad category of variance.

Finally the validity of our methodology may be subject to debate. Our use of survey data may cause concerns about potential biases, e.g. common method biases. However our use of more objective indicators for many of our constructs should alleviate some of these concerns. The cross-sectional approach to data acquisition may cause some concerns about recall bias and may constrain our ability to examine dynamics between prior relationships and IORCG mechanism design. Use of objective indicators should also be helpful in this regard. Future research recommendations are for longitudinal studies, which would allow more in-detailed and dynamic examination of Frequency and prior relationships and their impacts on IORCG.

Despite these limitations, we believe that our results have significant implications for those involved in designing IORCG mechanisms, who need relevant knowledge to make design choices. They will be able to design suitable IORCG mechanisms to address hazards associated with the primitive project characteristics (Frequency, in particular) with which they are faced. They will also be able to conduct marginal analysis using the IORCG mechanism measures. Given the continuing growth of IORs in the construction industry, the need for guidance on designing effective control structures will only increase in importance.

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APPENDIX

Table 1 Empirical research on Frequency Impacts on Interorganizational Relationship Contract Governance Design

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
2011	Animated film industry	Lumineau, Frechet, and Puthod	Longitudinal study of alliance contracting. Discussion of how contracting and learning processes are related. Analysis of the role of the contractual process in supporting organizational learning.	Frequency encourages parties to learn about: each other, transaction features, and the contracting process.	In addition to Experiential learning (trial-and-error learning or learning-by doing: making meaning from direct experience), there are: vicarious, and inferential learning mechanisms from repeated interactions.	No linear relationship between contractual details and experience was observed (as was the case for Vanneste and Puranam).
November-December, 2010	Buyers and Suppliers of IT products and services. IT Transactions range from: Routine commodities to highly customized and specialized development projects, which usually require relationship-specific investments, high levels of integration and mutual coordination.	Dekker & van den Abbeele	Analysis of transactions between buyers and suppliers to determine how partner search processes and prior exchange experiences impact firms' ability to design control structures for new inter-firm interactions.	BOTH COMPLEMENT & SUBSTITUTE: Partner search and prior experience facilitate learning and control design, but reduces the need for control and the intensity of the partner search process (need for new information is reduced) for new transactions.	Prior experiences increase trust and provide first-hand partner experience. Prior experience with focal partner has a negative direct effect on use of control mechanisms to manage interfirm transactions.	Control mechanisms: (Outcome Control; Behaviour Control)
March, 2010 June, 1998	Biotechnology Research Agreements	Lerner and Malmendier	Analyze how contractibility affects design.	Alliances negotiated at the earlier stages allocate fewer control rights to R&D firms	Learning	Procedural/Control: Effort Incentives Complentarity between enforcement mechanisms and wider decision rights Procedural: Decision-Making
January,	IT Procurement by Dutch	Vanneste &	Analysis of conditions	COMPLEMENT: Learning	Learning Effects	Frequency: Technical

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
2010	small- and medium-sized enterprises (SMEs)	Puranam	under which learning effect is most likely to manifest itself.	effect is stronger for technical, than for legal detail; and is stronger for firms with IT expertise than for firms without such expertise		Provisions become more detailed. Legal Provisions do not become more detailed. The learning effect is stronger for technical provisions than for legal provisions, and for transactors with at least some in-house IT expertise.
June, 2009	Joint Technology Development in Telecommunications and Microelectronics (High Technology Sector)	Ryall & Sampson	Investigation of the extent to which firms substitute relational for formal mechanisms in the presence of repeated interactions (Empirical comparison of contract terms in 52 contracts	COMPLEMENT (between formal and relational contracts): Prior deal experience affects positively, and significantly, the level of monitoring. The firms' contracts are more detailed and more likely to include penalties when it engages in frequent deals	Informal/Social Control (Relational Capabilities) A learning effect for Specificity – increased capacity to draft detailed contracts with increasing experience.	Transactional: Enforcement Procedural; Ambiguity/Specificity Frequency: Penalties more likely with increased interaction.
2008	Sequential exploratory (purpose was to evaluate new technological opportunities through upstream activities, such as: fundamental research, experimenting, and testing) R&D alliances between	Faems et al.	Case study of two sequential alliances between the same pair of R&D firms. 1st Alliance: Exploration of feasibility of side shooter head (SSH) for printing applications	Disentangling of how: (1) contracts with a similar degree, but different nature of formalization (narrow vs broad) trigger different types of trust dynamics at operational and managerial levels. (2) trust dynamics and	Contract designs differed in the way that monitoring, task division, and information flows were defined, but were the same regarding the juridical clauses regulating partner	Provisions for Monitoring, task division, and information flows

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
	one of the world's leading imaging companies (Graph – 20,000 employees in 40 countries) and a stock-quoted inkjet technology company (Jet – 185 employees). Alliances were made up of a team from each company, of approximately 5 engineers, supported by 2 senior managers		2nd Alliance: Exploration of feasibility of end shooter head (ESH) for printing applications	contract application (rigid vs flexible) coevolve over time. (3) relational dynamics in previous transactions influence contract design in subsequent transactions.	behaviour outside the alliances.	
2008 No	IT Services Industry	Mayer and Bercovitz	Examines whether the prior relationship between two firms produces an inertial drag that influences contracts used for subsequent exchanges	Prior relationships between the firms create interorganizational inertia (a constricting effect) on future contracts, which leads firms to use the same level of contingency planning in current exchanges that they used in prior contracts	Interorganizational inertia	Contingency Planning
December, 2007	HR Outsourcing	Mellewigt et al.	Highlight the fact that contracts serve a dual purpose of control and coordination; and analysis of the relationship between trust and contractual complexity	SUBSTITUTE AND COMPLEMENT: High trust means weaker +ve relationship between control concerns and contractual complexity. High trust	Trust moderates the relationship between Control (substitute), Coordination (Complement) concerns and contractual complexity	Coordination, Control and Complexity. Trust can be a substitute for Complexity (regarding control concerns); Trust can be a complement for Complexity (regarding

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
						coordination concerns). Low Trust + ↑Complexity = Enabling Control; High Trust + ↑Complexity = Enabling Coordination
March, 2007	Alliances vs M&A, Equity vs Non-Equity	Reuer & Ariño	Examination of contractual features of strategic alliances. (Dimensionality of contractual complexity and firms' adoption of various contractual provisions)	COMPLEMENT Firms that have collaborated with each other in the past are less likely to negotiate enforcement provisions; rather, repeat collaborators are less likely to adopt contractual provisions that are informational in nature and are geared to the coordination of the alliance	Firms' usage of particular contractual provisions is a function of Asset Specificity and whether the alliance duration is open or prespecified. (Consistent with learning effects)	Coordination: Repeat collaborators are less likely to adopt contractual provisions that are informational in nature and are geared to the coordination of the alliance
Jan/Feb, 2007	IT Services (high technology projects)	Argyres, Bercovitz & Mayer	Analysis of the relationship between contingency planning and task description for contracts where environmental uncertainty or technological complexity are significant. (Contract changes)	COMPLEMENT: Repeated exchange between two firms leads to a greater effort at contingency planning in subsequent contracts. Contingency planning and task description are complements in contractual design. This reflects patterns of learning to contract.	Learning spillovers from repeated interactions.	Evidence of complementarity found between task description detail and Contingency Planning. Specificity of ASD increases as a result of more Contingency Planning, and increased extensiveness of task descriptions. No support found for a direct relationship

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						between prior relationships (Frequency) and cost and effort of writing more specific task obligations
2006 No	IT Service Provision	Mayer		COMPLEMENT: Increase in Reusability of knowledge-intensive work results in increase in Specificity of ASD of task description		
December, 2005	IT Products and Accompanying Services	Anderson & Dekker	Analysis of how close partners exposed to a significant hazard, structure and control a significant interaction. Analysis of terms of contracting to determine whether transaction and supplier characteristics that generate opportunistic hazards are related to the formal management control structure. Analysis of whether misalignment between transaction and supplier	COMPLEMENT: Characteristics associated with hazards are +vely related to contract extensiveness.		Control Structure: Characteristics associated with hazards are positively related to extensiveness.

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
			characteristics and the control structure is associated with *ex post* performance problems Analysis of the relationship between transaction characteristics and *ex post* transaction problems			
April, 2005	Large pharmaceutical firms and biotechnology partners	Hoang and Rothaermel	Analysis of general and partner-specific alliance experience on objective joint R&D project performance	General alliance experience of the biotechnology firm +vely affected joint performance. This relationship exhibited diminishing marginal returns due to limits on cognitive abilities of the biotech managers. Partner-specific experience has a –ve, marginally significant effect on joint project performance	Managerial learning effects Biotechnology firms due to their size (alliance manager is one key individual, so learning about entering, managing, and exiting alliances occurs more readily; firms are smaller and less wieldy, so implementing changes is easier) and presence of incentives to learn (learning more critical to biotech firm survival.) -ve partner-specific	Benefits of alliancing are not automatic, but depend on whether firms can actively mobilize and leverage their experience.

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
					impact may be due to firms inappropriately generalizing from their experience with the same partners.	
July-August, 2004	Personal computer	Mayer & Argyres	Detailed case study of a time series of 11 contracts concluded during 1989-1997 between the same two partners, to explore whether and how firms learn to contract, with each other over time. (Contract changes)	The evidence shows that changes in contract structure are largely the result of processes in which the firms were learning how to work together, including learning how to contract. Learning is incremental and local	whether contracts have a positive or negative effect on interorganizational trust	Contingency Planning Frequency: Complexity - contracts became more complex, addressed communication and became more specific
April, 2004	Offshore Drilling	Corts & Singh	Analysis of repeated interaction on incentive problems and contracting costs	SUBSTITUTE: Oil & Gas companies are less likely to choose fixed-price contracts as the frequency of their interaction with a driller increases	Repeated interaction reduces incentive problems more than contracting costs; Contracts based on more ambiguous terms are increasingly opted for when previous experience with the same partner assuages the fear of moral hazard. i.e.	Transactional: Effort Incentives; As Frequency increases, Ambiguity of ASD increases when previous experience with the same partner assuages the fear of moral hazard.
April, 2004	IT Services	Kalnins & Mayer	Analysis of how prior relationship between the			Transactional: Effort Incentives

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
			firms influences the type of contract selected. Analysis of the use of fixed-fee, time & materials/cost plus, and hybrid contracts (time & materials with a cap)			
March, 2004	Strategic Alliances (Alliances vs M&A, Equity vs Non-Equity agreements)	Reuer & Ariño	Analysis of contractual features of strategic alliances	There are 2 underlying dimensions of contract complexity: enforcement and coordination. Firms that have collaborated with each other in the past are less likely to negotiate enforcement provisions. Contractual provisions adopted are informational in nature and are geared toward coordination of the alliance	Trust AND Learning Effects; Usage of particular provisions is a function of asset specificity as well as whether the alliance's duration is pre-specified or open-ended.	
January, 2004	Buyer-Supplier Strategic Alliance for supply and joint innovation Railway Safety Equipment	Dekker			Informal/Social Control ; Relational Trust; Good partner selection motivated by Trust in a partner's goodwill and capabilities. Despite an extensive governance structure, the	Procedural: Monitoring and Enforcement (Prevent Expropriation)

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
					high level of goodwill trust seemed to moderate the use of formal control mechanisms to manage transaction hazards. Formal controls added provided mutual transparency and facilitated achievement of the alliance's goals, and the partners strongly believed that they add quality to the relationship instead of being deteriorating to it.	
2003	Financial Contracts between Venture Capitalists and Entrepreneurs	Kaplan & Stromberg		COMPLEMENTARITY: Between monitoring and monetary incentives		Procedural: Monitoring. Enhanced supervision and monitoring observed with shorter founder track records.
August, 2002	Information Services outsourcing	Poppo & Zenger	Test that complexity (enforcement/control mechanisms)of the contractual governance apparatus increases with intensity of exchange hazards.			
2001	Automobile franchise contracts	Arruñada	Regression coefficients of the number of	COMPLEMENT		Procedural: Monitoring. Greater monitoring rights

YEAR	INDUSTRY	PAPER AUTHORS	SUMMARY OF PURPOSE OF STUDY	IMPACT OF FREQUENCY ON IORCG (SUBSTITUTE OR COMPLEMENT)?	CONSISTENT WITH TRUST, LEARNING EFFECTS, INFORMAL OR SOCIAL CONTROL?	PART OF CONTRACT Affected
			monitoring rights assigned to the franchisor			to financier contingent on alliance financial adversities
Winter, 1995		Bhattacharyya & Lafontaine				Transactional: Effort Incentives
February, 1995		Gulati	Choice of alliance type			
Spring, 1993	Jet Engine Procurement	Crocker & Reynolds				Ambiguity of ASD increases with task uncertainty, and decreases (Specificity increases) with a known propensity of the contracting party for litigiousness.

Contract administration

Standard Forms of Contract Selection Criteria: A Qualitative Analysis of the Western Australian Construction Industry

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Abstract:

Opportunities exist for a new structured decision-making criteria guide, towards selection of the most appropriate standard form of contract, in a given environment, for the West Australian (WA) civil-engineering/construction industry; the work presented describes decisions required to choose an effective standard form of contract (from a wide array of options) and the factors that influence these decisions. Secondary research identified a lack of structured guidance available locally, paving the way towards primary research, in conjunction with stakeholders in the Australian engineering construction industry, in the development of a new guidance tool. Data collected, analysed as part of a qualitative research methodology, provided the findings to develop subsequently a practical, objective, and structured standard form of contract selection guide for use within the local construction industry. The decision flow chart developed as part of this research is expected to improve the speed and accuracy in the choice of which standard form of contract is most suitable from the wide range of available options. This guide may also serve as a contract training aid for graduate civil-engineers involved in procurement activities in the construction industry.

Keywords:

contract, decision-making, Western-Australia, civil-engineering/construction

1 Introduction

This study explores contract alternatives in the West Australian (WA) Civil-Engineering/Construction Industry, with a key focus on the decisions leading to the choice of which standard form of contract is most suitable for a given Australian development project.

The purpose of a contract is essentially to ensure that what is agreed will in fact be carried out by the relative parties. In essence a contract acts as a measure to mitigate risk by outlining the requirements of the parties. However, the very existence of a contract cannot guarantee the omission of risk. An effective contract is one that outlines the responsibilities of the parties in a clear and precise manner. While this remains the

constant goal for industry, in reality this is very difficult to achieve due to respective stakeholders' varying interpretations of clauses.

Industry strives for continued improvement, that is, the minimisation of interpretations and the protection of the interests of the respective parties. A large number of alternative (WA) standard forms of contract have been developed to address this concern; however this in turn adds to the complexity of the contract choices and the decision process due to the sheer number of standard form of contract options available. Western Australian (WA) professionals identified a number of contractual concerns, particularly significant Liquidated Damages, associated with projects conducted in their unique home-state (WA is comparable in size to Western Europe, has a population of 2.3 million, and the world's most isolated mainland city, Perth) (ACA, 2008).

In order to make a decision as to which standard form of contract to use, experienced contract engineers often currently follow an innate, and largely subjective, decision process. Firstly a decision must be made as to which procurement strategy is likely to prove most suitable. Secondly, an appropriate tender process to engage contractors and consultants needs to be selected. A decision also needs to be made as to which type of contract will appropriately meet the needs of the chosen procurement strategy and finally which standard form of contract will best serve the needs of the project. Figure 1 outlines these decision relationships as defined by this research (where column four represents the range of potential standard forms of contract available for (West) Australian construction and civil-engineering activities.

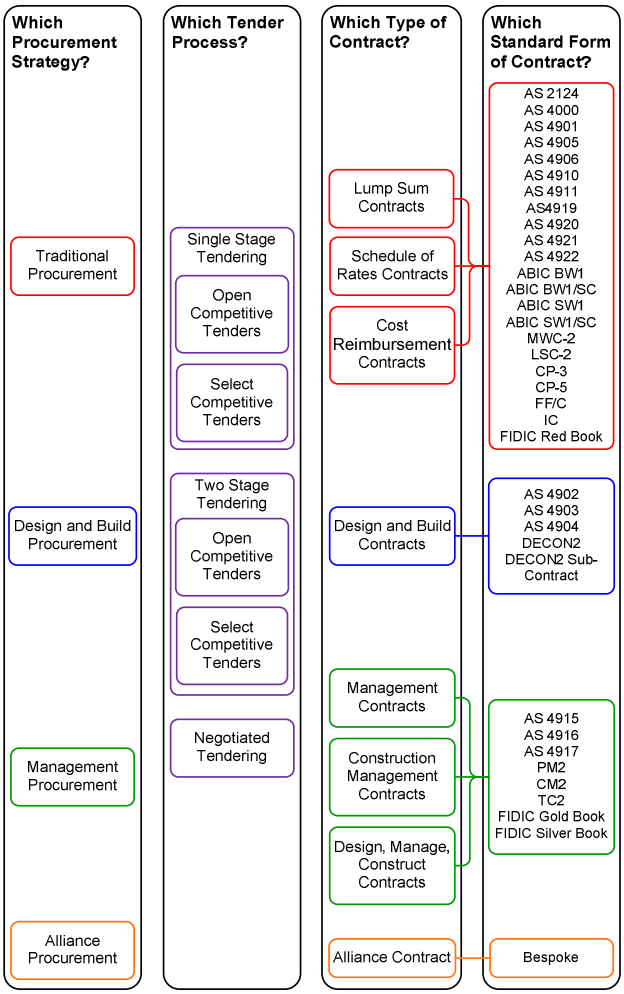

Figure 1: Contract Decision Relationships for Western Australia

This research looks to formalise this somewhat innate, subjective process by developing a structured, objective decision making guide towards the best alternative form of contract in a given environment. The research draws on a variety of sources, collating this information to provide a comprehensive overview of not only the factors considered in order to make an appropriate decision, but also the final product and its relative advantages and limitations.

1.1 Research Problem: Contract Choice in WA

The primary problem within the WA engineering construction industry which has motivated this research is the markedly large number of standard forms of contracts available to contract decision makers, coupled with the lack of independent guidance on which standard form is most suitable. The high number of choices available and the number of decisions that are needed to be made makes the decision process a difficult task requiring considerable time and therefore monetary investment in order to select an effective standard form of contract. Without a clear contract selection guide it is easy to neglect the full range of factors given the number of considerations that must be taken into account. Also, as a result of the complexity of this decision the task is generally reserved for experienced engineers who must draw on their years of individual experience in order to ensure a comprehensive consideration (which remains a personalised and subjective consideration) of the relevant factors.

This problem can be seen to offer three opportunities for improvement:

Firstly, to improve the efficiency of the contract decision making process;

Secondly, to improve the effectiveness and objectivity of the contract decision making process; and,

Thirdly, to pass on contract knowledge in such a way as to allow less experienced engineers to take on more responsibility in making contract decisions.

These opportunities would be best met by a structured approach to contract form selection. A need therefore exists within the WA civil engineering construction industry for a structured approach to making contract decisions.

1.2 Purpose of the Research: Decision Making Guidance

The purpose of this qualitative study is to gain a better understanding of how contract decisions are made within the Australian construction industry and use this understanding to develop a new structured contract selection guide by way of a decision flow chart for West Australian consultants to advise clients of the most suitable standard form of contract. This decision flow chart will look to improve the efficiency with which contract decisions are made while improving the probability of the most suitable contract being implemented for a given project.

2 Background: Contract Selection in WA

Civil engineering consultants are often asked to advise unknowledgeable clients on which standard form of contract to use for construction projects. It is important to choose an appropriate contract which balances the project parameters and allocates risk appropriately in order to avoid poor quality of construction, time and cost overruns, and reduce the likelihood of claims and litigation (Rwelamila, 2007). A compromise is also often required between conflicting project parameters such as cost, time and quality (Turner, 1997; Cox, 1999). For example, high product quality is likely to be achievable at a higher cost or longer timeline (Chua 2006). Similarly, in order to achieve shorter project programs than thought to be ideal, product quality may be reduced, or increased costs may be experienced (Chua 2006). The challenge of successful consultants is to find a balance between these priorities through suitable contracts (Wang 1996).

The contract decision is one which is very complex, requiring careful consideration of a number of different variables in order to reach a final decision (Rwelamila, 2007; Chua 2006; Wang 1996; Luu, 2003). It is widely accepted that the success of a contract, and therefore a project, is dependent on the appropriateness of the contract, being objectively assessed against the characteristics of the project and the project priorities, on an individual basis (Rwelamila, 2007; Chua 2006; Wang 1996; Oyetunji 2006). With no structured approach to contract decision making, consultants run the risk of investing vast amounts of time into making correct contract decisions, or, alternatively, they may rush the decision, or neglect to consider important variables resulting in a less than optimal contract being implemented.

A number of studies (Love, 1998; Wong, 1995; Wang 1996; Skitmore, 1988; Oyetunji 2006) have sought to develop a structured decision procedure for particular aspects of

the contract decision making process. However, it might be suggested that these influential studies seek not to attempt to offer a *complete* solution to the contract decision; concentrating upon either procurement strategy or the type of contract.

This project initially sought to identify the variables deemed most important to the decision making process through a secondary research methodology. This research identified a total of fifty-three variables that influence the contract decision. Of these, thirteen variables were mentioned by a significant number of researchers, and are therefore considered to most greatly influence the choice of form of contract. This research looked to develop a new means to measure the significance (or weighting) of these 'project priority' variables against the 'project characteristic' variables for various situations (looking at how the project priorities in WA influence the contract decision for different types of projects).

3 Methodology

The nature of the research question played a significant role in determining the most appropriate research methodology. It was considered that enquiries into how contract decisions are made to improve suitability and efficiency were best achieved by the use of the qualitative method of research. This method allowed the contract decision process to be investigated in terms of understanding the circumstances in which study participants address issues in decision-making (Creswell, 2007).

Pilot study data collection was undertaken in the form of six semi-structured interviews with procurement and contract professionals within the engineering industry. Interview participants were identified using 'purposeful sampling' with a view for 'maximal variation' (Creswell, 2007). On this basis participants company profiles varied in size, nature (client/consultant/contractor) and sector (public/private). All participants were senior personnel with extensive knowledge on contract and procurement practices.

4 Discussion of Results

4.1 Semi-Structured Interviews

The interviews conducted as part of a primary research methodology provided a means to measure the importance of variables identified as part of the secondary research literature review. These interviews indicated a high correlation between the factors considered by industry professionals within the Australian construction industry and those identified through the literature review. However, a number of (widely international) factors, considered influential to the standard form of contract decision by this research were neglected by the participants of this study. The reason for these omissions was likely due to the limitations of size; the sample size was of six participants, limiting perhaps variation measurement across the WA construction industry. It is for this reason that the standard forms of contract, and associated decision variables, explicitly mentioned in these interviews were likely to be limited to those administered by an engineer and used within the WA engineering construction industry. As such standard forms of contract developed by *Standards Australia* were highlighted in this study.

The interviews conducted as part of this research also raised the issues of client-contractor relationships and difficulties in changing the industry ethos. The relationship between the client and the contractor impacts on every factor taken into consideration in the decision process and is therefore fundamental to the success of the project. While a contract defines the relationship between the parties in terms of liabilities and responsibilities it cannot define the attitudes of the parties on which these will be based. Therefore in order to achieve positive project outcomes in terms of low costs, short schedules and high quality it is important that both the client and contractors conduct themselves in a manner that that encourages respect and co-operation between the parties. The benefits of such are expected to extend beyond the client in terms of improved value for money for the project to the consultants and contractors as a result of an increased workload (and therefore profits) brought about by a positive industry reputation and repeat work with the client.

The tendency within the West Australian construction industry to over simplify construction administration without due consideration to the increased legal environment in which they operate was also raised amongst participants. The increased emphasis on reducing the project schedule (time constraints) was cited as the most likely reason for this industry culture. Similarly, time constraints and lack of familiarity with all alternative options was indicated by participants as the most likely reason for implementing a contract out of familiarity (because it had been used on a similar project) without due consideration to all the relevant factors. On this basis, the use of a selection guide, such as the one developed as part of this research, is likely to eliminate the trade off between speed and suitability by facilitating an accelerated contract decision (and therefore project start) while ensuring a suitable contract is selected.

4.2 Key Decision Factors

This research identified a total of 28 factors as influential in the contract decision process. Of these 28 factors a number of factors influence more than one decision as summarised in Table 1 below.

Table 1: Key Decision Factors

No	Factor	Procurement Strategy	Type of Contract	Tender Process	Form of Contract	TOTAL
1	Schedule/timing	•	•	•		3
2	Minimum cost	•	•	•		3
3	Cost certainty	•	•			2
4	Complexity	•	•	•	•	4
5	Nature	•	•		•	3
6	Expected cost/value	•	•	•	•	4
7	Scope	•	•			2
8	Size	•	•			2
9	In-house capability	•	•			2
10	Quality	•	•	•		3
11	Allocation of risk/responsibilities	•	•		•	3
12	Market conditions		•	•		2
13	Flexibility	•	•			2
14	Level of competition	•	•	•		3
15	Time certainty	•				1
16	Control over sub-contractors	•	•		•	3
17	How well defined scope is	•	•		•	3
18	Evidence of transparency			•		1
19	Evidence of competition			•		1
20	Number of vendors able to supply goods/services	•		•		2
21	Dispute avoidance	•				1
22	Project administrator				•	1
23	Location				•	1
24	Funding				•	1
25	Procurement strategy leads to difficulty in evaluating tenders			•		1
26	Domestic/commercial				•	1
27	Separable portions required				•	1
28	Client profile				•	1
	TOTAL	18	16	11	12	

It can be seen that a total of 18 factors impact the choice of procurement strategy, 16 factors influence the choice of the type of contract, 11 factors influence the decision of which tender process will be used and 12 factors impact the decision as to which standard form of contract is most suitable. The research also indicated that these factors

were unable to be assigned a specific weighting given their interdependence on one another and the priorities of the individual project.

4.3 Standard Form of Contract Decision Flow Chart

The factors identified through this qualitative research methodology as influential to the standard form of contract decision, outlined above in Table 1, were used to develop a new series of eight related decision flow charts (alongside factor interrelationship implications, notwithstanding the recommendations discussion below) to aid in the selection of a suitable standard form of contract for Australian civil engineering construction projects [1]. Figure 2 shows a representative sample of the finalised decision flow chart developed as part of this research. The flow chart directs the user to complementary pages of the final research report (*go-to page 92,* and the like) where a final decision suggestion arises from a yes/no series of project status questions within the model; a number of definitions are also made available within the final report to assist the user to identify/objectify respective yes/no onward responses. This model flow chart specifically applies to the factors influencing the choice of procurement strategy, as the first step in the four stage process (refer to Figure 1).

The collective decision flow chart(s) developed as a result of this research can be argued to have a number of significant benefits to the West Australian construction industry. Firstly it will save time by reducing the number of hours required by contract engineers to make a standard form of contract decision. It will also reduce, if not eliminate, the requirement for legal consultation therefore reducing the time required for negotiations between clients and contractors or consultants. This research will also enable contract knowledge to be passed on to new contract staff more efficiently and comprehensively. The structured selection guide is also expected to improve corporate memory by reducing the risk of contract and procurement knowledge being lost when experienced employees leave the company. The structured contract selection guide will also allow less experienced contract engineers to take a more active role in the contract selection process, in turn reducing the involvement of more experienced engineers and therefore allowing these experienced engineers to be available to perform more advanced tasks. A structured contract selection guide ensures all important variables are considered for every project leading to the most suitable contract selection. The implementation of effective contracts leads to improved client contractor relationships and reduced litigation. Given the direct relationship between time and money, the time savings brought about by a structured selection guide will translate to significant cost savings. The cost of legal consultation in developing a bespoke contract is also a considerable one in contract management and the reduction, or negation of this requirement is expected to be significant. Improved corporate knowledge is expected to reduce costs by maximising the efficiency of experienced, more costly, engineers. Litigation is an expensive by-product of ineffective contracts due to the exorbitant cost of lawyers and legal fees. Therefore the reduced litigation as a result of suitable contract selection is expected to lead to significant cost savings.

[1] Final, full (unpublished) Decision Making Guide Report is available from Civil Engineering, Curtin University

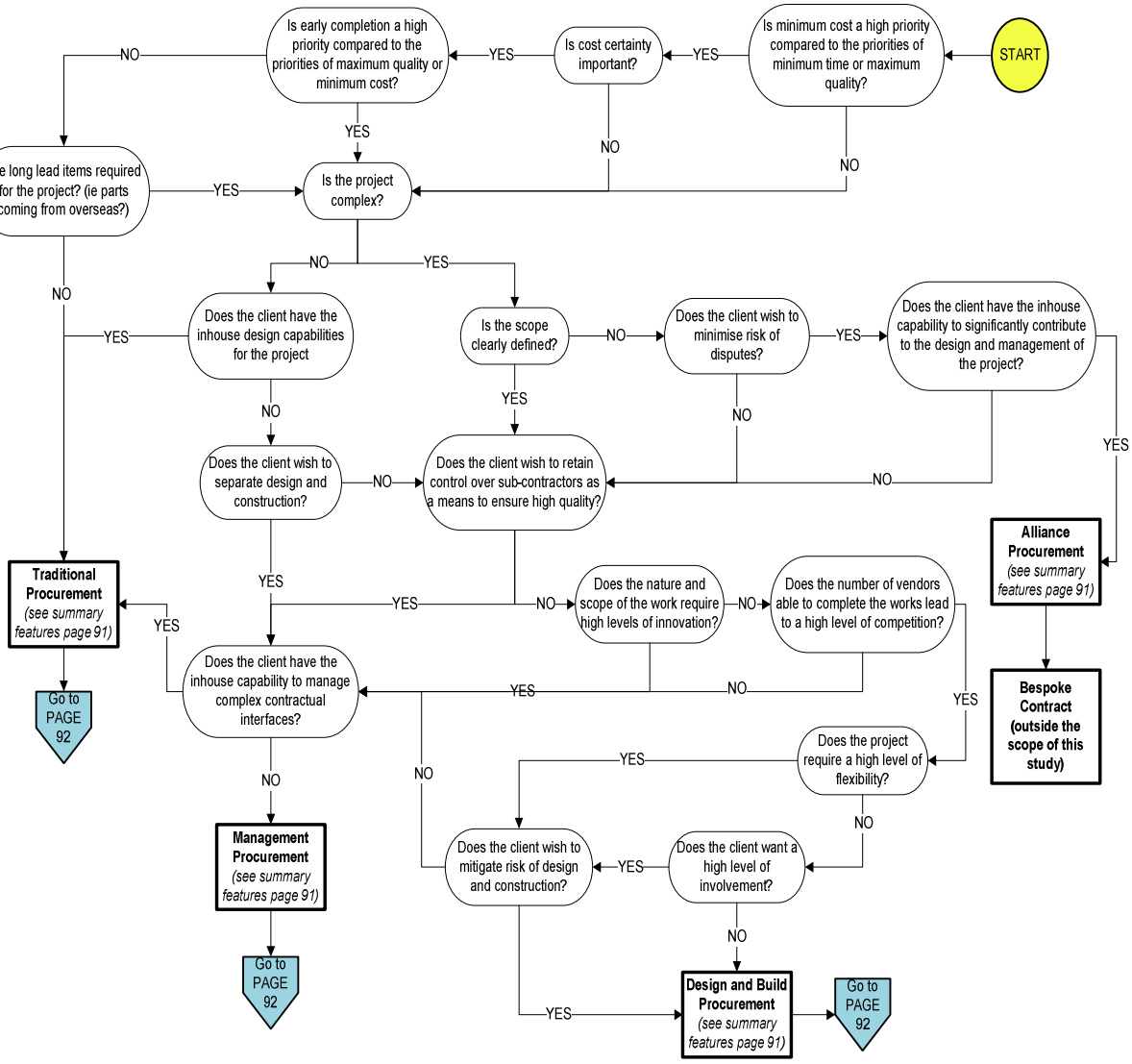

Figure 2: Decision Flow Chart – Procurement Strategy

5 Conclusion

This qualitative research focused on the decisions that are required to be made in order to select an effective standard form of contract and the factors that influence these decisions. Four key components to the form of contract decision process were identified. These components required decisions to be made between four identified procurement strategy options, five tender process options (including single stage and two-stage tendering), eight types of contract and over 48 standard forms of contract that are available within Australia. A total of 28 factors were identified as influential in the form of contract decision process which were unable to be assigned a specific weighting given their interdependence on one another and the priorities of the individual project.

The standard form of contract decision flow chart(s) developed as part of this pilot study research is expected to improve the speed and accuracy with which the decision of which standard form of contract to use is made. This guide is argued to also serve as a contract training aid for graduate engineers within the construction industry.

6 Recommendations

Due to the time constraints of this research the sample size was limited to six participants with prominent industry professionals. In order to improve the accuracy and applicability of the decision flow chart developed as part of this research it is recommended that additional primary research be conducted for a larger, and more diverse sample of participants. Results would best be achieved by conducting further structured interviews with contract and procurement professionals across a broader industry profile (for both domestic and non-domestic markets) and from companies defined within a small & medium enterprise (SME) category. Participants with backgrounds beyond civil-engineering encompassing development, building and architecture would also be seen as beneficial.

It is also recommended that further research be conducted to establish a more definite weighting system for the factors identified in this research; these factors were found to be heavily dependent on (historical) experience and as a result further validation by case-study is recommended. This would enable participants to directly relate these factors to a tangible situation. Benefits could also be seen from investigating processes and factors to improve client-contractor relationships within a contractual framework. This is expected to positively impact on the outcomes of the project in terms of costs, time and quality while improving contractor profits.

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Integrated Project Delivery: A Hidden Thorn of Decreased Cash Flow for the participants

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Abstract:

Integrated project delivery, or IPD, is a relatively new form of project delivery, but its principles have been around for as long as building has been documented. In the early days of historical construction, the project was entrusted to a single person known as the master builder. This master builder was responsible for both the design and construction of the project; thereby providing the owner, or project sponsor, with a single point of contact in line with what we now refer to as IPD. As the design profession matured into a profession separate from the building process, the building industry got away from the concept of master builder and owner's found it convenient to treat the two aspects of the project contractually distinct. In the more recent history of building, more and more information has been made available on the advantages of various forms of a collaborative building process which has led to the utilization of IPD.

A recent development adding to the "collaborative" discussion is that of building information modelling (BIM). BIM is becoming a popular tool offering many benefits to those utilizing the technology along with a BIM based building process. While many use only a portion of BIM for their personal needs on a project (e.g., an owner utilizing BIM for purposes of visualization or marketing; an architect utilizing BIM for developing schedules; or a general contractor utilizing BIM for clash detection), a BIM based building process, by nature, helps facilitate a collaborative approach to building. As collaborative efforts become more commonplace, building owners and all participants in the process need to be aware of how IPD is different from processes they may be more familiar with, and what should be expected from an IPD project.

On most projects an area of particular concern to the general contractor is that of cash flow. As an industry, general contractors are undercapitalized, work on relatively thin margins, deal in a cyclical market, and work with a retainage system that does not fully pay for their efforts until a project is complete. These factors, in combination, bring about a cash flow situation that is the downfall of many contractors. Poor cash flow is generally referred to as the number one cause of construction company failure in the U.S.

The purpose of this research is to look at a typical construction project and how the IPD delivery method can affect the cash flow cycle. A case study approach will be utilized

to illustrate the difference between the cash flow on a traditional commercial construction project in the U.S. versus a similar project in scope utilizing an IPD approach. While contract language can be utilized to minimize a change in the project cash flow cycle, this is an often overlooked detail during contract negotiations. The overall objective of this study is to clearly point out the differences in cash flow resulting from a traditional delivery method versus an IPD contract so that all participants in the project will understand how the cash flow cycle is changed and how it affects your profitability. With this knowledge as a basis, the participants can structure the contract language to best protect their interests. The paper will also provide a brief historical context on IPD.

Keywords:

BIM, cash flow, design-build, integrated project delivery, IPD

1 Introduction

Integrated project delivery (IPD) has been a frequent topic of discussion in the AEC industry for the past few years. Many consider this a continuation of on-going discussions about exploring different and better ways of working together without truely adding to the effort; while others look upon IPD as a significant shift in the way the AEC industry operates. Those with the former attidue would point to the fact that over the past fifty years or so the AEC industry has seen the introduction of design build, construction management, construction management at risk, prime contractors, value engineering, collaboraton, etc. All of which aim to have the pertinent parites - the architects, engineers and contractors - work more closely together and work more closely together earlier in the delivery process. Many refer to the use of IPD that is not a true shift as an IPDish project. As discussed in the next section, an IPDish project is one that utilizes some aspects of IPD yet maintins much of the traditional structure or organizaiaton as it has existed for many years.

Those that look upon IPD as a significant shift in the way we work will point to the fact that IPD represents a true cultural shift in the way a project is delivered; primarily where project participants seek to achieve the project goals above their own individual goals and utilize tools that aid in the achievement of that goal. While building information modeling (BIM) is not a staunch requirement of IPD, BIM is the tool that facilitates the achievement of many of the IPD goals.

Whatever your stance on the IPD issue, one area that seams to have been overlooked in the literature is what effect IPD can have on the cash flow of the participants. One of the main levers which makes IPD work delays the payment of profit to the parties. As many of the participants work on very thin profit margins, a shift in the pay cycle can have a significant effect on the cash flow of a company. Poor cash flow is most often pointed to as the number one cause of contractor failure.

The purpose of this study is to investigate how IPD, as currently practiced, changes the cash flow of the general contractor and to quantify the cost of this change. By realizing the cost a shift in cash flow might have on a company, the company is in a better position to modify terms of the contract to protect the interest of all involved. A case study approach will be utilized to aid in the quantification of this effort.

2 Review of Integrated Project Delivery (IPD)

The American Institute of Architects (AIA) introduced the most quoted definition of IPD in its publication *Integrated Project Delivery: A Guide* (AIA, 2007a). "Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."

The AIA goes on to state that "IPD leverages early contributions of knowledge and expertise through utilization of new technologies, allowing all team members to better realize their highest potentials while expanding the value they provide throughout the project lifecycle." And "[a]t the core of an integrated project are collaborative, integrated and productive teams composed of key project participants. Building upon early contributions of individual expertise, these teams are guided by principles of trust, transparent processes, effective collaboration, open information sharing, team success tied to project success, shared risk and reward, value-based decision making, and utilization of full technological capabilities and support. The outcome is the opportunity to design, build, and operate as efficiently as possible." (AIA, 2007a)

This definition and statement of the AIA lays the framework for a process that differs significantly from the traditional design and construction processes. The following characteristics differentiate IPD projects from projects delivered using a traditional approach: (1) a multi-party contract, (2) early involvement of key participants, (3) collaborative decision making and control, (4) shared risks and reward, (5) liability waivers among key participants, and (6) jointly developed project goals (Ghassemi, 2011). All of the above characteristics must be incorporated in a project for IPD to be realized in its purest form (Sive, 2009).

In a traditional project delivery scheme there will be tens, if not hundreds, of traditional, two-party transactional contracts from the owner-architect agreement, owner-general contractor agreement, general contractor-subcontractor agreements, down to the subcontractor-supplier agreements. Each of these contracts align two parties together, each trying to achieve its individual goal, sometimes at the expense of the other party.

IPD contracts are referred to as relational contracts because consideration is given to the process, not just to the end product (Pelberg, 2009). A number of approaches have been suggested and utilized in order to achieve this relational contract scheme. Some advocate forming a "single purpose entity" to plan, design and construct the project. The entity can be a partnership, limited liability company (LLC), or limited partnership (LP), to name a few – with the project participants being partners or members of the entity. This, in effect, makes the participants agents for one another; thereby requiring each to put the others interest ahead of their own. Others recommend having a multi-party agreement (e.g., AIA C191, ConsensusDocs 300) that includes at a minimum the owner, architect and general contractor; but can also include major subcontractors as parties to the agreement.

IPD requires that key participants form a team early in the process to collaborate, set goals and insure that potential problems or inquiries are addressed in a timely fashion.

Mutual respect and trust is the single most important principle of IPD (AIA, 2007b). Often the approach is to have a two tier team approach. One team, the executive team, is comprised of the owner, architect and general contractor (again, at a minimum). This team meets regularly and normally must make unanimous decisions. A second team includes the participation of major subcontractors and consultants. This team acts as an advisory group for the executive team.

To determine if a project is truly IPD or not, one only has to look at how the compensation and risk are handled. In a true IPD project, a profit pool is established whereby the participants' profits or fees are placed in a common pool. The profit pool is distributed after the project goals are analyzed with the distribution based upon the achievement of established goals. This, in essence, is a cost-plus basis where the owner guaranties the direct cost, but the participants' profits and potential bonuses are dependent upon the project outcome (AIA, 2007a). Bonuses may be added to the profit pool by the owner upon the teams' achievement of established goals. The bonus portion is often referred to as an incentive compensation layer (ICL) and is often plus or minus 20% of the profit pool (AIA, 2009). It is in this incentive compensation layer that the participants cash flow can be harmed. Utilizing traditional project delivery the participants earn profit with each monthly billing and that profit serves to enhance their cash flow position. In IPD the profit is withheld until the project goals are met which typically coincide with the completion of construction.

Risk sharing is an integral part of an IPD project and, in theory, there should be no legal battles among the participants. The parties are encouraged to agree to liability waivers and thus have established provisions to prevent legal disputes. As such, insurance and bonding requirements should be held to minimum cost thresholds. However, the insurance and surety industries are based upon risk analysis; and IPD does not have enough history to allow the insurance industry to truly reflect the savings that should be achieved. To illustrate this point, the Ghassemi report includes brief case studies on nine IPD projects (Ghassemi, 2011). Of the nine projects, only five of the projects used multi-party contract arrangements; and only one project reported that the contracts included liability waivers among the participants. Further, only four of the projects reported that surety bonds were not required. This illustrates that, as currently practiced, more projects are IPDish than IPD.

3 Methodology and Results: Case Study

The purpose of this study is to investigate the changes that might occur with a company's cash flow on an IPD project. This was accomplished by utilizing the case study approach. Data was obtained from a general contractor[1] on an actual project in order to investigate how the cash flow might vary from a traditional contract and billing cycle to a project organized and billed in accordance with the IPD philosophy and contracts in place. While it must be kept in mind that compensation distribution and timing is a key point in contract negotiations, the case study will be used to show possible extremes in the process.

[1]Robins & Morton, Birmingham, Alabama. Thanks to Robins & Morton for providing the "real world" data utilized in this study.

The case-study project is a recently completed project with a budget of nearly $130 million. The construction schedule was three years. While projects of all size can utilize the IPD methodology, most agree that it is best suited for larger projects. Ghassemi observed in his study projects ranging in budgetary size of $10 million to $1.7 billion (Ghassemi, 2011) with the median project size of $150 million.

Table 1 illustrates the monthly billings for the case-study project. With a traditional cost-plus contract the fee will be billed and received with each monthly billing. With an IPD contract the fee would be paid by the owner in accordance with the monthly billing, but would be paid into an incentive compensation pool (ICP) which is to be distributed once the project objectives and incentives are analyzed for achievement. Assuming the project metrics are met, the participants (the general contractor in this example) would then receive their fee. While this study focuses on the general contractor, it should be kept in mind that all participants to the contract could potentially be subjected to the same constraints.

The fee received on the project based on traditional monthly (30-day) billings with a 15-day pay cycle has a present value of $2,596,099 (Table 1). Delaying the fee until the goals of the project are achieved at the completion of construction results in a reduced present value of the contractor's fee in the amount of $2,300,950 or $295,149 less than the present value of the fee received on a monthly basis. Assuming a 6% discount rate, this amounts to a loss to the contractor of 10.6% of its fee or 0.23% of the contract amount. While this amount may be lessened with a different contract structure, the true IPD contract typically treats the goals as either a "yes" or a "no" and has little room for "partially achieved" goals (Becerik-Gerber, 2010).

This works to the disservice to the contractor as the IPD contract will generally be looked upon as a "cost plus" type contract where the contractor is getting reimbursed for all costs associated with the project and paid a fee for their work effort. The time and materials that the contractor includes in its billing to the owner generally does not include a cost of "financing" the project. In a lump sum type contract or guaranteed maximum price (GMP) contract, the contractor anticipates the costs of financing the project and should include this cost as a part of his estimate to the owner. This, however, is not a standard practice of cost plus contracts (Autodesk, 2008, NASFA, 2010).

Table 1. Monthly Billing and Fee; $129 Million, 36 Month Project

Month #	Monthly Billing	Traditional CM Fee Included in Monthly Billing	Present Value of Traditional CM Fee
1	$1,598,195	$38,226	$37,752
2	$3,814,081	$91,226	$89,647
3	$1,819,314	$43,515	$42,549
4	$4,139,104	$99,000	$96,321
5	$4,756,086	$113,757	$110,128
6	$4,485,508	$107,285	$103,346
7	$4,070,181	$97,352	$93,311
8	$5,521,567	$132,066	$125,954
9	$5,894,718	$140,991	$133,797
10	$7,849,773	$187,753	$177,287
11	$9,964,456	$238,332	$223,927
12	$7,382,208	$176,569	$165,072
13	$7,586,534	$181,457	$168,797
14	$6,806,522	$119,932	$111,010
15	$6,829,206	$147,008	$135,394
16	$6,515,237	$140,250	$128,528
17	$5,228,602	$112,553	$102,633
18	$4,209,283	$90,611	$82,213
19	$4,034,199	$86,842	$78,402
20	$3,227,930	$69,486	$62,420
21	$2,719,641	$58,544	$52,329
22	$2,301,816	$49,820	$44,310
23	$3,448,322	$73,960	$65,453
24	$1,697,340	$36,538	$32,174
25	$822,297	$17,701	$15,509
26	$4,946,925	$23,591	$20,567
27	$809,324	$17,422	$15,114
28	$1,344,821	$28,949	$24,988
29	$823,242	$17,721	$15,220
30	$941,624	$20,270	$17,323
31	$253,594	$5,459	$4,642
32	$2,669,245	$6,499	$5,499
33	$269,524	$5,802	$4,885
34	$98,602	$2,123	$1,779
35	$56,457	$1,215	$1,013

36	$168,965	$3,637	$3,017
37	$400,283	$4,588	$3,786
	$129,504,726	$2,788,050	$2,596,099

4 Conclusion

Collaboration among the parties in the building process has received increased attention and emphasis with the gain in popularity of building information modelling. While BIM, in itself, does not require a change in the ways the parities align themselves contractually, it provides an opportunity for forward looking individuals to explore new and innovative ways of accomplishing the goals of a project. One such result is IPD.

True integrated project delivery should result in all participants involved in the building process to act as team members in the truest sense, where the members not only look out for their interests but the interests of the team as a whole. While this concept has been around for a number of years, it truly is in its infancy from a practical standpoint. For IPD to reach its full potential successfully, the team concept must include all major participants.

One of the overlooked aspects of IPD has been the change in the compensation schedule of the participants. While this case study has focused on the general contractor, it applies equally to the other participants who would be involved with the compensation pool. By delaying ones compensation until definable project goals are achieved, without the benefit of including this in your contract price, has a net result of discounting your overall profit or fee. In this case study, this amounted to 0.23% of the total project budget or stated in other terms about 10% of the contractor's fee would have been dissipated by the lag in payment.

Participants should keep this in mind when they are entering into an IPD agreement. In an IPD agreement provisions can be negotiated that would alleviate the financial burden that is placed on the participants by altering those terms and conditions which affect their cash flow.

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The Impact of Contract Administration on the Development of Small to Medium Contractors in Gauteng Province

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Abstract:

Small to medium size contractors that have entered the construction industry since 1994 democratic elections have not grown rapidly to participate in contracting opportunities created by the government infrastructure programme. These contractors are responding to procurement reforms that were initiated by government. These procurement reforms have over a period of two and half decades increased the number of contracting opportunities for small to medium contractors but they have not been very successful in building their capacity to procure and complete larger contracts. This study suggests that the bulk of government construction expenditure in the medium term will be directed to larger contracts. The current mismatch in contracting capacity will be accentuated as too many small to medium contractors are pursuing fewer opportunities. The unhealthy competition amongst these contractors ensures that too few of them are able to procure successive contracts hence build up capacity to grow into larger construction enterprises.

The focus of the study was on how contract administration capability could assist the small to medium contractors with potential to complete successfully larger and/or multiple construction projects. The findings suggest the small and medium contractors have only accumulated basic knowledge of contract administration which may be sufficient for smaller contracts but is inadequate for more complex contracts. To grow the small to medium sized contractors a more in depth comprehension of technical and contractual issues relating to construction work are required. The research methodology followed was to review the relevant literature, conduct structured interviews with contractors, policy makers and project managers.

Keywords:

contractor administration, contract development, construction expenditure, small to medium scale contractors

1 Introduction

Construction industry in South Africa has grown consistently over the last decade. The industry is on the brink of sustained boom for at least the next decade if planned infrastructure programmes that underpin the country's economic development strategy are realised. Treasury is committed to infrastructure spending around R787 billion between 2009 and 2011 and this amount has since been increase to about R840 billion between 2010 and 2012 (South African Treasury, 2009 and Industry Insight, 2010)

This suggests a sustained contracting opportunities over the next few years that are predicated on public infrastructure spending. These contracting opportunities are inherently larger, technically complex and more administratively involved. The appropriately capacitated medium size contractors can augment the already stretched construction capacity to levels required to meet projected economic growth and planned construction projects.

There are too many low Construction Industry Development Board (CIDB) graded contractors that are not equipped to partake in the bulk of projects within the government infrastructure programme (Cameron, 2007). The question is how to assist these contractors to build capacity so that they can consistently and successfully complete larger project. In other words what are necessary capabilities for these contractors to grow into medium sized entities that can execute larger and/or multiple projects? The inability of low CIDB graded contractors to improve their capabilities has persisted despite more than a decade of governmental contractor development programmes.

The aim of this study was to ascertain whether the advanced knowledge of contract administration on the part of small to medium scale contractors is a requirement to grow capacity of these enterprises.

It was also investigated how low grade contractors can optimally mobilize and build-up contract administration expertise and systems necessary for larger projects in the context where resources are scarce, expensive and concentrated in already larger contracting entities.

2 Literature Review

Struggling small to medium sized contractors is an international phenomenon particularly in developing countries. A few international writers have attempted to explain the reasons for failure of small to medium scale contractors to grow into larger contractors.

Three pertinent international research works by Schleifer 1989, International Labour Office (1987) and Ganesan (1982) were reviewed and collated in order to provide theoretical grounding of the causes of construction enterprises failure. The reasons for failure of the construction enterprises to grow documented in each research work are briefly summarized below.

The seminal research on constraints to growth of small to medium contractors, based on experience of developing countries in Africa and Asia continents, was conducted by the

International Labour Office (1987). This document argues that the factors which individually or in concert can stymie the performance, consequently the growth or even the survival of small to medium contractors fall under the following categories:

Market and business environment in which the contractor operate;

Conduct of the clients; and

Inherent inadequacies of the contractors themselves.

The first two groups factors viz market and business environment are beyond the control of the small to medium contractors. The document identified the key market or environmental factors as access to work, access to finance, delayed progress payments, complex tender document, access to material and plant and scarcity of skilled labour.

International Labour Office (1987) lists the following five problems that are inherent to contractors:

2.1 Technical understanding

Most small- scale contractors have difficulties in understanding the simplest technical drawings.

2.2 Estimating and tendering

"Small scale contractors are not usually able to afford the fees of professional advisors, nor does their workload justify employing a full-time estimator instead, the contractor himself tends to compile or commit to memory cost data based on his own experience…" (ibid: 46). Inevitably the contractor can seriously underestimate the new types of projects or large projects (ibid: 46).

2.3 Contract Law

It is very rare that the works on site proceed exactly as set out in the tender document as consultants make errors, unforeseen circumstances do arise and clients also change their requirements (ibid: 32). Established contractors with good understanding of construction contract law in terms their obligation and rights will make the most of the changes.

2.4 Planning and Management

Deficiencies in planning and management skills represent probably the greatest single stumbling block among small scale contractors. "Unlike the small building project on which a single building team may work sequentially on each element, larger projects may have groups of specialist workers, each of which can be dependent on the others. … Planning, logistical and site management thus become more sophisticated and more critical "(ibid: 32).

2.5 General Bookkeeping

In order to obtain working capital loan, guarantee and insurance from financial institutions the contractor should be in a position to furnish projected income and expenditure in contract work and company's financial statements. Without assistance

from financial institutions the contractor will not be able to proceed with the project even if he has won a tender.

All the above factors listed except estimating and tendering is at play only once the contractor has been appointed and therefore is part of contract administration.

Another investigation done in the United States of America by Schleifer (1990) identified ten reasons why the small to medium contractor do not realize profit on project/s thus fail to grow, stagnate and/or decline. There are two categories of these reasons "…five relate to the company's business strategies or practical consideration and five relate to fiscal or accounting consideration" (Scheilfer, 1990: 16). They are:

2.6 Increase in Project Size

Unfamiliarity with new Geographic Area

2.7 New Type of Construction

Changes in Key Personnel.

2.8 Lack of Managerial Maturity in Expanding Organizations

2.9 Poor use of Accounting Systems

2.10 Failure to Evaluate Project Profitability

2.11 Lack of Equipment Cost Control

Poor Billing Procedures

2.12 Transition to or Problems with Computerized Accounting

In the early 1980, S. Ganesan, a researcher with the Asian Productivity Organization investigated the performance of small contractors in five countries namely Sri Lanka, Singapore, Thailand, the Philippines and Japan identified a number of generic problems leading to their failure. These are: labour shortage, access to finance, lack of policy and procurement of work

3 Research Methodology

The first step in investigating the research questions required sourcing of relevant literature amongst academic books, journals, seminar papers, proceedings of workshops, brochures of agencies dealing with constraints small to medium-scale contractors and solutions thereto. The aim of the literature review was to explore principles and theoretical foundation that can inform analysis of constraints faced by small to medium contractors and some suggested solutions thereto.

To explore the perceptions of the construction industry participants on the role of contract administration in development of construction contractors, structured interviews were conducted with key informants particularly leaders of the small to medium enterprises, CIDB officials and organized association of contractors. There were also interviews with client representatives' managing projects, senior officials

responsible for programmes providing managerial training to contractors, policy makers and relevant service providers to contractors.

A stratified random sampling technique was employed to identify respondents that were appearing in the CIDB list. For cost and time reasons only contractors that are domicile in Gauteng Province was included in the sample. The contact details of contractors based in Tshwane and Johannesburg as they appear in CIDB data base was used to compile a sample. In case where the contractor was for whatever reasons not able or unwilling to participate in the interview s/he will replace by another contractor of similar characteristics.

A sample of fifteen contractors was considered sufficient to adequately reflection of the total population. Such a sample size also ensures that the study is completed within the time and financial constraints.

It is however acknowledged that though there may be regional difference but the results should sufficiently robust to point to the national trends.

4 Findings and Discussion

4.1 Generic Characteristics of the Contracting Enterprises

All the contracting enterprises that were interviewed had their day-to-day operations managed by the equity owners who have spent the better part of their working life in the construction industry. Only 28% of the interviewees did not have long careers in the industry. Most owner managers had spent between 6 to 30 years in the construction industry. The average duration that they had run their businesses was 10 years. The shortest duration at the helm of the enterprise was 4 years.

These enterprises rarely changed equity ownership despite the fact they have been around for a decade or more. Amongst the interviewed enterprises 85% were still in the hands of the original owners.

4.2 Number of Concurrent Projects in 2008 and 2009

Table 3. Concurrent Projects

Number of Projects	2008	2009
0	0%	15%
1-2	55%	70%
3-4	30%	15%
5-6	15%	0%

Table 3 shows that on average handled two contracts per year. Only 45% in 2008 and 15% in 2009 of interviewed contractors had more than two contracts in their order books. This could perhaps be ascribed to both their fledgling capacity and unavailability of work.

4.3 Contract Administration Capacity

The owner managers were personally responsible for all contract administration matters on all the projects undertaken by the enterprises in 70% of cases reviewed. Most owner managers had some additional support from the site agent, health and safety office, quantity surveyor or project manager depending on nature of the project. The owner managers tend to be involved in matters that directly and immediately impacted on project finances (e.g.: scope of work, time and financial claims, quotes and invoices) and matters relating to on-site management (e.g. work quality, day-to-work plan, receiving site instructions, labour recruitment, security arrangement etc).

4.3.1 Owner Manager Contract Administration Experience and Formal Training

The owner managers of medium size construction enterprises have some experience in contract administration with seven years being the average duration. This refers to leadership and oversight responsibilities on projects.

4.3.2 Site Agent/Project Manager Contract Administration Experience and Formal Training

Table 4. Site/Project Manager's Experience

Site Agent/ Project Manager Years of Experience	%
Less than 5 Years	43
Between 5 – 10	14
More than 10 Years	43

The distribution of years of construction experience accumulated by site agent/project manager is bi-modal as about 43% have in excess of 10 years experience and the other 43% has less than 5 years experience. The group with 5-10 years experience constituting only 14%.

Table 5. Site/Project Manager's Training

Site Agent/ Project Manager Formal Training	%
Trade Certificate	0
Matric	0
Post-Matric Requisite Diploma/Certificate	86
Post-Matric Requisite Degree	14

All the site agents/project managers had Post-Matric construction qualifications which are equivalent of National Qualification Framework (NQF) Level 5 as per South African Qualification Authority prescribed standards. The NQF Level 4 National Certificate in Construction Management "…is regarded as the minimum competence necessary to successfully manage a contracting enterprise and for supervising building and construction works" (CIDB, March 2009: 10).

The survey suggests that the respondents had at least one person either the owner manager or the site agent/project manager, with reasonable experience and formal training on certain built environment discipline.

The person performing contract administration functions were generally working for the enterprises on full-time basis. These were either shareholders or permanent employees. There were some instances where short-term contract employees or consultants such as estimators or quantity surveyors were used on projects. This tend to happen on larger building projects usually in excess of R5 million.

4.3.3 Application of Contract Administration Knowledge Areas

In order to understand how the various contract administration tasks were executed by each contractor, the respondents were asked to identify persons to whom such tasks were assigned on current or recent projects. In such case a point was allocated to the relevant position. These points were tallied to determine the preponderance of specific task being assigned to a particular position. The results that were converted into percentiles are shown below:

Table 6 Administration/Financial Tasks

Administration/ Financial Tasks	Contracts Director/ Manager	Project Manager	Site Agent/ Foreman/Clerk	Quantity Surveyor	Health & Safety Officer	Estimator	Other[1]
Preparing Quotes for V.O's	52%	4%	4%	32%	0%	8%	0%
Preparing Payment Certificate	47%	0%	9%	38%	0%	6%	0%
Compilation and safekeeping of project records and accounts	28%	13%	59%	0%	0%	0%	0%
Processing various project authorization	38%	0%	46%	0%	0%	0%	6%
Ensuring compliance with health & Safety	8%	0%	0%	0%	92%	0%	0%

[1]Other: main contractor/ consultant/ senior JV partner

The review of the Table 6 suggests that the contracts director / managers, who are invariably the owner managers, predominantly took responsibility for matters with the immediate financial implications e.g. preparation of quotes for variation orders and preparing payment certificate. If for some reason the owner manager is unable to fulfil this role, particularly in building projects, an external quantity surveyor was contracted usually on short term basis essentially as a cost consultant. The site agent was primarily

responsible for on-site administrative matters like compilation and safekeeping of records, obtaining various authorizations. All the matters relating to compliance with health and safety issues were almost entirely left external health and safety officer.

4.3.4 Contract/Regulatory Compliance

Table 7 Contract/Regulatory Compliance Tasks

	Contracts Director/Manager	Project Manager	Site Agent	Quantity Agent	Other[2]
Preparing extension of Time/Financial claim	80%	0%	0%	12%	8%
Identify Site Instruments requiring variation order	26%	26%	18%	30%	0%
Ensuring compliance with Empowerment Regulation	54%	8%	30%	0%	8%

[2]Other: Senior JV Partner

Similarly in this group of the tasks those involving the immediate financial consequences viz time and financial claims were the prerogative of the contracts director /manager. However the identification of site instructions triggering variation orders was almost split evenly across project management staff i.e. contract director/manager, site agent or quantity surveyor. This may be an indication of the difficulties on the part of owner manager (contracts director /manager) who appropriates all tasks with immediate financial consequences to himself/herself when he/she not is always on site to receive and effect all the site instructions. It is however worth noting that although preparations of time and/or financial claim and identifying site instruction that should trigger variation order were assigned to certain personnel. Empowerment compliance which normally includes local employment, appointment of local/marginalized enterprises and training thereof seem to involve both the owner manager and site agent although more often than not the former will take the lead.

4.3.5 Construction Technology

Table 8. Construction Technology Tasks

	Contracts Manager/ Director	Project Manager	Site Agent	Quantity Surveyor	Other[3]
Ensuring that works comply with drawings and specification	23%	19%	58%	0%	0%
Oversee preparation of shop drawing and contractor alternative drawings	8%	0%	16%	0%	76%

[3]Other: Not performed yet

Building technology is the responsibility of the site agent, although there are instances where because of size of the project that is too small to employ an additional person, the owner manager perform these tasks him/herself. As a rule these contractors do not offer alternative tenders nor prepare shop drawings during construction period. This may suggest that generally these contractors are more comfortable with their routine or run of mill technical knowledge.

4.3.6 Site Management

Table 9. Site Management Tasks

	Contracts Manager/ Director	Project Manager	Site Agent	Quantity Surveyor	Other[1]
Setting out and day-to-day planning of works	8%	0%	92%	0%	0%
Projects Scheduling	57.5%	31%	11.5%	0%	0%
Appointment of subcontractors and negotiating with support	65%	15%	20%	0%	0%
Arranging site security	23%	15%	46%	0%	15%
Quantity Control	8%	11.5%	64.5%	8%	8%
Progress monitoring, recording and reporting	71%	14.5%	14.5%	0%	0%
Reading drawing and specification	42%	11.5%	46.5%	0%	0%
Expediting Issuance of Completion Certificate	50%	11.5%	8%	22.5%	8%

[1]Other: Senior JV Partner/consultant/Main Contractor

The allocation of site management tasks still were still divided according to on-site and head office functions. Consequently the site agent was primarily responsible for setting out day to day planning of work, quality control of work production, ensuring the work is according to drawing and specification and overseeing site security arrangement. On the other hand the owner manager took responsibility for work programme from start to finish, appointment of sub-contractors and suppliers, regular progress reports and recording and securing the release of retention and guarantee after issuing of completion certificate.

5 Conclusion and Further Research

5.1 Conclusions

The recent developments in construction industry have combined to create unprecedented business opportunities for small to medium sized contractors. The procurement reforms led by public sector employers have seen emerging contractors that are ordinarily smaller in scale dramatically increasing their share of construction work in the last fifteen years. This was achieved by legislative and policy changes that allowed enterprises owned by previously disadvantaged persons to get preferential treatment. This has led to preponderance of smaller sized contractors in the industry which is exceeding the scale of contracting opportunities. This proliferation of lower CIBD graded contractors has been fuelled by increasing public sector spending in construction industry since the late 1990s.

The survey in Gauteng shows that the overwhelming majority of small to medium sized contractors that recently entered the industry are owned by pioneers who are managing all operations of the enterprise at the beginning. When the enterprise grows the owner-

manager usually employs a person to oversee the work production on-site. The growth of the enterprise occurs naturally, as it increases the number and size of projects on its order book. There has been no instance of pooling of resources amongst different enterprises through mergers of acquisitions. Consequently the growth to medium size entities has been painstaking and protracted. The owners of theses enterprises were normally one person, family members, friends or colleagues who have known and/or work together for years. (CIDB, 2004:39). Whilst this ownership arrangement has ensured stability of these enterprises, operating as 'one person' or family business restricted capacity growth. The enterprises relied on a person's, friend's or family's resources or enterprise's savings to growth.

The research suggests that the majority of recently established contractors have found it difficult to grow to such an extent to enable them to successfully secure and complete large or multiple contracts. This treatise suggests that this could in part be ascribed to inadequate contract administration knowledge. For historical reasons these enterprises neither have access to the pool of persons with advanced expertise nor are they organizationally flexible enough to quickly consolidate such advanced expertise currently located amongst different enterprises.

5.2 Recommendations

Solutions to overcome these endemic inadequacies of small to medium contractors have to be found. It should however be accept that not all small to medium contractors can improve their CIDB grading. The ratio of the number of larger contracting opportunities relative to the number of contracting enterprises is also comparatively high. It is therefore imperative that small to medium sized enterprise improve their contract administration capability that will in-turn allow them to successful tender and execute larger projects .To this end the following is recommended:

The existing and already successful contractor development programme should be overhauled to improve structured training and mentoring of the small to medium contractor. The training and mentoring should be directed particularly at advanced aspects of contract administration particularly construction contract law, time and financial management and relevant procedures, identifying project scheduling of complex projects and value engineering. This knowledge could be imparted to the contractors through short courses tutoring, project mentoring/coaching or combination of both.

The small-scale construction enterprises that have generally evolved as one-person or family enterprise have limited ability to grow and consolidate beyond a certain threshold without access to professional capability (CIDB, 2004: 39). Mergers and acquisition should be deliberately encouraged to reduce the numbers of low grade contractors and increase the number of high grade contractors. The objective is to create a critical mass of resources to undertake larger and multiple contracts. It is however important to ensure that only those who combine their resources have a potential to grow. It should also be noted that mergers and acquisitions may also have disadvantages associated with it. It is possible that some staff members can become redundant due to a duplication of certain key functions. Different business objectives may also lead to conflict.

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Cost and value management

Key Construction Performance Indicators for Employers and their Agents

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Abstract:

Annual monitoring of the condition of the South African construction industry is vital to enable government and other role players to evaluate the impact of current interventions and to timely and pro-actively implement revised legislation, strategies and development programs to act as an updated roadmap for the future well-being and growth of the industry. This monitoring of the construction industry is done annually by the Construction Industry Development Board (cidb) by using key performance indicators.

A database with contact particulars of employers, contractors and agents (consultants) involved in more than 2800 projects completed in 2009 was compiled. Three separate survey forms were faxed or e-mailed to them. Their responses were captured in a Microsoft Access database.

The scope of this paper is limited to the results received from the employers and agents. Where possible the results were compared with those obtained from previous similar surveys.

It was found that only 46% of agents were paid on time. Contractor quality was discarded as being of any importance in many tenders awarded. There was a strong indication of political intervention in the allocation of tenders.

This paper contributes to the understanding of the construction industry and gives a marked-up roadmap with pitfalls to avoid on the way forward. Government can make use of the results obtained to timely and pro-actively implement revised legislation, strategies and development programs to ensure the well-being and growth of the industry.

Keywords:

CII, Construction Industry Indicators, Key Performance Indicators, KPI

1 Introduction and Literature Review

The Construction Industry Development Board (cidb) Act (Republic of South Africa, 2000) was passed in 2000 to establish a statutory body aimed at driving an integrated construction industry development strategy. This body was necessary as the

construction industry plays an indispensable role in the South African economy by providing the physical infrastructure which is fundamental to the country's development. The construction industry operates in a uniquely project-specific and complex environment, combining different investors, clients, contractual arrangements and consulting professions. It impacts directly on communities and the South African public at large, and its improved efficiency and effectiveness will enhance quality, productivity, health, safety, environmental outcomes and value for money. In terms of this act, the cidb 'may develop target and performance indicators related to best practice standards and guidelines and establish mechanisms to monitor their implementation and evaluate their impact'.

Construction Industry Indicators (CIIs) have been developed by the Department of Public Works and the cidb with the assistance of the CSIR (van Huyssteen, van Heerden, Perkins and Gyimah, n.d.: Online) to play a useful role in developing a sustainable industry and to be adopted as a tool for improving performance in the South African construction industry. The CIIs of the cidb rely heavily on international experience and particularly those indicators adopted in the United Kingdom. In the United Kingdom the first Key Performance Indicators (KPIs) were published in 1999 in response to the Rethinking Construction report by Egan (1998). These KPIs had three objectives, namely:

- To provide companies and projects with a simple method of establishing a performance measurement system;

- To provide organisations with a straightforward method of benchmarking their performance against others in the construction industry; and

- To track long term trends in performance, and specifically, to demonstrate whether the construction industry was achieving the targets set out in Rethinking Construction.

  (Rethinking Standards in Construction, 2006: 3)

Cost, time and quality are the three basic and most important performance indicators in construction projects followed by others such as safety, functionality and satisfaction (Chan and Ada, 2004: 203-221). Based on the Egan report the Movement for Innovation and Construction Best Practice Programme (CBPP) was formed and is now recognised as a leading organisation involved in the production of KPIs within the industry (Beatham, Anumba and Thorpe, 2004: 93-117). The KPIs launched by the CBPP are: client satisfaction, product and service, profitability, productivity, defects, safety, construction time and construction cost. These KPIs were benchmarked within the construction industry and have been very successful in introducing many companies to the subject of performance measurement (Beatham et al., 2004: 93-117).

The cidb CIIs measure the performance of the South African construction industry by measuring employer satisfaction with the project milestone dates achieved, construction costs versus tender amount, contractors' performance, agents' (consultants') performance, and the quality of materials used. The contractors' satisfaction is measured by their profitability, the performance of the employer and his agents, the quality of the contract documentation, the management of variation orders and claims,

payment delays and the performance of their materials suppliers. The procurement indicators measured are obtained from the agents involved and include contractor performance issues utilised in the adjudication of tenders, the type of procurement procedure used, and the contracting strategy adopted.

The cidb CIIs described above have been captured since 2003, and are currently being captured in partnership with the Department of Quantity Surveying and Construction Management of the University of the Free State. This report is part of a series of annual papers (Marx 2009) presenting the results of this continuous survey project. It is a report on the results of the 2010 survey for projects completed in 2009.

2 Methodology

A database, with contact particulars of employers, contractors and agents involved in 2807 projects completed in 2009, was compiled. Three separate survey forms were faxed or e-mailed to the contractors, employers and agents of these projects. Their responses were captured in a Microsoft Access database. The average perspectives of the respondents were determined for different project types, employer categories and provinces. All questionnaires made used of the scale shown in Table 1 to measure satisfaction levels.

Table 1. Definition of the % satisfaction levels

Dissatisfied			Neither Satisfied nor Dissatisfied				Satisfied		
10	20	30	40	50	60	70	80	90	100

3 Scope

The CIIs of the cidb need to evolve from the lessons learned from previous surveys, and are therefore subject to change and refinement. Furthermore, the CIIs used were only mainline indicators. Questions were not asked to pin-point the exact reasons for all problems experienced. The CIIs considered were only the project related indicators.

From the 2807 completed projects in the database, the contact particulars of 2807 contractors, 2624 employers and 1520 agents were available. Survey forms were received back from 1053 contractors, 434 employers and 445 agents reflecting response rates of 37,5%, 16,5% and 29,3% respectively. The scope of this paper is limited to the results received from the employers and agents.

4 Discussion of the Agents' Survey Results

4.1 Agent survey response distribution per project type and employer category

Table 2 gives a summary of the survey forms completed by agents. The number of survey forms completed is indicated for different employer categories and project types, with the purpose to evaluate whether responses were obtained for all types of construction projects and all the different employer bodies.

Table 2. Agent survey response distribution per project type and employer category 2009

Project Type	**Total No. of projects**	23	13	7	16	33	6	2	0	**% of Total Survey Results**
Residential Building	38	15	-	2	14	7	-	-	-	9
Non-residential Building	100	34	12	13	23	9	3	6	-	23
Civil Works	210	33	26	14	19	97	18	3	-	47
Mechanical Works	40	8	5	1	7	14	4	-	1	9
Electrical Works	42	7	9	2	8	16	-	-	-	9
Special Works	15	6	5	-	-	2	2	-	-	3
Not Specified	-	-	-	-	-	-	-	-	-	0
Total No. of Projects	**445**	103	57	32	71	145	27	9	1	
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	Not Specified	
		Employer Category								

Table 2 shows that the largest group of responses received were from civil works (47%) and non-residential building projects (23%) and projects of the private sector (23%), provincial departments (16%) and metropolitan councils (33%) were best represented in the survey.

The percentage survey results received from each province was also correlated with the construction activities in the province, as represented by cement sales in the particular province, to establish whether the survey captured a well distributed response from all provinces. This is shown in Fig. 1 and was found to be the case. The results are presented per project type and per client category to ensure that the results for less represented project types do not disappear in the average of all projects.

4.2 Contractor performance issues utilised in the adjudication of tenders

Agents were requested to indicate which contractor performance issues were taken into account during the tender adjudication process and the results are indicated in Table 3 for different employer categories.

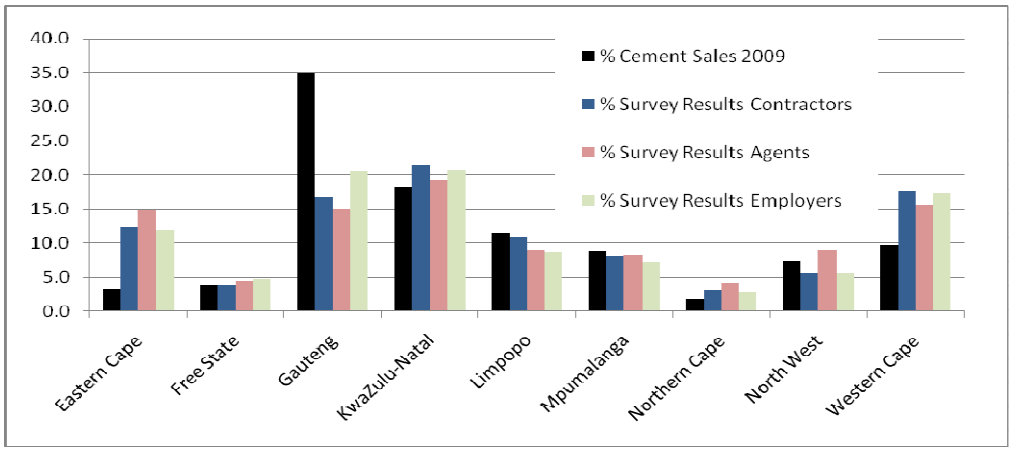

Figure 1: Correlation between survey responses received and cement sales per province (Source: Cement and Concrete Institute)

Table 3. Contractor performance issues used in the adjudication of tenders 2009

Performance Issues	**% of Projects in each Employer Category using different Performance Issues**						
Financial offer	31	16	17	10	5	11	11
Financial offer and preference	14	23	53	38	54	50	22
Financial offer and quality	21	11	3	12	6	4	34
Financial offer, quality and preference	34	50	27	40	35	35	33
	Private Sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
	Employer Category						

Table 3 shows that even the private sector incorporated preference in 48% of all their projects. No longer are price and quality the only issues evaluated and tender allocation based on financial offer, quality and preference was most popular (34%). Table 3 shows that there were still a large number of projects where financial offer and preference were the only criteria used to allocate tenders. It is alarming that financial offer and preference were the only criteria considered in 53%, 38%, 54% and 50% of projects for national and provincial departments, metropolitan councils and regional/district councils respectively. In other words, the quality i.e. capability, training, performance and track record, of the contractors, were considered as being of no importance to select a contractor to do work for the employer. This political strategy to support and build emerging contractors should be re-evaluated by government.

4.3 Agents' satisfaction with the time allowed for planning

Table 4 shows the agents' satisfaction level with the time allowed by the employer for project planning. Agents were least satisfied (68%) with the national departments for

the time they allowed for planning. According to the results received the time allowed for thorough planning and documentation is, generally speaking, not problematic.

Table 4. Agents' satisfaction level with time allowed for planning 2009

% Satisfaction per Employer Category						
78	76	68	75	78	87	82
Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Employer Category						

4.4 Deviation from the tender adjudication procedures

Agents were posed the question whether the employer awarded the tender to the responsive tenderer who achieved the best tender score during the tender evaluation process. The tenders were evaluated by the agents according to the employer's own approved tender evaluation procedures. Non-responsive tenders received were ignored. Table 5 shows the percentage of contracts that were not awarded to the responsive tenderer with the best tender evaluation score per employer category and province.

Table 5. Contracts not awarded to the tenderer with best tender score per province 2009

Employer Category	**% Contracts not awarded to the responsive tenderer with best tenderer score**								
Private Sector	8 (13)	33 (3)	26 (29)	32 (22)	25 (8)	33 (9)	25 (12)	40 (5)	18 (11)
Public Corporation	11 (9)	0 (2)	14 (14)	8 (13)	0 (2)	17 (6)	0 (1)	0 (2)	14 (7)
National Department	0 (4)	0 (2)	0 (5)	0 (4)	17 (6)	0 (3)	-	-	0 (7)
Provincial Department	13 (16)	-	0 (1)	8 (13)	54 (13)	56 (9)	25 (4)	25 (4)	13 (8)
Metropolitan Council	14 (14)	8 (12)	4 (25)	26 (23)	25 (8)	0 (6)	5 (20)	0 (3)	3 (31)
Regional / District Council	20 (5)	100 (1)	-	11(9)	-	33 (3)	0 (2)	0 (3)	0 (4)
Public Private Partnership	0 (3)	-	33 (3)	0 (2)	-	-	-	0 (1)	-
The value in brackets is the number of projects involved	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape
	Province								

The provincial department of Limpopo and Mpumalanga overruled tender recommendations in 54% and 56% of their tenders awarded. The results are disturbing bearing in mind that it is not based on perceptions of the aggrieved tenderers, but on the knowledge of the independent agents of the employers. This suggests that there may be some form of political intervention, manipulation of results or corrupt / fraudulent practices. The national departments, except in the Limpopo province, performed very

well. Table 5 shows in which provinces and for which employer categories tender adjudication practices should be investigated.

4.5 Payment delays

The average number of days delays between submission of professional fee accounts and receipt of payment is shown in Table 6. The agents' fees were paid within 30 days for only 46% of all projects completed. The provincial departments were the slowest payers with professional fees for 25% of their projects only paid after more than 60 days. Public private partnership employers followed with 22% and metropolitan councils and regional / district councils each followed with 19% of their projects where payments were only made after 60 days or more.

Agents refrain from standing up to their contractual right to be paid on time for fear of losing new project appointments in the future.

Table 6. Payment delay of agents' fees per employer category 2009

Avg. Days Delay	**% of Projects with Payment Delay per Employer Category**							**% of all Projects**
≤ 14	22	7	3	6	5	11	11	10
14 to 30	36	47	50	31	31	37	22	36
30+ to 60	32	30	31	38	45	33	45	37
60+ to 90	5	11	10	13	10	8	11	9
90+ to 120	3	3	6	8	6	4	11	5
120+	2	2	0	4	3	7	0	3
	Private Sector	Public Corporation	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	
	Employer Category							

4.6 Agents who tendered for projects

Table 7 shows the percentage of projects per employer category where agents became involved by tendering for work. For metropolitan and regional / district councils the agents tendered for 63% and 56% of all their projects respectively. The low tender percentage for provincial departments (15%) indicates that they still procure professional services by means of a roster system.

Table 7. Agents who tendered for projects per employers category 2009

19	44	31	15	63	56	44
Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership
Employer Category						

5 Discussion of the Employers' Survey Results

5.1 Employer survey response distribution per project type and employer category

Table 8 provides a summary of the survey forms completed by employers for projects completed in 2009. The number of survey forms completed is indicated for different employer categories and project types.

The table shows that the majority of responses were for civil works (41%) and non-residential building projects (21%). Projects of the private sector (29%), public corporations (20%) and metropolitan councils (25%) were best represented in the survey. The results are presented per project type and per employer category to ensure that the results for less represented project types do not disappear in the average of all projects. The percentage survey results received from each province was also correlated with the construction activities in the province, as represented by cement sales in the particular province, to establish whether the survey captured a well distributed response from all provinces. The result is shown in Fig. 1 and it was found that the survey results were well distributed between provinces.

5.2 Construction commencement milestone dates

Table 9 shows the percentage of projects with the project commencement and completion dates achieved for different project types and employer categories. It is not known whether the reason for a late start was contractors who could not produce their guarantees on time, or employers who did not have the sites ready to hand over to the contractors. Table 9 shows that 96% of all projects started on time and 87% of all projects finished on time. The finish on time date included any normal extension of time allowed for by the contract. Only 79% of the mechanical projects finished on time. This is the project type with the lowest performance. Regional / district council projects had the lowest percentage (76%) that finished on time. It is not known if the reason for late completion is lack of contractor capacity, managerial skills, finances, know-how or perhaps unrealistic construction periods specified by agents or employers.

Table 8. Employer survey response distribution per project type and employer category 2009

Project Type	**Total No. of Projects**	29	20	5	14	25	5	2	0	**% of Total Survey Results**
Residential Building	28	17	4	3	2	2	-	-	-	7
Non-residential Building	93	41	19	5	15	8	4	-	1	21
Civil Works	178	30	23	9	29	69	12	6	-	41
Mechanical Works	42	15	7	2	6	8	2	2	-	10
Electrical Works	62	14	26	3	2	14	2	-	1	14
Special Works	30	7	8	1	7	6	1	-	-	7
Not Specified	1	-	-	-	-	1	-	-	-	0
Total No. of Projects	**434**	124	87	23	61	108	21	8	2	
		Private sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership	Not Specified	
		Employer Category								

Table 9. Project start and completion milestone dates 2009

Project Type	**Start on Time %**	**Finish on Time %**
Residential Building	96	85
Non-residential Building	95	84
Civil Works	98	90
Mechanical Works	95	79
Electrical Works	94	89
Special Works	100	87
Overall	**96**	**87**
Employer Category	**Start on Time %**	**Finish on Time %**
Private Sector	95	87
Public Corporation	95	83
National Department	100	91
Provincial Department	97	80
Metropolitan Council	98	93
Regional / District Council	90	76
Public Private Partnership	100	88

5.3 Customer satisfaction

Table 10 shows the average level of employer satisfaction for different project types. These are the performance levels of their agents and contractors and the quality of materials used. Bearing in mind that a score of 80% means satisfied, Table 10 shows that employers were satisfied with the overall performance of their agents, and their contractors and the overall quality of materials used on site. Residential and non-residential building projects received the lowest score (79%) for work defect free at practical completion. Mechanical work projects received the lowest satisfaction level (79%) for the contractor's ability to finish on time. Generally speaking the average satisfaction levels expressed by the employers were high.

Table 11 shows the employers' satisfaction level with the overall performance of the contractors per province. There is an indication of low performance for certain project types in various provinces although the results are in some cases obtained from only a few survey responses.

Table 10 Employer satisfaction 2009

Project Type	**Employers' Level of Satisfaction % with**						
Residential Building	81	84	83	84	83	79	86
Non-residential Building	82	82	81	83	82	79	85
Civil Works	82	83	83	84	83	82	86
Mechanical Works	83	82	79	84	81	82	85
Electrical Works	83	84	84	87	86	84	87
Special Works	87	84	83	85	84	84	87
	Overall performance of Agents	Overall performance of Contractor	Ability of Main Contractor to finish on time	Quality of Completed Work	Main Contractor's Resolution of Defective Work	Work Defect free at Practical Completion	Overall quality of Materials used

5.4 Employers' own capacity

Table 12 shows the percentage of contracts per employer category where agents were not appointed. The national department delegated all their project design work to agents except for 4% of their projects. This indicates that there is nearly no departmental capacity in among others the engineering, architectural and quantity surveyor fields of work. Furthermore, it is quite likely that the remaining 4% projects were projects such as large painting contracts where technical and professional expertise is not required. It is of great concern that role players in the construction industry has to communicate with officials in government departments who have no or very little understanding of the contractual procedures and technical complexities inherent to construction projects.

Table 11 Employers' level of satisfaction with the overall performance of contractors per province 2009

Project type	**Satisfaction Level%**								
Residential Building	60 (1)	80 (1)	84 (5)	83 (7)	95 (2)	-	95 (2)	90 (1)	83 (9)
Non-residential Building	80 (10)	67 (3)	85 (35)	81 (16)	83 (3)	93 (3)	90 (4)	60 (2)	79 (17)
Civil Works	84 (28)	83 (11)	81 (23)	86 (40)	82 (20)	84 (14)	78 (11)	80 (5)	83 (26)
Mechanical Works	95 (6)	100 (1)	75 (8)	84 (10)	-	82 (6)	68 (4)	-	80 (7)
Electrical Works	88 (5)	83 (3)	78 (9)	82 (10)	91 (11)	85 (8)	80 (3)	90 (3)	79 (9)
Specials	90 (2)	90 (2)	79 (8)	80 (7)	90 (2)	-	80 (1)	80 (1)	90 (7)
The value in brackets is the number of projects involved	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape
	Province								

Table 12. Employer's own capacity per employer category 2009

% of Projects where Agents were not appointed						
3	8	4	11	13	0	13
Private Sector	Public Corporation e.g. ESKOM, ACSA	National Department	Provincial Department	Metropolitan Council	Regional / District Council	Public Private Partnership

6 Conclusions

The main findings of the 2010 survey for projects completed in 2009 were as follows:

1) It is of great concern that contractor quality was discarded as being of any importance in 53%, 38%, 54% and 50% of tenders allocated for national and provincial departments, metropolitan councils and regional/district councils respectively.
2) Agents were least satisfied (68%) with the amount of time allowed for planning by national departments.
3) Only 46% of agents were paid on time within 30 days.
4) There is a strong indication of political intervention in the tender adjudication procedures of many employer bodies.
5) Only 79% of mechanical works projects were finished on time.
6) Employer bodies have very little in-house capacity.

7) Employers were satisfied with the overall performances of their agents and contractors and the quantity of materials used.

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Innovative Value Management: Assessment of Lean Construction Implementation

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Abstract:
Lean construction has been predominantly employed by companies to increase their responsiveness to customer needs, through a variety of conduits, including capital and operating reduction mechanisms aligned to quality improvement measures. In this respect, clients and the construction industry need to be aware of the potential benefits of lean construction to projects to encourage them to employ lean construction techniques on their projects. This paper examines the challenges of maximising 'value' in lean construction implementation. Lean construction concepts and principles have proven to be particularly effective; and the suitability of lean construction techniques to promote value in construction is raised for discussion. The paper reveals the main strategies for implementing a value management approach to improve on lean construction methodologies in order to contribute to sustainability implementation and performance improvement. The paper also explores the theories behind value management and the concept of value optimisation within construction.

Keywords:
client value system, customer value management, value management, value, lean construction techniques

1 Introduction

The construction industry has adopted lean techniques to eliminate waste and increase profit due to the success of lean production in the manufacturing industry (Salem *et al* 2005). Most of the work in the early history of lean construction has been dealing with reduction of waste; a little work has been looking at project management principles and even less has addressed the issue of maximising value for the client (Bertelsen 2004).

At present, most construction companies in the UK have started implementing lean construction with the hope of achieving better result, following the 'Egan Report' (DETR, 1998) which has strongly influenced the idea of lean thinking in the UK. Lean thinking now seems set to dominate the UK construction industry's quest to improve quality and efficiency (Green 1999). Several studies have assessed the implementation of lean with respect to reduction of waste but few empirical studies investigated the effect of lean construction techniques in terms of value to the client. The construction industry and its clients need to be aware of the perceived benefits of lean construction on projects to encourage them to employ lean construction techniques on their projects.

Value Management and Value Engineering are techniques for enhancing value within a project by defining what will deliver value in a specific project, engineering a best value solution to meet those defined value parameters, and then delivering a cost effective solution (Egbu et al, 2004).

This paper explores the theories behind Value Management and the concept of value. It is part of an ongoing doctoral study on: the impact of lean construction techniques on sustainable construction.

2 Value Management and Value System

Value Management is considered as an important tool in managing a project. According to Kelly et al (2002), Value Management has been defined as a proactive, creative, problem-solving service. It involves the use of a structured, facilitated, multi-disciplinary team approach to make explicit the client's value system using functional analysis to expose the relationship between time, cost and quality.

Emmitt *et al* (2005) stated that value is the end-goal of all construction projects and therefore the discussion and agreement of value parameters is fundamental to the achievement of improved productivity and client/user satisfaction. Achieving best value in construction has long existed as the aim of clients and contractors. At present, it has become a raised area for drastic performance improvement in the public and private sector (Egbu et al 2004). Supporting this view, Berstelsen (2004) stated that much work remains within the area of value and Value Management including how to maintain and communicate the projects' specific value parameters during the whole project life cycle. The framework developed by Emmitt et al (2005) as shown in figure 1 reveals the 7Cs of value based building process. This shows that the client role is important in the value design stage and to the success of construction projects. OGC (2007) submits that value in its broadest scope is the benefit to the client.

Emmitt et al (2005) view value as an output of the collective efforts of the parties contributing to the design and construction process; which is central to all productivity; and providing a comprehensive framework in which to work. Value must be established before doing anything else. Emphasis is on value creating activities as the initial framework for the entire building process and the reduction of waste in the later value delivery phases.

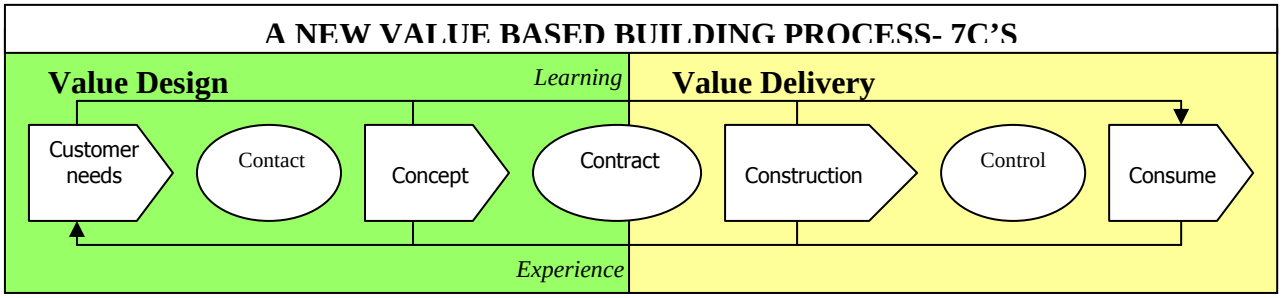

Figure 1: A value-based building process (source: Emmitt, et.al 2005)

According to Gohil et. al (2010), the concept of value can have many definitions but generally, they are not conflicting. These definitions majorly address "hard" features or elements of values and not the "soft" attributes discussed by Emmitt and Christoffersen (2008). Bruno and Lay (2008) stated that the importance of values is that once it is internalised, it becomes, consciously or subconsciously, a criteria for guiding one's

beliefs. Values exist in relation to the values held by others and are thus not absolute but are in constant transformation. Hence, agreement of an objective best "value" for a group can differ from the individuals' perception of value (Gohil et. al, 2010). Even though most people have a feeling of what is meant by the term "value", it seems to be difficult to formulate a common definition (Thyssen et al. 2010). Some definition of value from a range of perspective such as marketing, Lean Thinking, Value Management and customer relation approach are presented in Table 1.

Table 1: Definitions of value

Authors/year of publication	**Definition/description/understanding and explanation of value**
Woodruff and Gardial (1996)	Value can be considered as the final result of the exchange of negative and positive consequences as perceived by customers
Neap and Celik (1999).	Value can be considered as an innovative concept whose definition includes mainly two parameters: cost and soft measure such as worth, functionality or satisfaction (depending on the expected project out comes)
Weinstein and Johnson (1999)	Value is the satisfaction of customer requirements at the lowest total cost of acquisition, ownership, and use
Lindfors (2000)	Value is the products/services that increase profit, decrease time and cost, and improve quality for the company and generate profit/value for the customer.
Kelly and Male (2001)	Value is defined as the equivalence of an item expressed in objective or subjective units of currency, effort, exchange, or on a comparative scale that reflects the desire to obtain or retain the item.
Womack and Jones (2003)	Value refers to materials, parts or products – something materialistic which is possible to understand and to specify
Kelly (2007)	Value equals to function divided by cost
Buttle (2009)	Value is the customer's perception of the balance between benefits received from a product or service and the sacrifices made to experience those benefits.

2.1 Client Value System

Construction industry's procuring clients are largely pursuing innovative approaches to ways in which their projects are planned, designed and delivered to facilitate their business strategies. They are looking for a structured method to manage their project process within the context of their organisation business strategy, and also to work closely with the supply chain to maximise value and achieve continuous improvement in construction performance (Kelly et al, 2002). This has also been put forward by Brimson and Antos, (1999) that value depends on the supply chain synchronisation. This is because the supply chain synchronisation of supplier to organisation to customer is a key to adding value. Zimmerman (2001) widens the theory of intrinsic value in which it is stated that in any value system no parts of the variables are correlated and all variables should have intrinsic value. Value, as defined in Lean Thinking (Womack and Jones 2003), refers to materials, parts or products – something materialistic which is possible to understand and to specify (Koskela 2004).

According to Emmitt *et al* (2005), value may be divided into external and internal value: External value is the clients' value and the value which the project should end up with, while internal value is the value that is generated by and between the participants of the project delivery team (contractor, architects, designers etc.). In this regard, the concept of understanding value generation during the early stage design phase as a

learning process between the client and the design professionals has been put forward by Green (1999) such that there was a joint understanding of client's value parameters and their realisation in the design.

2.2 Customer Value Management

According to Gale (1994), there are four stages to customer value management: conformance quality stage, customer satisfaction stage, market-perceived quality and value relative to competitor's stage, and quality - a key to customer value management. Creating value that customers can see start from understanding customer needs in a well defined market and results in the overall goal of profitability, growth, and shareholders value.

Various ideas on Value Management have been put forward with emphasis on the initial project stages where the value parameters are specified (Emmit et al 2004). It is very important to understand the construction process as comprising of two distinct processes: value creation and value delivering i.e. Concept and Construction. The client has a set of requirements and budget limit and in the concept phase the challenge is therefore to maximise the value within this financial constraint (Bertelsen, 2004). A comprehensive customer value analysis was presented taking into consideration the seven customer analysis tool. The seven customer analysis tools according to Gale (1994) are:

1. The market-perceived quality profile
2. The relative price profile
3. The customer value map
4. The won/lost analysis
5. A head-to-head area chart of customer value
6. A key events time line
7. A what/who matrix

Bertelsen (2004) stated that manufacturing identifies the market's value parameters and develops the product accordingly, while construction is often creation of unique works. Construction integrates the product development with the actual production for example a flow of work and creation of value as well (Koskela, 2000). A Value Based management approach was proposed by Wandhal (2005) in which the value for the customer is considered as product value and the value for the workers and project participants is termed process value. Value Management is currently only associated with the early stages of projects, focusing on the analysis of functions to achieve the value defined by the customer without diminishing cost and quality (Salvatierra-Garrido et al, 2008).

The aim of Value Management is to optimise the points of view of different participants —from stakeholders to final users— into the process in order to achieve the final goal with minimum resources. "The concept of Value is based on the relationship between satisfying needs and expectations and the resources required to achieve them" (The Institute of Value Management UK, 2011).

2.3 Value Management Strategies

Value Management uses a unique combination of concepts and methods to create sustainable value for both organisations and their stakeholders. Value Management provides a means to define projects clearly and unambiguously in terms of the client's

and the end user's long-term business needs, and provides opportunity for options to be considered. Value Management supports crucial decision-making based upon maximising value (Smith, 2008). According to The Institute of Value Management, UK (2011), some tools and techniques are specific to Value Management and others are generic tools that many organisations and individuals use. The following are some of the main tools and techniques: Brainstorming of Mind Shower, cost benefit analysis, criteria weighting technique, excursion/metaphors, functional analysis system techniques, objectives hierarchy, issues generation and analysis, pair wise comparison, Pareto analysis, process mapping, risk analysis, SCAMPER, stake holder analysis, SWOT analysis, value analysis, and 5W's & H.

In value improvement process, value analysis or producing the FAST model and analyzing functions with the value analysis matrix are the first steps in the process. However, work begins with brainstorming, developing and analyzing potential improvements in the product.

Salvatierra-Garrido et al (2008) concluded that additional research is needed to develop Value Management enabling techniques and procedures.

3 Lean Construction and Value

Koskela (2000) carried out a detailed exploration of the use of the term 'value' and deduced that value can be related to either market value and/or utility value. This view of value is supported by many other researchers as presented in the lean construction (LC) papers (Wandahl and Bejder, 2003). Value Management is described as, "Conceptualization of production (from value viewpoint): As a process where value for the customer is created through fulfilment of his requirements." (Bertelsen and Koskela, 2002). Nonetheless, Koskela (1992) suggested that construction production process should be viewed as transformation of input and outputs, a flow of material and information, and a value generation process. Thus, value creation and generation is the major component of the Transformation-Flow-Value (TFV) of production that was put forward by Koskela (1992). Ballard and Howell (1998) stated that value is generated through a process of negotiation between customer's ends and means. According to Lindfors (2000), value is the products/services that increase profit, decrease time and cost, and improve quality for the company and generate profit/value for the customer. Leinonen and Huovila (2000) mentioned three different kinds of values; exchange value, use value and esteem value. The first two can be translated directly into market value and utility value. The third value has a broader scope than only the product-customer perception. A model for reinforcing the manager's belief is applied by Marosszeky et al (2002), and it is concluded that each organisation tends to view quality from its parochial perspective due to the culture. Figure 2 shows the difference in perception of product and process values.

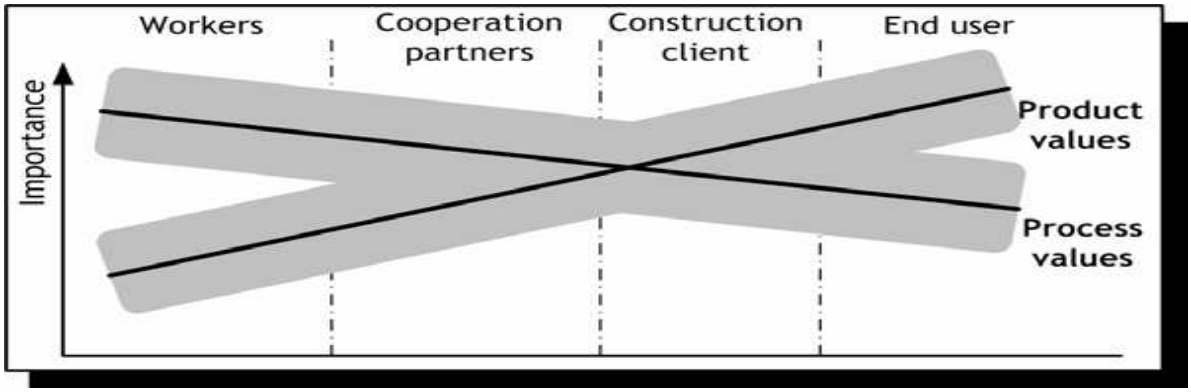

Figure 2: Difference in perception of values (Source: Wandahl 2002)

3.1 Value Delivery through the Implementation of Lean Construction Techniques

Work flow control through the Last Planner system, Value Stream Mapping (VSM), Just-In-Time (JIT) production and Supply-Chain Management (SCM), and Pokayoke or the Five Why's technique are the most commonly referred lean techniques in construction (Björnfot and Stehn, 2007). The work in lean has focused on the management of value in construction projects by using process tools to identify and minimise uncertainty and improve work flow in production (Emmitt et al 2004). According to Koskela (1992), there are two main processes in a construction project: design process and construction process. Design process is a stage wise refinement of specifications where vague needs and wishes are transformed into requirements, then via a varying number of steps, to detailed designs. Simultaneously, this is a process of problem detection and solving. It can be further divided into individual sub processes and supporting processes. Construction process is composed of two different types of flows: Material process consisting of the flows of material to the site (including processing and assembling on site), and Work processes of construction teams (Lee 1999). Koskela (1992) stated that the processes may be characterized by their cost, duration and the value for the customer. The value consists of two components: product performance and freedom from defects (conformance to specification). Value has to be evaluated from the perspective of the next customer and the final customer. Cost and duration depend on the efficiency of value-adding activities and the amount of non value-adding activities. Several principles that enable of the share of non-value-added activities conducted was summarised by Koskela (2000) as follows: increase output value through systematic consideration of customer's requirements; reduce variability; reduce cycle time; simplify by minimising number of steps; parts the linkages, increase output flexibility; increase process; transparency; build continuous improvement into process; balance flow improvement with conversion improvement; benchmark. Emmitt et al (2004) stated that in design management and lean approaches, craving for value maximisation starts from the initial team composition.

3.2 Challenges of Value Maximisation in Lean Construction Implementation

According to Mok et al (2010), few researches have been conducted pertaining to the improvement of value maximisation in the construction industry. As projects become complex, dynamic, and fast, managing value becomes a challenge in lean construction. Literature has revealed that over the years, some authors have made an approach to this challenge, mostly with an outset in methods found in value engineering or similar disciplines (Bertelsen 2004; Salvatierra-Garrido et al 2008). The creation of this waste

can be prevented by applying lean construction principles. Salvatierra-Garrido et al (2008) stated that more research efforts are needed to better understand the concept of value generation and how to implement it. This is because the major challenge in research dealing with value is the fact that the term itself has escaped a canonical definition. According to Josephson and Saukkoriipi (2005), a Swedish study reports that only about 20 % of performed work is directly value adding, showing a striking rate of pure waste in traditional construction projects. Lean construction considers both construction waste and poor safety as potential wastes that hinder flow of value to the client and should hence be eliminated. Several barriers to the implementation of lean construction have been identified as shown in Table 1. Subsequently, these barriers to the implementation of lean construction will be narrowed down to those challenging maximisation of value to client. Bashir et al (2010) classified these barriers into six different categories: Management issues, financial issues, educational issues, governmental issues, technical issues, and human attitudinal issues.

Table 1: Challenges of Lean Construction Implementation

Authors	Barriers Identified
Seymour (1999)	-how to come to grips with the specification of desired or required behaviour beyond the task level -how to articulate, through some kind of representation, what is intended and how it is to be achieved.
Common et al (2000)	- A distinct lack of understanding and application of the fundamental techniques required for a lean culture to exist
Salem et al (2005)	-The unfamiliarity with or misunderstanding of lean concepts and implementation -Cultural barriers in many organisations act as obstacles to change.
Olatunji (2008)	-Lack of adequate skills and knowledge -Management issues -Government issues such as bureaucracy and instability -Attitude issues such as wrong attitude to change and poor team spirit among professionals -Resources related issues such as lack of basic amenities, equipment, and funding for project. -Logistics issues such as delay in delivery and material scarcity
Abdullahi et al (2009)	-Lack of attentiveness and commitment from top management -Difficulties in understanding the concept of lean construction -Lack of exposure on the need to adopt the lean construction concept -Lack of proper training -Weak communication among clients, consultants, and contractors -Tendency of construction firms to apply traditional management concepts -Poor attitude and teamwork -Long implementation period
Mossman (2009)	-Fragmentation -New thinking vs. old habits -Squeezing Middle Management -Low level literacy and computer literacy -Lean education, competing consultants -There's not so practical as a good theory -Fear
Tourki (2010)	-Technological barriers -Financial barriers -External barriers -Internal barriers such as human factor, culture factor, and learning factor

This challenge is taken up by lean construction which has proved to be a valuable philosophy for construction by better meeting customer demands and improving the construction process (Howell, 1999; Ballard and Howell, 2004). Successful implementation of lean has been reported by Emmitt *et al* (2005) and a number of definitions have been suggested which may be used generally for discussing and implementing value through lean construction.

4 Value Management, Lean Construction and Sustainability

Value Management and lean construction have been seen as the way forward to improve delivery of value to clients and building users (Emmitt et al, 2005). Value Management seeks to maximise project value within time, cost and quality for the customers with an item that satisfies the basic function they require at the best value for the money spent. The term "Value Management" encompasses both Value Engineering and Value Analysis. However, it should be noted that improving whole-life project value sometimes requires extra initial capital expenditure (OGC, 2007).

Value Management is about enhancing value and not about cutting cost, although this may be a by-product. The principles and techniques of Value Management aim to achieve the required quality at optimum whole-life cost during the process of developing a project. The principles centred on the identification of the requirements that will add demonstrable value in meeting the business need (OGC, 2007). The idea of creating value is mainly focused on value engineering to ensure that the value specified will be delivered to the client while the cost is kept as low as possible (Bertelsen, 2004). Lean construction practices is intended to complement value engineering and therefore, do not compete with value engineering. Lean construction aims at maximising value and minimising waste (Lehman and Reiser 2004).

According to Senaratne and Wijesiri (2008), the core principles of lean construction are elimination of non value adding flow activities and making conversion activities more efficient. Leong and Tilley (2008) carried out a study to explore the notion of measuring next customer needs as part of a lean performance measurement strategy in order to try to achieve end user customer satisfaction. It was concluded that the failure to implement appropriate measures is common within the industry and can lead to not only wrong conclusions or behaviour, but also poor decision making due to inadequate information. Furthermore, they stated that in order to drive behaviour towards value through the elimination of waste, the industry needs to understand the principles of systems thinking and variation and implement appropriate measures to identify where system improvements can be made.

Lean thinking places ‘optimising the total value’ instead of ‘minimising the cost’ as the main goal. Within lean, cost cutting has to be seen in perspective of eliminating non value adding activities (Womack and Jones, 2003). Salvatierra-Garrido et al (2008) stated that when defining value, there are different disciplines such as the Lean Thinking and Value Management, which aim to incorporate value in the process of developing a successful final product and satisfying user’s real need. They further stated that integrating Value Management and Lean Thinking at the early stage of social housing project in Chile is proposed as the solution to achieving better results in projects where cost, quality and social responsibility are drivers. Lean Thinking in construction focuses on process tools to identify and minimise uncertainty and hence improve workflow in production (Emmitt et al., 2004).

Similarly, Sustainability is about securing our long-term future, by following the four main tenets of sustainable development which are: protection of the environment, prudent use of scarce resources, promotion of access to services for the benefit of all, and production of a healthy local economy, including high levels of employment (Royal Institution of Chartered Surveyors, 2009). According to MaSC (2002), Sustainability

promotes a balanced approach by taking account of the need to continue in business, but does not seek profitability at the expense of the environment or society's needs. Thus, sustainability concerns protecting environmental quality, enhancing social prosperity and improving economic performance (Addis and Talbot, 2001). According to the members' report of the workshop organised by Construction Productivity Network (2009), lean and sustainability concepts are basically compatible through waste minimisation. Cost savings from waste reduction can provide both real added value to the business as well as paying for sustainability actions.

According to Al-Yami and Price (2006), it is highly beneficial to adapt Value Management for use in uplifting sustainable construction principles so as to implement in the early stages of building projects. As such, there is need for a change of thinking from clients, operators and managers in the construction industry during implementation of sustainable construction principles in a project from short term to future impact; shareholders to stakeholders; product to service; and cost to value. These changes, according to Hayles (2004), are the key priorities of a Value Management project. Al-Yami and Price (2006) concluded that soft Value Management is an essential tool to be used in identifying and developing the briefing of a building project to reduce negative impacts on the environment, assure optimised whole life cost of a project, and satisfy good indoor environment in the project thus achieving the aims of sustainability.

5 Discussion

The perception of value to stakeholders in construction differs but Value Management, through the implementation of lean principles, resolves differing priorities to meet the expectation of stakeholders. So, lean construction is not only concerned with minimising waste but it directly contributes to value creation. Even though the adoption of lean construction principles seem to lay a foundation for Value Management, concerted effort should be made to further emphasise Value Management approach to improve on lean construction methodologies in order to contribute to sustainability implementation and performance improvement. Thus, there is need to determine the linkage between Value Management and lean construction, priorities of lean construction, and how implementation of lean construction principles leads to value maximisation.

6 Conclusion

Construction projects are intrinsically prone to changes and innovation. They are understood in theory to deliver value to customer/client. Currently, lean construction loses sight of the innovative and ingenious dimension of Value Management and the effect of lean construction techniques on sustainable construction in terms of value to the client. The suitability of lean construction to promote sustainable construction in terms of value to the client is discussed. The main strategies of Value Management approach to improve on lean construction methodologies in order to contribute to sustainability implementation and performance improvement are been explored, thus reflecting the concept of value maximisation at the early stage of the project.

Integrating lean construction principles in Value Management is essential for the optimisation of value for end users, construction clients and all the stakeholders as the

process and the product value is of utmost importance to them. When lean construction and Value Management are effectively integrated they form an intrinsic tool to be used for project briefing and development. This paper is part of an ongoing research which aims to examine the impact of lean construction on sustainable construction in order to further promote the understanding of lean construction principles and facilitates its adoption and implementation as regards value generation, maximisation, and delivery within the construction industry. This integration will impact on the three dimension of sustainability in a project: environmental, social and economic. The ongoing research will proceed to identify the priorities of lean construction and sustainability and also identify the success factors and barriers to the implementation of lean construction.

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Development of Models for Assessing Risk Impacts on the Variability between Contract Sum and Final Account

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Abstract:
Risk is endemic in construction projects and previous studies suggest that variability between contract sum and final account was as a result of risk occurring during the project's life. This study uses the risk theory to uncover the significant risk variables thought to impact the construction phase with attendant impact on the out turn cost of construction projects. The significant risk variables were then used to develop models for assessing risk impacts on the variability between contract sum and final account. A two-stage approach was adopted in data collection. The first was an online questionnaire survey of risk factors thought to impact the variability between contract sum and final account. A ranking of the mean score of the survey responses enabled the significant risk factors to be determined. The second stage of the data collection involved collection of data regarding contract sum and final account from recently completed projects. Quantity Surveyors who worked on the projects were then requested to score the extent of occurrence of the identified significant risk factors on a Likert-type scale. The pair of data set obtained was then used to model risk impacts on the variability between contract sum and final account using artificial neural network modelling method. The result obtained was promising and the developed models could help the construction contractor to predict the likely impacts of risk occurring at project execution phase on out turn construction cost.

Keywords:
artificial neural network, contract sum, final account, risk variables, risk modelling

1 Introduction

It is widely acknowledged that the construction industry is both more risky and uncertain than most other industries. This makes the subject of risk a very important factor to be considered in construction projects. Change is inevitable in construction and if it is not dealt with properly it can have detrimental effects on time, cost, scope and quality targets. Smith (1999) points out that change cannot be eliminated but, by applying the principles of risk management, practitioners are able to improve the effective management of this change. According to Smith (1999) risk exists when a decision is expressed in terms of a range of possible outcomes and when known probabilities can be attached to the outcomes.

Odeyinka *et. al.* (2009) investigated the budgetary reliability of bills of quantities (BOQ) in building project procurement and concluded that the difference between the budgeted cost and the final cost incurred differed greatly depending on project type. The variation between the budgeted cost of a project in the BOQ and the actual cost incurred was evaluated using secondary data obtained from recently completed traditionally procured building projects in Northern Ireland. The study concluded that with housing projects the percentage deviation from the BOQ was between -3.42% and +3.85%. With educational projects the percentage deviation was found to be between -3.69% and +17.05%. The range in regards to commercial projects is between -19.94% and +19.92%. When refurbishment projects were looked at, the percentage deviation was found to be between -10.72% and +36.90%. This finding shows that there can be a huge difference between the contract sum and the final account.

According to Flanagan and Tate (1997) clients want certainty of price, projects constructed within budget and no surprises. According to them, the budgeted cost decided at the pre-contract stage of any construction project forms the basis of the contract sum. As this is the budget established for the project it is not expected to be exceeded. According to Flanagan and Tate (1997) a contingency sum should be included in the cost budget to cover unforeseen items and all eventualities which can occur during the construction of a project. This should ensure the completion of all projects within the cost budget. However according to Winch (2010) and Walker (2002) there is much evidence in construction management literature that would indicate that it is very difficult to find a project in which the initial contract sum is not exceeded at completion.

According to Winch (2010), risk is inherent in construction from the inception to the completion stages of a project's life. According to him, the less information is available at the inception of a construction project, the higher the level of risks and uncertainties. Whilst it is a known fact that the risk factors inherent in a construction project are responsible for the observable deviation between the tender sum and final account, how these risk factors combine to impact the project cost is the concern of this study. The overall aim of the research is to model risk impacts on the variability between contract sum and final account.

2 Literature Review

According to Baloi and Price (2001) risk can mean different things to different people and therefore the concept of risk can vary according to individual's viewpoint, attitudes and experience. For example; engineers, designers and contractors may be more likely to view risk from the technological perspective whereas lenders and developers tend to view it from an economic and/or financial point of view, etc. Baloi and Price (2001) therefore concluded that risk is in general seen as an abstract concept which is very difficult to measure. Smith (1999) defines risk as a decision which has a range of possible outcomes and that a known probability can be attached to each of these potential outcomes. Akintoye and MacLeod (1997) state that risk in construction has come to attention as a very important aspect to be considered because of the occurrence of cost and time overruns in construction projects.

Baloi and Price (2001) maintained that risk within construction projects could be defined as the likelihood of a detrimental event occurring to the project. Similarly,

Wideman (1986) defines project risk as the chance of certain occurrences adversely affecting project objectives. However, Chapman (2001) argued that this definition does not take into consideration, the possibility of a positive outcome and so he defined risk as an event, which should it occur, would have a positive or negative effect on the achievement of a project's objectives. That view was also supported by the Project Management Institute (2008).

Chapman's (2001) definition was also supported by Heale (1982) who also argued that risk is an exposure to either economic loss or gain due to involvement in the construction process. Similarly, Winch (2010) argued that in statistical terms risk refers to unexpected events where the outcome is either to the benefit or detriment of the decision maker. However, he also goes on to say that in common practice risk is only used to refer to the probability of a detrimental effect, with the word reward being used to signify the probability of a beneficial event occurring.

According to Flanagan and Tate (1997) the budgeted cost established at the pre-contract stage forms the basis of the contract sum, this is the amount established for the entire project and it is not expected to be exceeded. In addition, Flanagan and Tate (1997) maintained that the budgeted cost should include for both foreseen and unforeseen costs that are needed for the completion of the project's objectives. According to Ashworth and Hogg (2002) all the planning and decision making by both the contractor and the client depends upon the budgeted cost and so the budgeted cost is expected to be accurate in order to avoid cost overruns.

According to Potts (2008), most clients work within tight pre-defined budgets, which are usually part of a larger scheme. If a budget is exceeded, the whole scheme may fail. Pre-contract estimating produces the original budget and this forecasts the likely expenditure for the client. He goes on to say that this budget should be used positively in order to make sure that the design stays within the scope of the original scheme. According to Magnussen and Olsson (2005) the observed difference between the contract sum and final account is due to factors which are not only hard to predict but difficult to manage. Morris and Hough (1991) state that cost overruns are caused by circumstances which are outside of the project's area of control. According to them, many projects overrun on cost because of price escalation, government action, strikes etc. Therefore an important issue is the ability to predict such factors and the impact they will have on the project.

Fong (1987) and Odeyinka *et. al.* (2006) asserted that it is generally recognised that those within the construction industry are continually faced with a variety of situations involving many unknowns, unexpected, frequently undesirable and often unpredictable factors. These factors according to Fong (1987) include timing schedule slippage of the project tasks, technological issues, people-oriented issues, finance, managerial and political issues. The concern of this study is the variability between contract sum and final account. The conjecture of the study is that risk is responsible for the observed variability. This study therefore explores the cognitive model of risk (Winch, 2010) to uncover the underlying risk variables impacting the variability between contract sum and final account. Using JCT (2005), some of the risk factors identified include; variations by the client, change in design by client, change in scope of works, unexpected site conditions and change in design by the Architect. Others include; problems arising due to client's lack of experience, inadequate specification, extremely

competitive tender, third party delays, defects in design, delay in resolving disputes, delay in nominated/ named material supplier, underestimation of quantities, local concerns and requirements, contract document conflicts, project funding problems, ambiguous contract terms, loss or damage by fire or flood.

3 Research Methodology

A two-stage approach was adopted in data collection. The first was an online questionnaire survey of risk factors thought to impact the variability between contract sum and final account. Data sets for the first stage were sourced from UK based Private Quantity Surveyors (PQS), Contractors' Quantity Surveyors, Architects and Project Managers. A stratified random sampling approach was adopted whereby the sampling frame was drawn from available databases such as the Royal Institution of Chartered Surveyors' (RICS) Find a Surveyor Service, the Royal Institute of British Architects (RIBA) database and Constructing Excellence in Northern Ireland (CENI) database. A total of 348 potential respondents were emailed enquiring whether they were willing to complete an online questionnaire for the purpose of this research. Of these 62 replied that they were willing to complete a questionnaire. In all, 43 completed responses were received, which translates to a response rate of 69.35%. The designation of the respondents is shown in Table 1 with mean years of experience of 26.05 and standard deviation of 12.17. A project-by-project approach was adopted in the survey and the location of the surveyed projects is shown in Table 2. About 60% of the projects surveyed were new build whilst about 40% were refurbished building projects as shown in Table 3. Using the cognitive theory of risk, a total of 18 risk factors thought to potentially influence the variability between contract sum and final account were identified from literature and also from discussion with construction professionals. Using a two-dimensional scaling, respondents were requested to score on a Likert –type scale of 0-5, the extent of the identified risk factors occurring and their perceived impacts in case of occurrence. The Likert-type scale used for the two-dimensional scaling questionnaire was defined as follows: 0 – no likelihood of occurrence and no impact, 1 – very low occurrence and very low impact, 2 – low occurrence and low impact, 3 – medium level of occurrence and medium impact, 4 – high level of occurrence and high impact, 5 – very high level of occurrence and very high impact. This then gives the measuring scale the property of an interval scale, which makes the collected data suitable for various statistical analyses.

Table 1: Designation of Respondents

Designation	Frequency	Percent	Cumulative Percent
Architect	11	25.58	25.58
Client's QS	21	48.84	74.42
Contractor's QS	6	13.95	88.37
Project Manager	5	11.63	100.00
Total	43	100.00	

Mean years of experience: 26.05 and Standard deviation: 12.17

Table 2: Project Location

Location	Frequency	Percent	Cumulative Percent
England	20	46.51	46.51
Northern Ireland	6	13.95	60.47
Scotland	2	4.65	65.12
Wales	15	34.88	100.00
Total	43	100.00	

Table 3: Type of Building Surveyed

Building Type	Frequency	Percent	Cumulative Percent
New build Commercial	7	16.28	16.28
New build industrial	4	9.30	25.58
New build public & community building	4	9.30	34.88
New build contract house building	5	11.63	46.51
New build institutional building (Education & Health)	6	13.95	60.47
Refurb commercial building	4	9.30	69.77
Refurb public & community building	7	16.28	86.05
Refurb contract house building	4	9.30	95.35
Refurb institutional building	2	4.65	100.00
Total	43	100.00	

Responses to the questionnaire survey were analysed using the mean analysis, which were subsequently ranked in order to determine relative importance of the risk factors considered. The mean score is determined as follows:

$$MeanScore = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1 + 0n_0}{(n_5 + n_4 + n_3 + n_2 + n_1 + n_0)} \quad \text{(Equation 1)}$$

Where: n_0, n_1, n_2, n_3, n_4 *and* n_5 are the number of respondents who scored the responses as 0, 1, 2, 3, 4 and 5 respectively.

Many risk management researchers as stated earlier viewed risk as the probability that cost, schedule or technical performance of a system goes wrong combined with the consequences of these aspects going wrong. With this view, they argued that risk could be measured using the following formula:

$$R = P * I \quad \text{(Equation 2)}$$

where: R = the degree of risk, P = probability/extent of occurrence of a risk factor; I = the consequence or perceived impact on a project.

Akintoye *et. al.* (2001) and Carter *et. al.* (1994) referred to this as the risk exposure or expected value (EV) while Tweeds (1996) referred to it as average risk estimate. This method of risk measurement has a well-established place in decision theory domain and has been employed in this study to determine significant risk factors.

The second stage of the data collection involved collection of contract sum and final account data from recently completed projects. Project Quantity Surveyors who worked on the projects were then requested to score the extent of occurrence of the identified significant risk factors on a Likert-type scale. The pair of data set obtained was then used to model risk impacts on the variability between contract sum and final account using artificial neural network modelling method.

4 Findings and Discussion

The summary of the mean response analysis result of construction professionals' perception of the extent of occurrence of the identified risk factors and their perceived impacts is shown in Table 4. Table 4 shows the ranked mean response analysis along the classifying categories of 'all projects surveyed', 'new build projects' and 'refurbishment projects'. The mean score analysis of the 'overall extent of risk occurrence' ranges from 1.07 to 3.26. This suggests that the overall extent of risk occurrence ranges from very low to medium level. The mean score analysis of the perceived impacts of risk occurrence ranges from 1.05 to 3.05 which also indicates that the overall risk impacts range from very low to medium level of impact. The same trend was observable for 'new build' and 'refurbishment' projects.

Using Equation 2, the degree of risk was calculated for 'overall', 'new build' and 'refurbishment' projects surveyed. The results of the calculated degree of risk are listed in Table 4. It is interesting to see that the ranking of the degree of risk for the three classifying categories follow the same order. Using risk-rating rules as suggested by the Project Management Institute (2008), a risk extent/ impact matrix was devised to determine the significant risk factors to focus on. From the list in Table 4, the top 5 risk factors were selected as those to focus attention on for modelling purposes.

It is actually not a surprise that the top 5 risk factors, namely; 'variations by the client', 'change in design by the client', 'changes in scope of works' and 'unexpected site conditions' and 'change in the design by the Architect' all ranked high in terms of extent of occurrence and impacts. This is because these are risk factors which are difficult to predict in advance in most large scale and one off projects. The majority of these risk factors are design-related and at the pre construction phase, the quality of the design will be as good as the design information available. However, during the construction phase, as more information are available, Architects may see the need for changes to the original design, clients who are also getting the grasp of construction realities may also wish to suggest variations so as to ensure that their objectives are met. In some cases, they may also suggest changes to the scope of works. Since contract sum is based on pre construction information available, it is therefore not a surprise that some variability exists between the contract sum and the final account.

4.1 Model Development

In order to model risk impacts on the variability between contract sum and final account, data were sourced from some recently completed building projects. The data

set collected include contract sum, final account, project type and whether new build or refurbishment. In order to obtain reliable models, the data sets were categorised according to building type and whether new build or refurbishment projects. Variations between the contract sum and final account were then computed for each category. Using the identified significant risk factors determined in the previous section, the project Quantity Surveyors who worked on the selected projects were asked to score on a Likert-type scale, the extent of occurrence of the identified significant risk factors. These set of data pairs were then used to develop models to predict risk impacts on the variability between contract sum and final account.

Two approaches were considered in model development, the traditional approach, using multi linear regression (MLR) and the artificial neural network (ANN) approach. The results obtained using MLR was not promising; as such modelling efforts were concentrated on using the ANN approach. According to Ogunlana et. al (2001) and Masters (1994), neural network based modelling process involves five main aspects. These are (1) data acquisition, analysis and problem representation; (2) architecture determination; (3) learning process determination; (4) training of the network; and (5) testing of the trained network for generalisation evaluation.

Since there are 5 significant risk factors which constitute the input variables, this suggests that the neural network architecture will have 5 input nodes. As there is only one output value of variation between contract sum and final account, this suggests that the neural network will have 1 output node. After a number of trials and errors, the network was found to stabilise with 2 layers of 5 hidden nodes each. Thus, the model employed a 5- 5- 5- 1 back propagation architecture as shown in Fig 1.

Table 4: Ranking of extent of risk/ impact and degree of risk for new build and refurbishment projects

Risk factors	Overall risk extent mean	Overall risk impact mean	Overall degree of risk	Rank	New build risk extent mean	New build risk impact mean	New build degree of risk	Rank	Refurb risk extent mean	Refurb risk impact mean	Refurb degree of risk	Rank
Variations by the client	3.26	3.05	9.93	1	3.32	3.08	10.23	1	3.17	3.00	9.51	1
Change in design by client	3.16	2.98	9.41	2	3.24	2.92	9.46	2	3.06	3.06	9.35	2
Change in scope of works	2.74	2.86	7.84	3	2.6	2.68	6.97	3	2.94	3.11	9.15	3
Unexpected site conditions	2.21	2.26	4.99	4	2.16	2.28	4.92	4	2.28	2.22	5.07	4
Change in design by Architect	2.09	1.95	4.08	5	2.12	1.80	3.82	5	2.06	2.17	4.46	5
Problems arising due to client's lack of experience	2.07	1.91	3.95	6	2.16	1.88	4.06	6	1.94	1.94	3.77	6
Inadequate specification	2.05	1.77	3.62	7	2.08	1.64	3.41	7	2.00	1.94	3.89	7
Extremely competitive tender	1.98	1.70	3.36	8	2.08	1.72	3.58	8	1.83	1.67	3.05	8
Third party delays	1.93	1.67	3.23	9	1.88	1.84	3.46	9	2.00	1.44	2.89	9
Defects in design	1.86	1.65	3.07	10	1.84	1.72	3.16	10	1.89	1.56	2.94	10
Delay in resolving disputes	1.79	1.65	2.96	11	2.2	1.60	3.52	11	1.22	1.72	2.10	11
Delay in nominated/ named material supplier	1.72	1.60	2.76	12	1.84	1.48	2.72	12	1.56	1.78	2.77	12
Underestimation of quantities	1.65	1.49	2.46	13	1.64	1.60	2.62	13	1.67	1.33	2.23	13
Local concerns and requirements	1.51	1.47	2.21	14	1.48	1.40	2.07	14	1.56	1.56	2.43	14
Contract document conflicts	1.4	1.42	1.99	15	1.48	1.56	2.31	15	1.28	1.22	1.56	15
Project funding problems	1.35	1.37	1.85	16	1.52	1.48	2.25	16	1.11	1.22	1.36	16
Ambiguous contract terms	1.28	1.26	1.61	17	1.4	1.36	1.90	17	1.11	1.11	1.23	17
Loss or damage by fire or flood	1.07	1.05	1.12	18	1.04	1.00	1.04	18	1.11	1.11	1.23	18

As project data were collected in different building project types, different models were developed for different project types. The one reported in this paper is the one developed for new build commercial building projects. In all, 19 data sets were collected from commercial building projects. Out of these, 12 data sets were used for training the ANN. After the network was found to have stabilised, it was used to predict the variability between the contract sum and final account for the remaining 7 data set not used for network training.

Table 5 shows the model validation results. Using absolute deviation measure and percentage absolute deviation measure, the Table shows that the difference between the predicted variation and actual variation ranges from 0.2% and 6.5%. Given the limitation of the available data set, the accuracy level of the model is very promising. With more data available, the accuracy level of the ANN model will also improve.

Table 5: Modelling validation results

Project No.	Actual % variation	Predicted variation	absolute deviation	% absolute deviation
1	0.106	0.156	0.050	5.0
2	0.093	0.044	0.049	4.9
3	0.270	0.240	0.030	3.0
4	0.017	0.015	0.002	0.2
5	0.041	0.106	0.065	6.5
6	0.131	0.094	0.037	3.7
7	0.104	0.131	0.027	2.7

5 Conclusion and Further Research

This study has attempted to model risk impacts on the variability between contract sum and final account. Using 18 risk factors derived from literature and from discussion with construction professionals, data were collected on a Likert-type scale using a two-dimensional scaled questionnaire. Data collection was on a project by project basis from different traditionally procured project types, including new and refurbished commercial, industrial, contract house building and industrial buildings. Data analysis was carried out using a mean response analysis and ranking of the mean scores. Further analysis was done using the degree of risk calculation, a procedure which is well established in risk and decision theory.

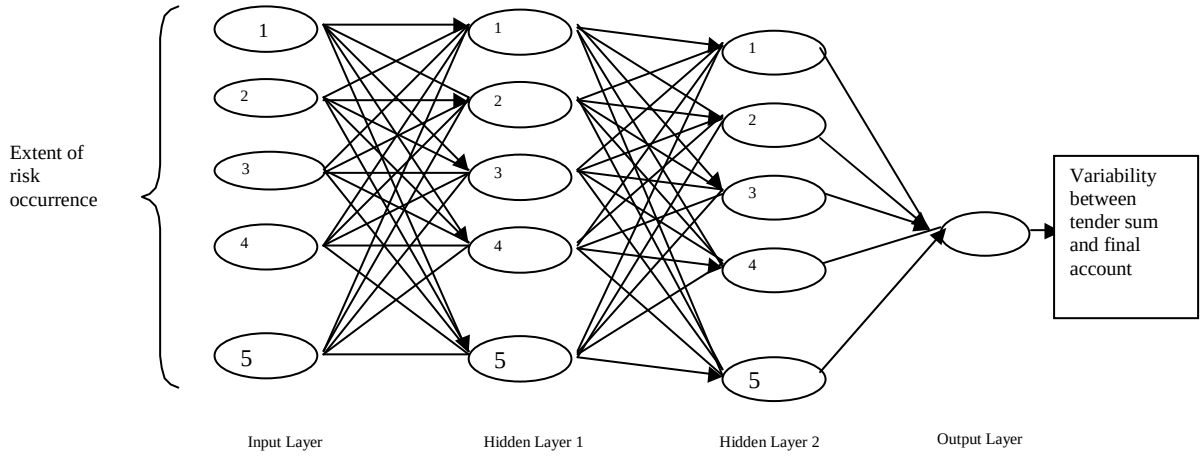

Fig. 1: Artificial Neural Network Modelling Architecture

Within the limitation of the data collected, it can be concluded that the significant risk factors impacting the variability between tender sum and final account relate to the level of design information or lack of it at the pre construction stage. Those significant risk factors include 'changes in design', 'variations by the client', 'changes in scope of works' and 'unexpected site conditions'. This finding corroborates Winch's (2010) assertion that the more information is available at the pre construction stage, the less risk to contend with during construction.

Using the 5 identified significant risk factors, namely; 'variations by the client', 'change in design by the client', 'changes in scope of works', 'unexpected site conditions' and 'change in the design by the Architect' together with the variability between contract sum and final account, a predictive model was developed using ANN. The validation results from testing the developed model showed that the difference between the predicted variation and actual variation ranges from 0.2% and 6.5%. Given the limitation of the available data set, the accuracy level of the model is very promising. With more data available in future research, the accuracy level of the ANN model will also improve. Future research could also involve the exploration of the risk theory in other procurement methods.

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Evaluation of trends in the UK construction industry using growth and productivity accounts

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Abstract:
For an assessment of the productivity performance of construction at the industrylevel, the quality of any analysis can be improved by the availability and use of detailed data on the basic components of the industry's production function. The EU KLEMS Growth and Productivity Accounts comprise a data set that provides a rich source of information on the sources of growth by industry, one of which is the construction industry (ISIC 45), since the 1970s for European Union countries and other major economies. The database allows a breakdown of factor inputs by thecategorisation of capital inputs into asset types and labour inputs into components such as skill levels to provide more precise measurement of sources of growth at industry level. The UK construction sector forms the focal point of the analysis but some comparisons are also made with the construction industries of other countries. The results of the analysis provide evidence of a steady increase in the growth of ICT and improved labour skills usage and a relatively high rate of total factor productivity for the UK construction industry.

Keywords:
growth, performance, productivity

1 Introduction

Over recent decades, there have been numerous attempts to model and measure productivity in the construction industry focusing on a multi-factor productivity approach and the measurement of total factor productivity (TFP) but such studies of industry level productivity performance assessment have been particularly hampered by the lack of availability of appropriate data on the composition of output and inputs at the meso-level. In the context of the construction industry, Arditi and Mochtar (2000) identified TFP as the definition of productivity that should be used by policy-makers to determine policy and evaluate the state of the sector. Other researchers have derived a variety of means of estimating TFP. For example, Xue et al (2008) used DEA-based indices to measure construction industry productivity in China; Li and Liu (2010) used a Malmquist index method as a decomposition technique to estimate the TFP of the Australian construction industry and analyse the factors affecting technological change in the industry; Tan (2000) and Zhi et al (2010) undertook measurement of TFP for the Singapore construction industry.

However, the problems of data provision are not just issues for the construction industry. The methodology to derive multifactor productivity growth rates has been firmly established since the work of Jorgenson et al (1987) but in practice it has been rarely applied comprehensively. In terms of international data services, the OECD and the Groningen Growth and Development Centre maintain multi-factor productivity series for OECD economies at the macro-level but, to permit international comparisons, the main bottleneck has been the lack of available statistics on the composition of labour and capital at the industry level for a sufficient number of countries. As a result, researchers undertaking international industry productivity comparisons have resorted to cruder methods of output, inputs and TFP measurement, mostly based on national accounts data, the OECD Structural Analysis (STAN) database and its predecessor the International Sectoral Database (ISDB). These databases provide industry level series on output, aggregate hours worked and aggregate capital stock for a limited group of countries and years, while ignoring changes in the composition of factor inputs.

The EU KLEMS Growth and Productivity Accounts (EU KLEMS, 2011) now provide a set of data that provides a rich source of information on the sources of growth by industry and country in the European Union and other major economies. The database is constructed from national accounts and supplementary official statistics and, using growth accounting techniques, allows growth analysis of specific industries within economies as well as divergence across economies. To analyse the causes of changes in growth and productivity rates for an industry, a detailed breakdown of factor inputs and more precise measurement of the sources of growth at industry level is important. Specifically, the categorisation of capital inputs into asset types and labour inputs into components are essential steps towards a more adequate assessment of the growth sources and measures of TFP growth.

Labour input measures in the EU KLEMS Accounts take account of changes in the composition of the labour force and capital input measures include the effects of the rapid shift in investment towards Information and Communications Technology (ICT) assets in recent years. On this latter aspect, Ruddock (2006) reported that the issue of efficiency gains from the use of ICT in the construction industry could only be fully understood if measurement of usage could be improved.

2 EU KLEMS GROWTH AND PRODUCTIVITY ACCOUNTS

The EU KLEMS Growth and Productivity Accounts database was first released in 2007 and subsequently updated in 2008 and 2009. It is the result of a European Commission funded project to analyse productivity in the European Union (EU) at industry level. The purpose of the database is to: ‘ .. support empirical and theoretical research in the area of economic growth, such as study of the relationship between skill formation, investment, technological progress and innovation on the one hand, and productivity, on the other’ (Timmer et al, 2007a, p71).

The Accounts include measures of output, employment, capital formation and TFP at the industry level for EU member states. Generally, data for 1970 onwards is available for the EU-15 (member states as of 1 January 1995) and from 1995 onwards for the EU-25 (member states as of 1 May 2004). Additionally, the database also provides similar accounts for Australia, Japan, South Korea and the USA.

The variables covered in the series in the database fall into three categories:

Firstly, basic variables necessary to construct single productivity measures such as labour productivity, including volume and price series of output and intermediate inputs and volumes and prices of employment. Secondly, growth accounting variables, which are of an analytical nature and cannot be directly derived from published national accounts data without additional assumptions. These include series on capital services, labour services and TFP. The construction of these series is based on a theoretical model of production (O'Mahoney and Timmer, 2009 provide a full explanation of the model). Finally, additional series of data on inputs by category, such as measures of ICT capital and non-ICT capital and various labour characteristics are provided.

2.1 Growth accounting

The data series incorporate measures of output and input growth and derived variables and can be used to consider productivity growth for cross-national comparisons, inter-industry comparisons or for individual industries over time. The variables are organised around growth accounting methodology, which provides a clear conceptual framework, within which the interaction between variables can be analysed in a consistent way. Based on the methodology of Jorgenson and Griliches (1967) and further developed by Jorgenson et al (2007), the growth accounts allow the absolute and relative importance of labour, capital and intermediate inputs to growth to be measured and the derivation of multi-factor productivity measures to indicate the efficiency with which inputs are being used in the production process.

2.2 TFP as a measure of efficiency

Under strict neo-classical assumptions, TFP growth measures disembodied technological change but, in practice, TFP is derived as a residual and includes a host of effects such as improvements in allocative and technical efficiency, changes in returns to scale and mark-ups, as well as technological change proper. All these effects can be broadly summarised as "improvements in efficiency" (Timmer et al, 2007a), as they improve the productivity with which inputs are being used in the production process.

When used in industry comparisons across countries, measures of TFP provide an indication of relative levels of the efficiency of input use between that industry in different countries - TFP levels being measured as the difference in output when differences in all inputs have been accounted for. Differences in TFP levels can be interpreted as differences in the level of disembodied technology, where technology is defined narrowly as level differences in the production functions in different countries. TFP does not, for example, include technology differences that are embodied in the use of capital goods. However, this interpretation of TFP levels is only true under a stringent set of assumptions including an identical production function, constant returns to scale, competitive markets and technical and allocative efficiency. Moreover, input measures must adequately reflect differences in adjustment costs, cyclical effects and input quality between countries (See Schreyer and Pilat (2001) for further discussion).

3 INDUSTRY LEVEL GROWTH ACCOUNTING USING EU KLEMS DATA

3.1 Growth Accounting methodology

Based on the work of Jorgenson and Griliches (1967), the growth accounting framework utilises production possibility frontiers where industry gross output is a function of inputs indexed over time. Output growth can be expressed as a (cost share) weighted growth of inputs and technological change using a translog functional form (O'Mahoney and Timmer, 2009). This means that the production function for an industry is given by:

$Y = f(X, L, K, T)$

where Y = gross output, X = an index of intermediate inputs, L = an index of labour service flows, K = an index of capital service flows and T = time.

3.2 Factor inputs

Input and output measures from the UK EU KLEMS database can be used for levels estimations (Timmer et al, 2007a). The share of each input in the value of output under growth accounting assumptions equals total cost. The contribution of each input to gross output growth is found by multiplying its share by its growth rate.

The capital and labour service indices derived in the EU KLEMS database are used in fixed effects and first differences estimations.

TFP indicates the efficiency with which inputs are being used in the production process and is an important indicator of technological change. Under the assumptions of competitive factor markets, full input utilization and constant returns to scale, the growth of output in an industry can be expressed as the (compensation share) weighted growth of inputs and TFP (denoted by A):

$$\Delta \ln Y = v_x \Delta \ln X + v_l \Delta \ln L + v_k \Delta \ln K + \Delta \ln A$$

Where $\Delta \ln X$, $\Delta \ln L$ and $\Delta \ln K$ are the growth rates of intermediate inputs, labour services and capital services respectively; $v_{x,}$ $v_{l,}$ and v_k indicate the respective shares of intermediate inputs, labour services and capital services respectively in total gross output averaged over two years and $v_x + v_l + v_k = 1$. Each of the three input elements on the right-hand side therefore indicate the proportion of output growth accounted for by growth in the three inputs.

Accurate measures of labour and capital input are based on a breakdown of aggregate hours worked and aggregate capital stock into various components. Hours worked are cross-classified by various categories to account for differences in the productivity of various labour types, such as high- versus low-skilled labour. Similarly, capital stock measures are broken down into stocks of different asset types. Short-lived assets like computers have a much higher productivity than long-lived assets like buildings, and this is reflected in the capital input measures. The contribution of intermediate inputs is broken down into the contribution of energy goods, intermediate materials and services.

The EU KLEMS database makes it possible to take into account changes in the composition of the labour force and the use of capital services, so that TFP is a proxy for technical change.

3.3 Measurement of labour services

An important feature of the database is the breakdown of the labour input data into different components. There may be considerable differences in the productivity levels of, for instance, low-skilled and high-skilled workers. If measures of labour input take the heterogeneity of the labour force into account in analysing productivity, the contribution of labour to output growth can be better measured.

In the accounts, the term for the labour input measures is *labour services*, as they allow for differences in the amount of services delivered per unit of labour in the growth accounting approach. Based on the assumptions that that the flow of labour services for each labour type is proportional to hours worked and workers are paid their marginal productivities, an index of labour services (input L) is given by:

$$\Delta \ln L = \Sigma v_{li} \Delta \ln H_{li,}$$

Where $\Delta \ln H_{li}$ indicates the growth of hours worked by labour type i and weights are given by the average shares of each type in the value of labour compensation. In this way, aggregation takes into account the changing composition of the labour force. The database provides a break-down of the labour into categories based on skill level, gender and age group (providing eighteen labour categories in total). This means that labour composition effects can take account of the effects of factors such as a shift in the share of hours worked by low-skilled workers compared to high-skilled workers.

3.4 Measurement of capital services

For the capital input, a feature of the database is the categorisation of capital assets.

Investment series by asset type and by industry come from series obtained from national statistical institutes, allowing for a detailed industry-by asset analysis. An important distinction is that made between ICT assets (office and computing equipment, communication equipment and software) and non-ICT assets (transport equipment, other machinery and equipment, residential buildings and non-residential structures). Quality-adjusted investment deflators for ICT assets are used based on a harmonisation procedure suggested by Schreyer (2001). The real investment series are used to derive capital stocks through the accumulation of investment into stock estimates using the perpetual inventory method and the application of geometric depreciation rates. Then capital service flows are derived by weighting the growth of stocks by the share of each asset's compensation in total capital compensation as follows:

$$\Delta \ln K = \Sigma v_{kj} \Delta \ln S_{kj}$$

where $\Delta \ln S_{kj}$ indicates the growth of the stock of asset j and weights are given by the average shares of each asset in the value of total capital compensation. In this way, aggregation takes into account the widely different marginal products from the heterogeneous stock of assets.

The weights are related to the user cost of each asset. The user cost approach is crucial for the analysis of the contribution of capital to output growth. This approach is based on the assumption that marginal costs reflect marginal productivity.

4 ANALYSING THE PERFORMANCE OF THE CONSTRUCTION INDUSTRY USING THE EU KLEMS DATA FILES

The EUKLEMS Growth and Productivity Accounts provide data over a period from the 1970s to 2007 for thirty countries covering forty sectors, one of which is the construction industry (ISIC 45). The database enables inter-industry comparisons to be made between the construction industry and other sectors of the economy in addition to inter-country comparisons.

The analysis in this section focuses on value-added as the basis for an assessment of the performance of the industry. Analogous to the breakdown of gross output growth into its constituent input growth components, value added growth can be decomposed to capture the contribution of inputs and TFP growth as:

$\Delta \ln VA = w_l \Delta \ln L + w_k \Delta \ln K + \Delta \ln A$

Where VA = value added and w_l and w_k indicate the share of labour and capital respectively in value-added.

As indicated previously, the contribution of capital services to value added growth can be split into the separate contributions of ICT capital and non-ICT capital.

The contribution of labour services can be split into the contribution of hours worked and the contribution of changes in labour compensation or into different contributions by skill level (or age or gender).

In the following sections, an appraisal of the UK construction industry is undertaken in terms of resource usage and productivity, utilising the basic variables, growth variables and additional series from the database by consideration of value added volume, trends in labour productivity, changes in input usage based on factor shares and the categorisation breakdown of those factor shares and finally TFP.

In this appraisal, the choice of areas for analysis is based on an attempt to highlight some of the particularly useful aspects of the available data. For instance, a focus of the component breakdowns of inputs concerns the complementary patterns of change in the use of skilled labour and ICT capital. Throughout these sections the analysis is based on data derived from the EU KLEMS Productivity and Growth Accounts.

4.1 Growth rate of value added volume

It is well-documented (by Barras (2009) and many others), that the construction industry is subject to higher rates of fluctuation in its level of activity than other sectors of the economy. Figure 1 allows a comparison between value added change in construction and total industries (i.e. the aggregate of the forty sectors). In comparison with other industries, the construction industry rate of change in value added is much more exaggerated in periods of economic boom or recession than other industries.

During the boom period of the late-1980s, for instance, the growth rate for construction peaked at 11.2% in 1987 but the total industries rate only reached 5.1% in 1988 and, during the 1991 downturn, the construction industry's 8.3% negative growth rate far exceeded the total industries decline to -0.5%.

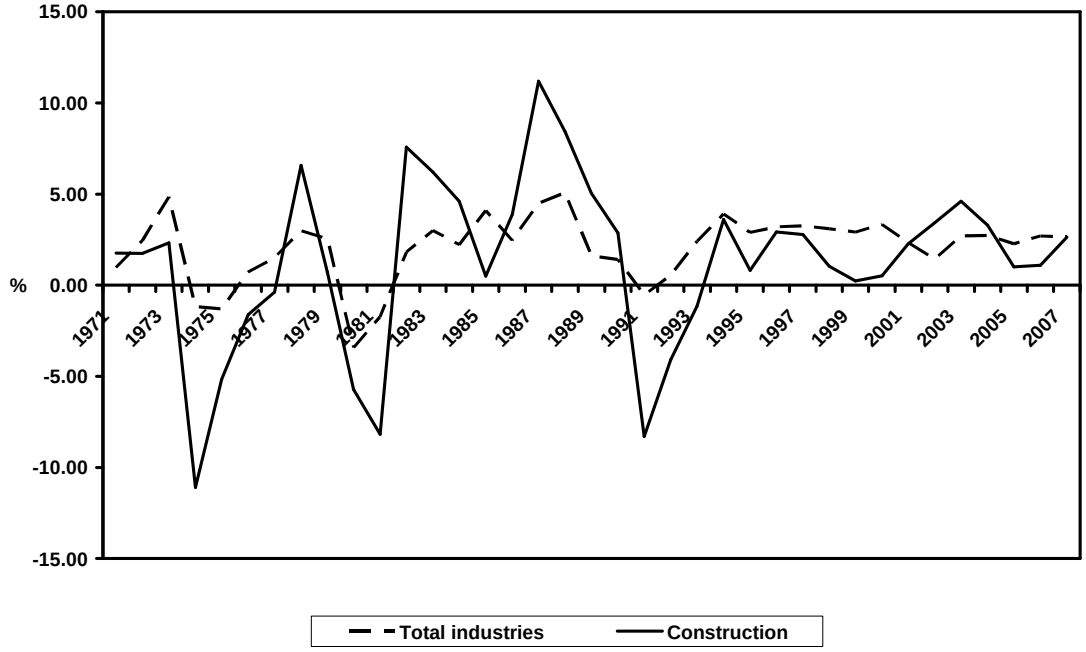

Figure 1. Growth rate of value added volume (% per year): UK construction industry and total industries

Even more extreme, has been the comparative effect on the contribution of hours worked to value added growth, with workers laid off or put on shorter working hours much more readily in the construction industry compared to other sectors. For instance, for the construction industry, the decline from the peak growth rate of 6.9% to the low of -11.9% over the period 1988 to 1992 compares to a change from 3.5% to -3.2% for total industries over the same period, as shown in Figure 2. Conversely, the comparative increase in growth was at a far higher rate for construction during upturns in the economic cycle.

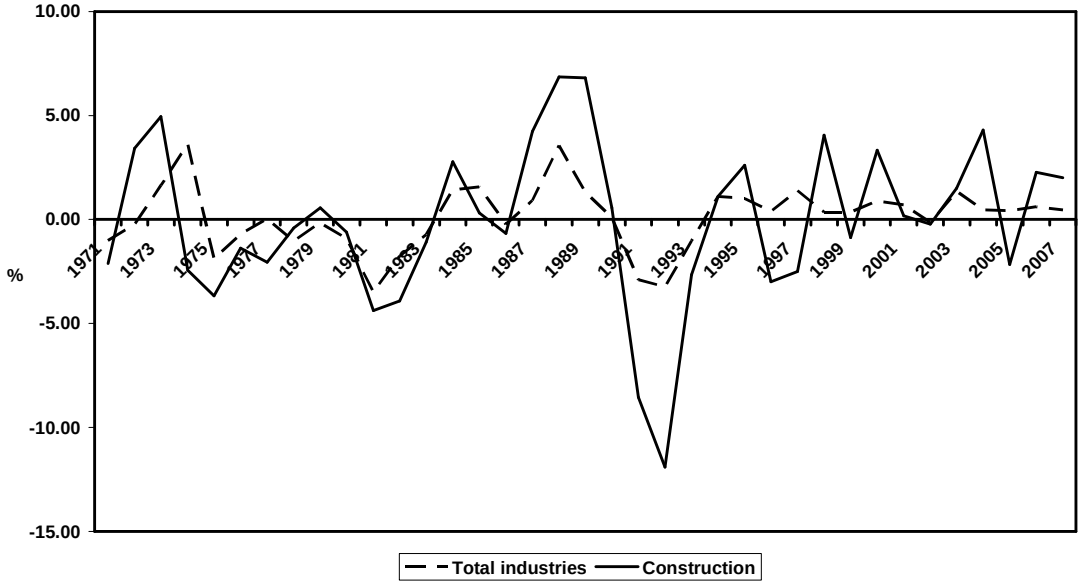

Figure 2. Contribution of hours worked to value added growth (% per year): UK construction industry and total industries

4.2 Trends in labour productivity

General trends in labour productivity: Value added per hour worked

Cross-industry comparisons can be made in terms of the value-added per hour worked as a measure of productivity. There are significant differences between the rate at which value added per hour worked in different sectors of the economy has changed in recent decades. In Figure 3, the construction industry is compared to total industries, manufacturing and post and telecommunications - the latter being an example of an industry that has most benefited from new ICT development. In the construction industry, value added per hour worked in real terms shows a consistent, moderately rising trend since 1977. Throughout the period, gross value added per hour worked in the UK construction industry has remained at about the same level as that of total industries whereas, since the late 1980s, for manufacturing it has grown significantly and for post and telecommunications (ISIC 64), a high technology industry, increased exponentially.

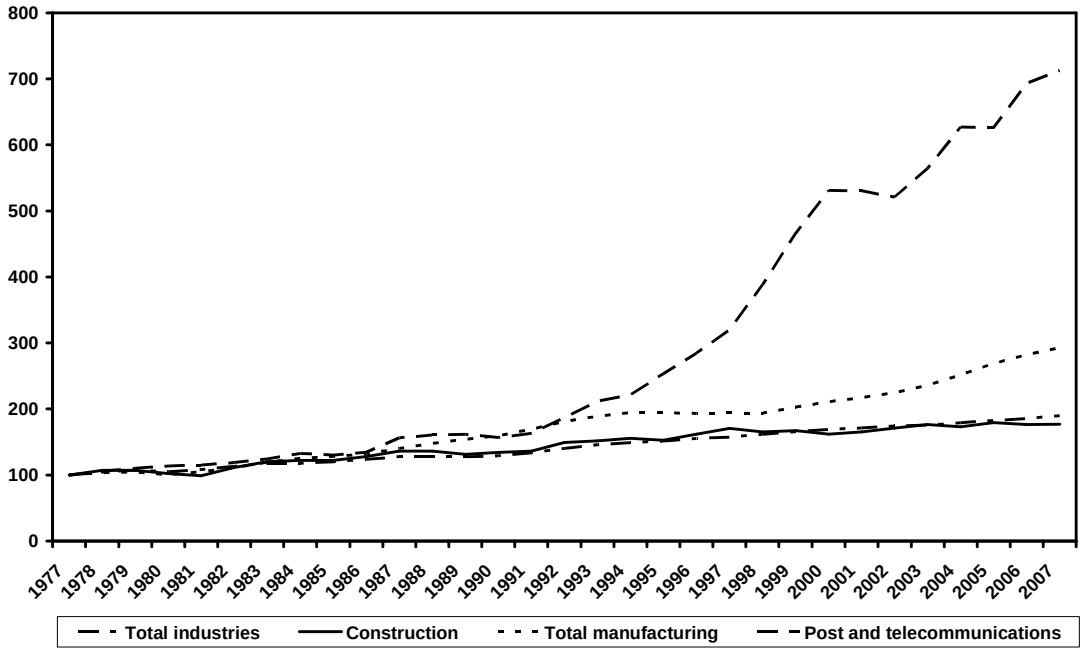

Figure 3. Value added per hour worked in selected UK industries (1977 = 100): An inter-industry comparison

Making international comparisons for the construction industry (Figure 4), the aggregate EU-15 countries also show a similar rising trend to the UK (albeit at a lower level), even though there are significant differences between the constituent countries. In the USA, however, the construction industry has been one of the poorest performing sectors, with a steadily declining level of value-added productivity – one of the few sectors in that country to do so. In Japan, the upward trend of the 1980s was replaced in the 1990s by a steady decline and a levelling off post-2000. With Japan having experienced a prolonged period of economic stagnation since the beginning of the 1990s, the construction industry began to experience declining values since 1990 and, by 2007, the index was back to its 1987 levels.

Generally, labour productivity in construction is particularly low. There is a wide range of levels in growth across industry sectors, which suggests that industries differ significantly in their production technologies. Whereas Kuznets (1971) and Maddison (1980) noted the slow growth of labour productivity in services and construction compared to manufacturing industry from the late 1940s until the1960/1970s, since the 1980s, the ability to utilise and take advantage of information and construction technology has been a major factor in determining an industry's ability to raise its labour productivity at a higher rate.

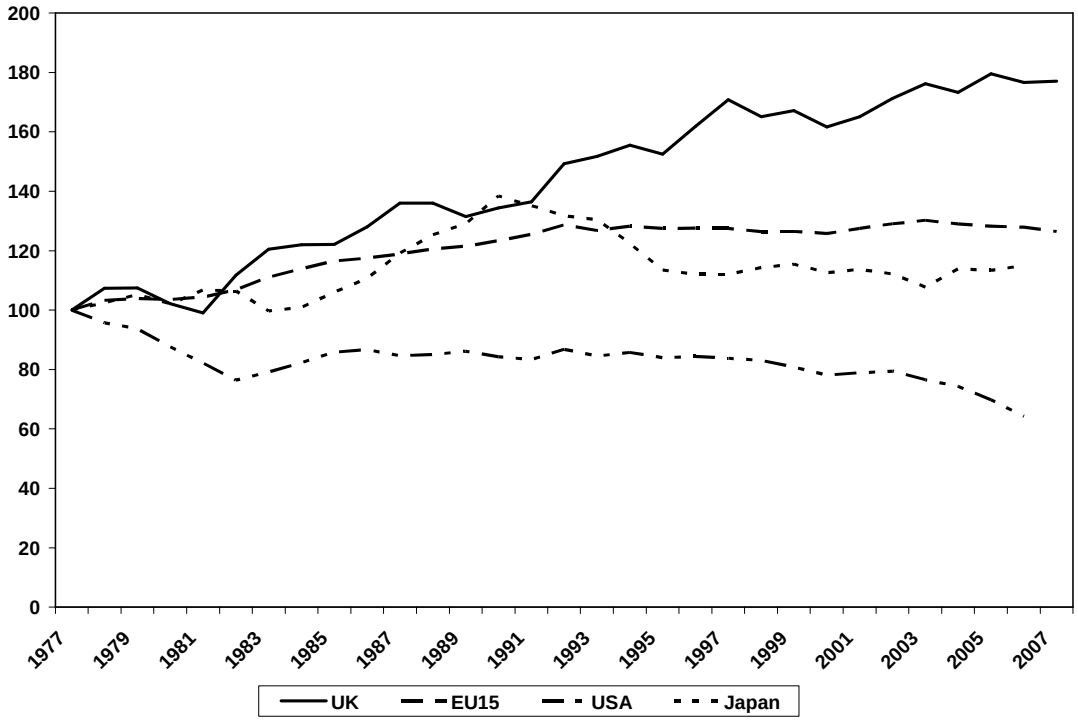

Figure 4. Value-added per hour worked in the construction industry (1977 = 100): An international comparison

4.3 Changes in input usage

The long time series in the EU KLEMS factor database permits a longitudinal study of resource usage over the period. In terms of inputs, in addition to consideration of the changing capital : labour ratio over time, the breakdown of factor compensation data allows comparative usage of different categories of labour and of capital to be measured.

For example, in terms of labour, the breakdown of compensation data by skills levels allows comparisons to be based on the skills mix and questions to be considered, such as: Has the construction industry become more skills intensive over time and what happens to the skills mix during periods of recession in the industry?

Regarding capital usage in the industry, a widely accepted view is that the industry has fared poorly in its ability to take advantage of developing ICT. Data on the split of capital usage into between ICT and non-ICT capital enables consideration of the validity of the view that construction is an industry with an inability to take advantage of developments in ICT compared to most manufacturing and service sectors.

4.4 Factor shares and the use of ICT and skilled labour

Dynamic change in any industry entails not only changes in output and productivity but also shifts in the mix of inputs. As Jorgenson and Timmer (2009) point out, generally technical change favours inputs that are well-suited to the generation and processing of knowledge and information i.e. skilled labour and ICT capital.

In order to track, over time, the use of labour and capital inputs in an industry, cost share (price times quantity) data can be used. The relative share of the two inputs (or input intensity) is determined as:

$P_L Q_L / P_V Q_V$ and $P_K Q_K / P_V Q_V$

Where $P_V Q_V$ is the total value added with a cost share of ($P_L Q_L$) for labour and ($P_K Q_K$) for capital respectively.

4.4.1 The labour-capital compensation mix

The share of labour compensation in total value added for the construction industry has generally been at around the 70-75% mark throughout the period. This is consistent with Kaldor's (1961) view that there is a 'natural' level for the split in value added between labour and capital. As can be seen in Figure 5, this has been similar to the total industries level apart from the 1990s, when labour compensation in the construction industry averaged around five percentage points higher. For comparison purposes, it can be seen that the business services sector saw a relative shift away from labour compensation, as ICT investment took off in the 1990s.

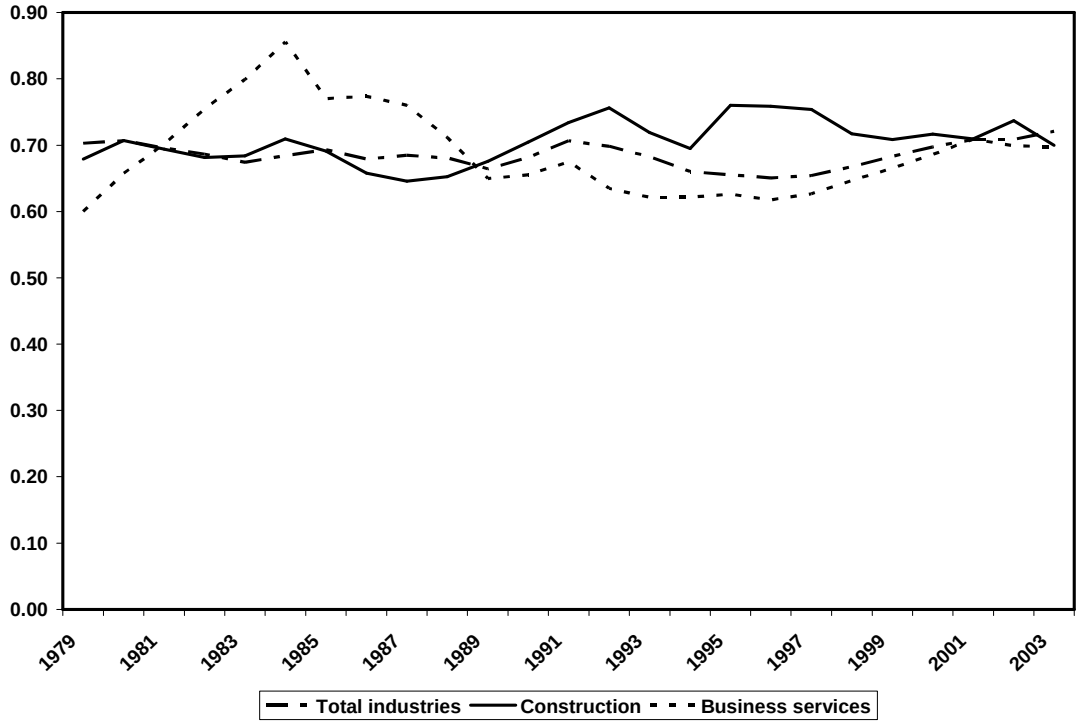

Figure 5. Share of labour compensation in value-added: A UK inter-industry comparison

4.4.2 Trends in labour compensation

Labour compensation is determined by the two elements of labour services per hour worked and the number of hours worked. What has been a significant trend has been the trade-off between these two components over time. There has been a very notable trade-off between the cost of labour services per hour worked and the average number of hours worked and there is a strong inverse correlation between the two variables. As

wage costs have increased, the average number of hours worked per worker has tended to fall.

Figure 6 illustrates that the rise in the hourly cost of labour services has been accompanied by a declining trend in the average number of hours worked over the period, with the recessionary years of the late 1980s to the early 1990s being the exception due to a decline in average wages.

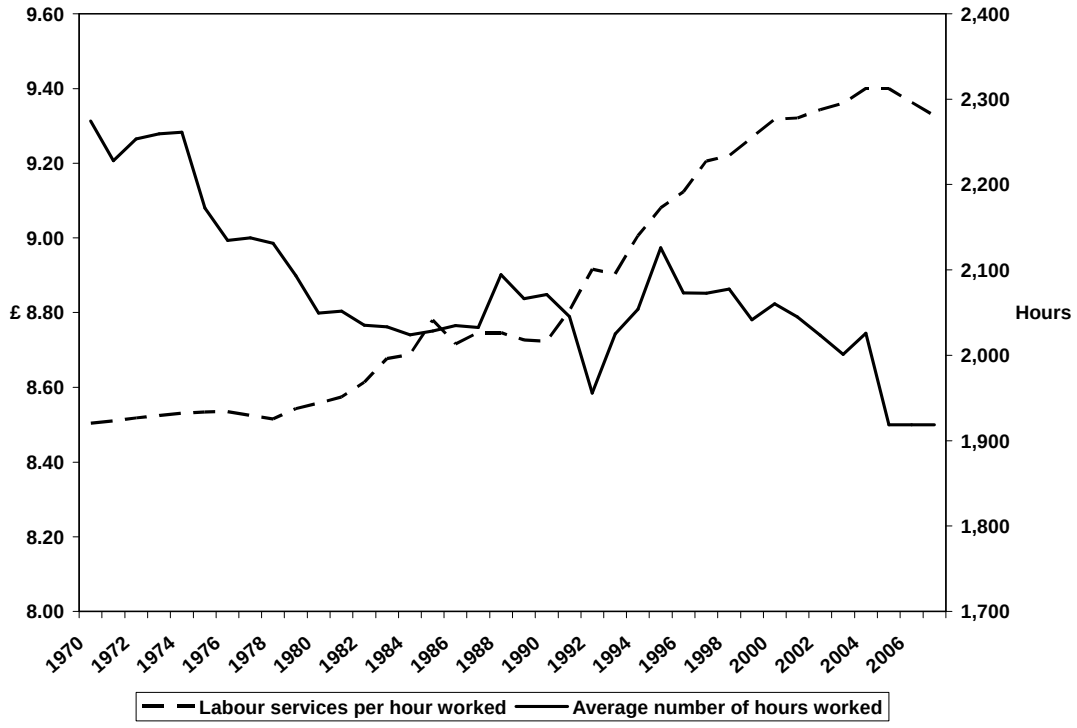

Figure 6. Labour services per hour worked and average number of hours worked in the UK construction industry

4.4.3 Changes in the skills mix

A breakdown of the labour input categorised into three skill levels enables changes in the use of skilled labour to be tracked. The definitions of high, medium and low skills are consistent over time for each country but do differ across countries. For the UK, High-skilled refers to university degree or equivalent; Medium-skilled includes qualifications from trade apprenticeship, GCSE, BTEC/HND or equivalent; Low-skilled means no qualifications (Timmer et al, 2007b). Incorporating educational attainment as a measure of skill may be too restrictive for comparisons across countries, but is useful for tracking developments over time within a particular country such as the UK.

In terms of the compensation share of workers categorised by skill, there are large differences between industries in the use of high-skilled labour. In the UK, as in other countries, construction is invariably among the least skill-intensive industries. This is remarkably consistent over time. A feature of the EU KLEMS database is that each of

the inputs is defined as a translog function of its components. The weighting procedure means that, for instance, a doubling of hours worked by a high-skilled worker gets a bigger weight than a doubling of hours by a low-skilled worker.

An interesting aspect of the trend of the skills mix is the variation in the volume growth rate of labour use by skill category. In Figure 7, it is apparent that there is a high degree of correlation between the growth rate for high-skilled and low-skilled labour but the pattern for the use of medium-skilled labour is much more extreme in terms of the level of change during upturns and downturns. This indicates that the use of technical staff and craft level workers is subject to the greatest changes during periods of downturn and upturn in construction activity.

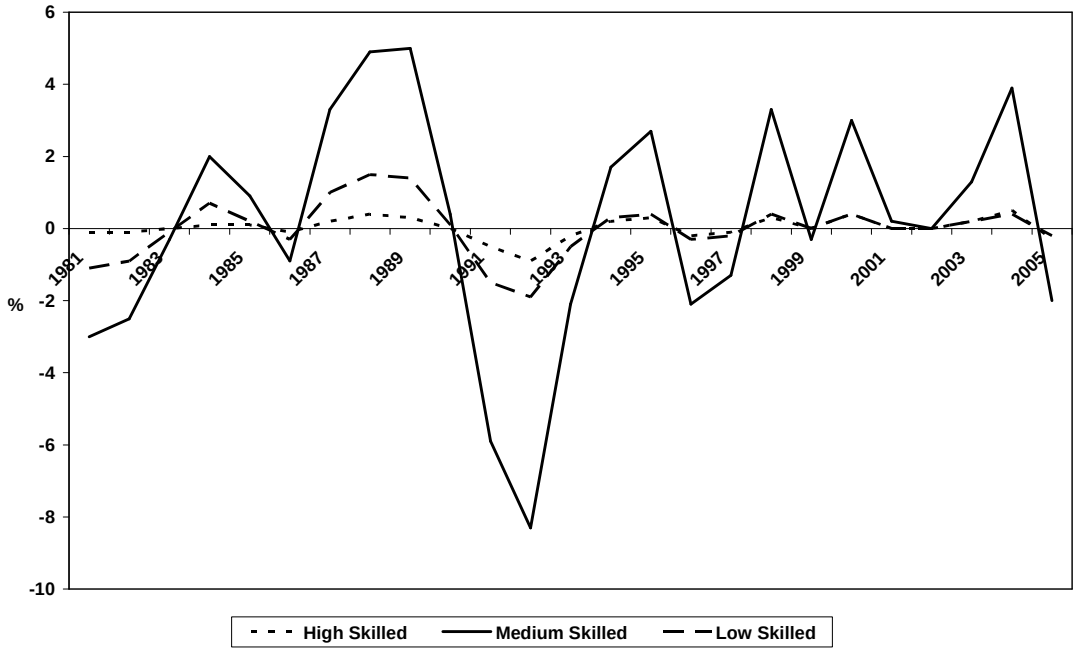

Figure 7. Skills compensation breakdown in the UK construction industry - Annual average volume growth rates (%)

4.4.4 Trends in capital compensation

ICT capital intensity is difficult to measure because the quantities and prices of capital services are not directly observable. Based on the capital services approach (Jorgenson and Griliches, 1967), the capital input can be measured through its delivery of services as measured by user cost. This approach takes account of the fact that the annual amount (value) of capital services delivered per £ investment in ICT is much higher than, for instance, than that for buildings.

In the EU KLEMS database, ICT assets include IT assets, communication technology assets and software. ICT intensity is measured by total capital compensation multiplied by the share of ICT assets in total capital compensation divided by the nominal value-added. As pointed out by Ruddock (2006), the benefits from investment in ICT in the construction industry in terms of improved efficiency and productivity are notoriously difficult to determine accurately. Figure 8 shows that ICT capital services growth rates have been much less volatile than non-ICT. ICT intensity of production has doubled or

even tripled over the period from1980 to 2005. This rapid increase in the share of ICT in value added (from an obviously low base) can be attributed to strong substitution with ICT induced by the rapid decline in its price relative to non-ICT assets and labour.

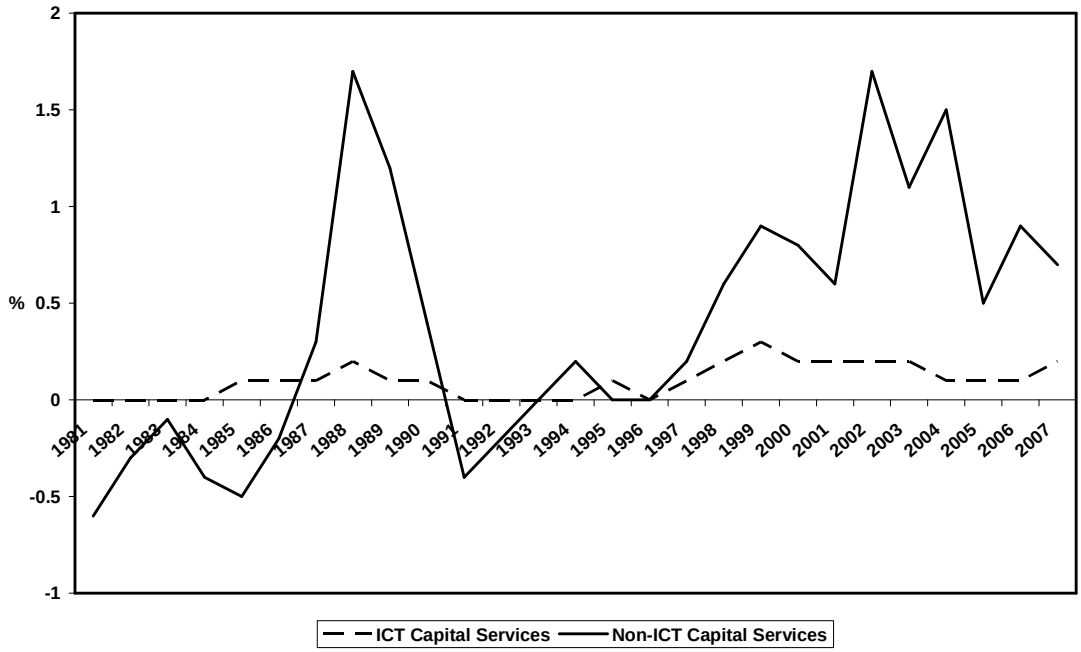

Figure 8. Capital services breakdown in the UK construction industry - Annual average volume growth rates (%)

4.5 TFP growth trend

When the growth in value added is decomposed and the contributions of factor inputs are removed, the residual is TFP growth. TFP includes a range of effects and its value can be affected by many factors. Ruddock and Ruddock (2009), for instance, indicate that issues such as the effects of organisational change and the non-inclusion of intangible capital investment can significantly affect the value of TFP.

In effect, value added TFP only provides an indication of the importance of productivity differences in factor inputs. Figure 9 shows the TFP contribution to value added growth for the UK, USA and Germany (for the various periods for which these data are provided in each country's accounts). In each case, there have been periods in which the annual growth of TFP has been negative but for the UK the average annual growth rate over the period 1981-2007 was 0.68%. This compared favourably with the negative TFP growth rates of -0.78% (1992-2007) for Germany and -2.15% (1978-2007) for the USA. The figures corroborate the results of the study by O'Mahoney and de Boer (2002), in which, for the period 1989-99, they estimated the annual TFP growth rate to be 0.69% for the UK but negative for Germany and the USA.

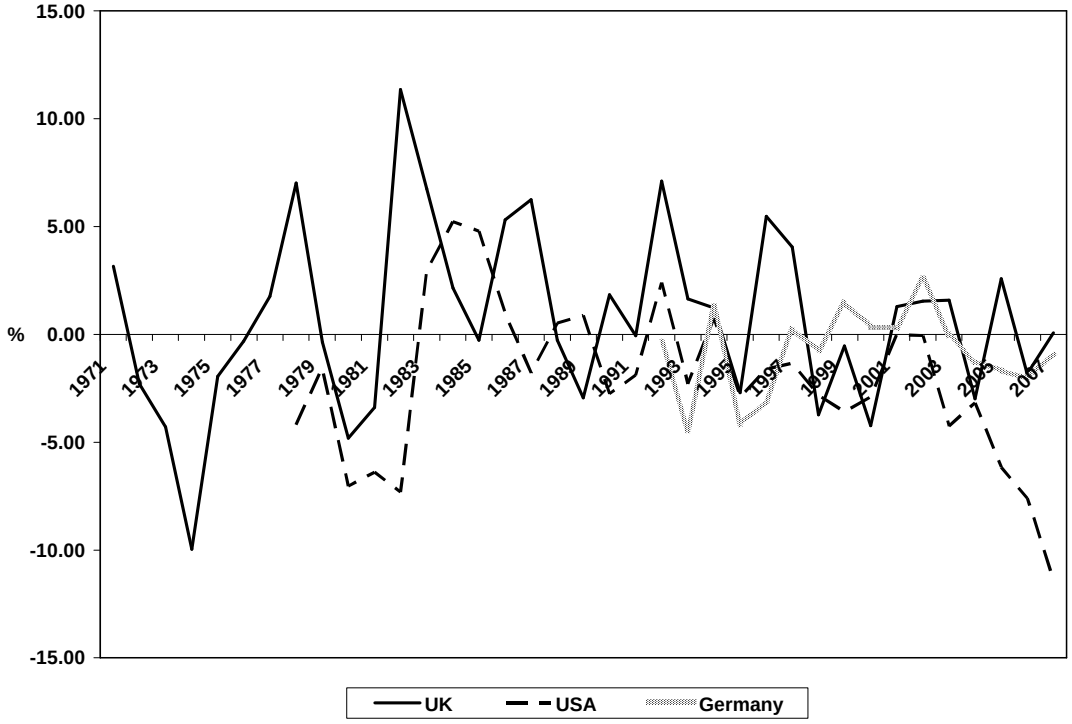

Figure 9. Contribution of TFP to value added growth (%): International comparison

5 CONCLUSION

With a database covering almost four decades, the EU KLEMS Growth and Productivity Accounts provide a rich source of information for the analysis of productivity growth in the construction industry. The use of detailed data on, and measurement of, the sources of growth at the industry level and the breakdown of labour into categories and capital inputs into asset types is an essential step towards better assessment and understanding of productivity changes. The broad results from the analysis undertaken, indicate that there is some evidence that the sources of growth in the construction industry are different from other industries.

In terms of the basic factors of labour and capital, labour is the most important input in terms of cost share. With the labour inputs, the growth attributable to labour compensation has tended to show only a limited degree of change over the period except during recessionary periods (such as the early 1980s and 1990s) and, if the construction industry is compared to many other industries, the relative level of labour compensation is low. Even though much construction work is considered to be labour intensive compared to other industries, the comparatively low skill level of the industry's workforce is reflected in a lower level of remuneration.

The fastest growing category of input is ICT capital although its share in overall costs is still modest. Also, for the capital variables, the extent to which growth is attributable to change in non-ICT investment is much more affected by change in the economic cycle than it is in the far steadier pattern depicted by the level of investment in ICT.

There is strong correlation between the use of skilled labour and ICT at the industry level. Simultaneous increases in the use of skilled labour and ICT indicates capita–skills complementarity and, therefore, indicates a need for an investigation of links between these drivers of technical change. The need is not new but the evidence presented emphasises its importance.

TFP growth appears to be small (sometimes even negative on an annual basis) indicating that the overall technical efficiency with which the labour input has been used is not increasing. A negative value for TFP growth means (in theory) technological regression but, in practice, could include measurement errors and other factors such as the omission of intangible investment in capital usage (O'Mahoney and Turner, 2009). Soft innovations, such as organisational change, and other intangible investments are much more difficult to measure than hard technologies. At the sector level, Basu et al (2003) focused on how far TFP growth can be explained by investment in organisational capital, which they argue is necessary to reap the benefits from a general purpose technology such as ICT. They use the growth in ICT investment as a proxy for organisational capital and find a suggestion of an initial fall in TFP, in the UK before the benefits are realised in the longer run. The level of investment in ICT might be expected to determine the level of growth in productivity but a time lag is inevitable for the implementation of new technology to realise its full potential. Processes to make products are re-engineered together with restructuring the business before real gains are achieved.

The evaluation of productivity in the construction industry can be fraught with difficulty but this analysis has considered how the availability of detailed industry data, particularly on the use of labour and capital, can potentially be an extremely useful tool in the development of more valid assessments.

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What are the big issues in cost management?

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Abstract:
This paper presents the current big issues in cost management. It covers the theoretical aspects, the causes and effects, and possible countermeasures. This paper is a result of a literature review conducted during the initial stages of a doctoral research. In doing so, principles of lean production are considered as a basis for critical evaluation. Seven big issues have been identified as shortcomings in the current construction cost management approaches. Some of such issues identified are failure to forecast, failure to pinpoint improvement opportunities and poor support to inter-organizational cost management. Possible countermeasures are suggested to address the identified issues. This research is expected to contribute towards developing conceptual solutions for improving the cost management approaches.

Keywords:
cost management, lean, value, waste.

1 Introduction

Cost management can be generally considered as a set of techniques and methods for controlling and improving a company's activities and processes, its products and services, to achieve cost effectiveness (cost reduction, value improvement and substitution) by collecting, analyzing, evaluating and reporting cost information for budgeting, estimating, forecasting and monitoring costs, in order to assist decision making.

Since the seminal contribution by Kaplan and Johnson (1987), literature indicates extensive discussions highlighting the need for improvements in cost management. Through a review of such literature, this paper aims to establish and consolidate the big issues in construction cost management, especially when analyzed from lean production perspectives.

Following this introduction, each big issue is discussed in terms of introducing the issue, the causes, an explanation, and possible countermeasures. A discussion identifying areas of commonality, consequences of the weaknesses, and areas for improvement are identified. Finally, conclusions and further research directions are indicated.

2 BIG ISSUES IN TRADITIONAL COST MANAGEMENT

2.1 Failure to Forecast

Forecasting is one of the key functions of cost estimation in construction projects. Zwikael and Smyrk (2009) have defined "project" as a form of investment in which outlays (approved by "funder") are made today with the intention of realising a flow of benefits over some future timeframe. Cost estimation is used to establish the probable cost of a future project or product, before designed in detail and contract particulars being prepared. In this way, the client is made aware of the likely financial commitments before extensive design work is undertaken (Seeley, 1983) and it can help in providing correct input to him for making the correct decisions on future investments. Forecasting has been discussed as part of attempts to improve accuracy in estimating (Jaya et al., 2010, Rosenfeld, 2009, Beeston, 1986, Ballard, 2008, Kenley and Wilson, 1986). However, Flyvbjerg (2008) and Elfving et al. (2005) believe that these endeavours have not been fruitful.

Many causes of inaccuracy have been pinpointed in previous research. Traditionally, it is common for building owners to decide on relatively detailed issues at the beginning of the project delivery process for the preparation of tender documents. There is a high possibility that the detail issues in the design at this early stage will change along the project delivery process, hence causing a considerable amount of waste in terms of time, information provided, and waste created during construction due to design faults (Elfving et al., 2005). In addition, cost is just understood to be there and the focus is on targeting for the 'expected cost' and not for 'targeted cost'. Flyvbjerg (2008), introducing the term "dark side of forecasting", points out unethical practices such as project champions / person in-charge (planner & the politicians) proceeding with projects even when inaccuracy in estimating is detected at the outset.

Currently, most of the cost data are taken from previous projects, which inherit waste. Such waste can be in varying amounts due to the emerging nature of waste. This fact is not acknowledged when compiling and using cost data, thereby resulting in inaccuracies in cost estimates.

Therefore, a possible countermeasure is to develop cost management approaches which account for the emergent nature of waste in the total construction process.

2.2 Failure to Pinpoint Improvement Opportunities

Current practices have witnessed many estimators being more keen on getting projects to be funded and built (Flyvbjerg, 2008) rather than getting the forecast right. In addition, early commitments to design solutions have established cost at the initial stage. Locking the cost and the design, reduces the opportunity to decrease the cost during construction, even though many authors have agreed that 70%-80% of product costs are committed during the concept phase (Rush and Roy, 2000). It is also highlighted that making a wrong decision at this stage is extremely costly further down the development process where product modifications and process alterations are more expensive. This situation may significantly increase resource consumption and generate waste (i.e., waiting and rework) (Elfving et al., 2005, Koskenvesa et al., 2010) and also reduce the product flexibility.

Causes of this issue include referring to cost data from sources such as Spon's Construction Price Book and BCIS (Building Cost Information Service), where information taken from previous projects include inherent waste. The usage of such data seems to slow down the growth of the labor productivity (Koskenvesa et al., 2010). In addition, Elfving et al. (2005) reported that decisions on early detailed issues in design might increase the probability of changes later on, which often leads to suboptimal solutions, quality defects and rework and this indirectly will contribute wastes in the process. In addition, initiatives in cost reduction have focused more on direct labor time instead of overhead cost where costs are actually increasing most rapidly (Kaplan and Johnson, 1987).

Koskela and Tommelein (2009) argued that cost can also be influenced along the entire project delivery. Target Value Design techniques (Kim and Ballard, 2000, Ballard and Reiser, 2004), which can influence the cost along the project delivery process, is one solution that can be adopted.

2.3 Costs are Shaped by Action rather than Result from Action

Kirkham (2007) points out that traditional cost planning will usually follow the conventional process structure of outline design, detailed design. This cost plan (estimate) is the basis of cost control.

Conventionally, cost control techniques are used during the design stage to enable the architect to be kept fully informed of the cost implications of all his design decisions, and throughout the construction period in order to rectify mistakes resulting by the action of the parties at the early stage of the project (Seeley, 1983). This situation, which set strategies based on the client's requirements, earlier on before the project started is referred to as the 'cost result from action' thinking and arguably leads to increased inaccuracy, creation of waste and also failure to achieve cost reduction.

Cost can be influenced in a positive way by the actors throughout the project delivery process. Therefore, it can be established that costs are 'shaped by action', and it is possible to make the design converge to an acceptable overall project cost rather than letting the cost reflect the design.

Adopting target value design (Ballard, 2010), which drives design to deliver customer values and develops design within project constraints, can influence cost along the project delivery process, in contrast to only predicting costs at the beginning of the project.

2.4 Relative Neglect of Value Consideration

When browsing through the index in books (Brook, 2008, Hillebrandt, 2000, Seeley, 1983), which are related to cost management, a missing discussion in value aspect can be witnessed. Traditionally, value has not been addressed in construction cost management, although many feel that the important criterion of value should be taken into consideration. The only problem is that they do not know where and how to do it.

Value consideration is necessary for construction project for allowing to achieve the best value for money by eliminating unnecessary costs and functions while maintaining and optimising the performance. Studies in value have addressed the provision of 'value' but ignored the concept of value from the customer's perspective (McNair et al.,

2001). Activity-based management approaches (Kaplan and Cooper, 1998) are used to divide the activities and costs of the firm into value-added or non-value-added categories, but it remains unclear whether and how customers' perspective is embedded into these approaches (McNair et al., 2001). The use of target costing (Tanaka et al., 1993) is considered of very limited value (Ewert and Ernst, 1999) to the overall cost management even though it relates cost to product attributes and its primary aim remains in cost minimization and value as proxy by market price is used only to define allowable costs (McNair et al., 2001).

All these techniques do not enable an identification of which activities should be emphasized and provide no assessment of specific linkages between internal cost structure and externally defined value (McNair et al., 2001). In summary, looking at the issues mentioned above, each tool mentioned fails to fully explain the complex relationship between cost and value (McNair et al., 2001).

It is suggested that the continuous monitoring of loss of value is needed by creating a better alignment between cost and value for helping the firm target areas where costs can best be leveraged to improve its overall profit potential (McNair et al., 2001). It started from the design stage until the construction stage for the success of value towards client's requirement. Continuous monitoring of loss of value is needed because cost management system is not aligned with the development in production process and value is not considered in it. Benefit realization management (Yates et al., 2009) and Choosing by Advantages (Suhr, 1999) are other alternative approaches to get the optimum result of project/product.

2.5 Poor Support for Inter-Organizational Cost Management

Currently, many-tiered supplier networks exist in traditional supply chains (Cooper and Slagmulder, 2004), where the connection between key supplier's suppliers, key supplier's other customers, customer's other suppliers' and customer's customer (Dubois, 2003) exist. These many-tiered supplier networks create a major addition in transaction cost until it reach the final customer, and it is believed that customer carries mostly the burden of cost accumulation in traditional supply chains (Kulmala et al., 2002).

The costs of purchased goods and services represent the majority of total costs for most companies (Dubois, 2003). Therefore, outsourcing purchased goods mostly happen chasing the lowest price for each transaction. All of these goods and services are purchased from supplier organizations and the purchases from supplier organizations are the largest single expenditure for most firms. This high share is attributable to the ambition of companies to concentrate more on their specialisation (Dubois, 2003). Furthermore, as time goes by, outsourcing of manufacturing activities has been followed by outsourcing of design and development work and therefore, suppliers are contributing to the technical development of a company (Dubois, 2003). Moreover, applying new techniques such as JIT (Just-In Time) and TQM (Total Quality Management) require active involvement of suppliers and affects the costs and benefits of both buyer and supplier (Dubois, 2003).

The cost management problems caused by the many-tiered supplier networks can be alleviated by adopting relational oriented philosophies (Kulmala et al., 2002, Kulmala, 2004), applying open book accounting (Kulmala et al., 2002, Seal et al., 1999) and

redefining of the unit of analysis (Dubois, 2003, Cooper and Yoshikawa, 1994, Christopher and Gattorna, 2005, Cooper and Slagmulder, 2004, Zimina and Pasquire, 2010, Cabral and Riordan, 1989).

2.6 Negative Influence on Behaviour

Several forms of negative influence from cost management systems on behaviour have been identified in literature, ranging from claim culture to manipulation of bids and performance measurements. Attitudes that relate to the occurrence of claims in the administration of contracts show that the industry has a culture that is opportunistic, prone to conflict and resistant to change (Rooke et al., 2003). People draw on whatever resources they can to make the best out of a bad job in order to get by and get things done to make extra profit or money (Rooke et al., 2003). There are contractors who expend more effort on generating profit from claims than from improved construction methods (Rooke et al., 2004).

Another example is 'unbalanced bid', which has the tendency to create cash constraints to many parties, such as cash flow problems to contractor (Tucker, 1986, Ali and Elazouni, 2009, Qingbin et al., 2010, Chen et al., 2008, Elazouni, 2009), financial disorder to client (Christodoulou, 2008) and also to both parties, when managing more than one project (Lu et al., 2007). This whole example will create a false alarm. In addition, the earned-value method, which is developed for integrating schedule and cost management, creates the opportunity to project managers to manipulate work sequences when releasing work to the field. In this situation, it may be work assignment that are not shielded from uncertainty are release for the sake of early payment (Kim and Ballard, 2000).

The blame is not only on contractors' part but can also happen because of client behaviour. Consistently, late payments by clients have encouraged contractors to act negatively because of the resultant cash constraints problems that they have to face.

Some countermeasures were suggested by Arditi and Chotibhongs (2009), Christodoulou (2008) and Cattell et al. (2008), where models were suggested to overcome the problem of unbalanced bid. Adoption of procurement methods that discourage claims, and open book accounting (Kulmala et al., 2002, Seal et al., 1999) are another possible solutions available.

2.7 Budgeting in Dynamic Situations

The budgeting emerged in the 1920s as a tool for managing costs and cash flow in large industrial organizations such as DuPont, General Motors and Siemens. Budgets are also used extensively in construction contexts too. Currently, a number of companies have recognized the full extent of the damage done by budgeting (Hope and Fraser, 2003b). They have rejected the reliance on obsolete data and the protracted, self-interested wrangling over what the data indicate about the future because it render pointless interpretation and circulation of current market information, the stock-in-trade of the knowledge-based and networked company.

Having a budget in a business unit, have created negative scenarios among employees in an organization because each and every activity involved in the product delivery process will be benchmarked with a budget. This will disempowers the front line, discourages information sharing, and slow the response to market developments until it's too late

(Hope and Fraser, 2003a). The usage of budget, which is at first to force performance improvements, have lead to a breakdown in corporate ethics where information is only funnel to those with a "need to know" and not the rest of the team (Hope and Fraser, 2003b).

In the absence of a budget, alternative goals and measures are move to foreground and business units and personnel performance is judged on how well its performance compares with its peers' and against world-class benchmarks that is collected and prepared by specialist firms that understand the particular industry. The result of this adoption has created more accurate interpretation of results (Hope and Fraser, 2003b).

Traditionally, early creation of a budget has been emphasized in construction project management. However, the dynamic situations in construction projects may demand a more flexible and a responsive approach to budgeting. A possible countermeasure is to develop cost management approaches which take the above in to consideration.

3 Discussion

When analysing the big issues, some common causes can be identified. They can be divided to four subsections, i.e. assumptions on how cost emerge, assumptions on management need for cost information, assumptions on conditions or context in cost management and how contract is formulated and payments arranged (Table 3).

Table 3: Common causes in the seven big issues

COMMON CAUSES	OUTLINE OF COMMON CAUSES	BIG ISSUES FEATURED
Assumptions on how cost emerge	Key underlying assumption is: Costs do not cover any avoidable waste	Costs are shaped by action rather than result from action Failure to forecast Negative influence on behaviour Poor support for inter-organizational cost management Failure to pinpoint improvement opportunities
Assumptions on management need for cost information	Key underlying assumption is: Cost information is only needed for decision-making	Poor support for inter-organizational cost management Failure to forecast
Assumptions on conditions or context of cost management	Key underlying assumptions are: Design and production occur is a static environment. The same value will be achieved through alternative course of action.	Relative neglect of value consideration Budgeting in dynamic situations Costs are shaped by action rather than result from action
How contract is formulated and payments arranged	Contract or payment arrangement creates an incentive for one party to manipulate design and production to its own advantage.	Negative Influence on behaviour Costs are shaped by action rather than result from action Failure to forecast

The consequences of the big issues in cost management do include inaccurate price of a project/product, suboptimal solutions, quality defects and rework, reduced growth of labour productivity (Koskenvesa et al., 2010), reduced product flexibility, increased resource consumption, making wrong decisions, cost accumulation to the customer, cash flow problems and bad financial planning.

These big issues have exposed significant weaknesses in the traditional cost management approaches. Based on the literature review findings, it seems that many parties have realised these problems that have existed in the current cost management system. Yet, hardly any of the initiatives that have been put forward seems sufficient as such for achieving a needed overhaul of the function, role and philosophies of the cost management system. Transparency of the cost and the thinking out of the box are required in order to improve. In addition, structural changes such as improvement in training and education towards the purported changes and revision of the procurement policies are suggested as well.

4 Conclusions

Effective cost management is important for the achievement of the investment put forward by the sponsor of the project. Therefore, in order to provide accurate guidance to the decision maker in initiating and making their decision, consideration of value,

achievement of maximal accuracy and reduction in cost are very important to be achieved in every cost estimation exercise. This paper sees that the real problem to the success of cost management is to find ways to reduce the amount of wastes that are embedded in the current construction costs. Informed by this review, the future direction of this research is to develop conceptual solutions to the current problems in construction cost management identified here.

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Education and training

Revisting the Logistics Course Content of Tertiary Construction Management Education in South Africa

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Abstract:
The management of the physical construction process is significantly characterised by conversion processes, which requires competencies in logistics management. However, the management of construction logistics in South African construction is reportedly sub optimal, though it could benefit substantially from logistics management tools. Recognising the usefulness of these tools, and motivating for their deployment in South African construction therefore requires site managers / agents that are competent. In this context, competence is relative to logistics. Therefore, as part of a longitudinal research project, this paper reports on a pilot study conducted among BSc (Honours) (Construction Management) students registered at a South African university. Selected findings include: students perceive that the academic programme has not adequately prepared them for logistics related site management roles in the industry. Specifically, they say the programme failed to significantly increase their knowledge, skills, and understanding relative to logistics management tools such as reverse logistics. Clearly, there is a need to revisit the programme and address issues raised by the respondents so that future construction management graduates can be confident in their ability to management construction site related internal and external logistics upon graduation from the university, thereby enhancing the management of logistics in South African construction.

Keywords:
construction management, education, knowledge, logistics, South Africa

1 Background

The council of logistics management (CLM) defines logistics as that aspect of the supply chain process that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements (Blanchard, 2004). In other words, logistics management refers to the science of planning, procurement, maintenance, distribution and replacement of materials and personnel. This means having the right person / vehicle / equipment / material in the right place at the right time. In terms of construction projects therefore, principal responsibilities of a construction / project manager revolves around the optimisation of daily operations through careful planning, organising, directing, and controlling activities before and during construction. Therefore, operational efficiencies that involve day-to-day decisions relative to logistics are directly part of the responsibilities of site management.

In this context, construction logistics activities include: material supply, storage, processing and handling; manpower supply; schedule control; site infrastructure and equipment location; site material flow management on a job site, and management of information related to all physical and services flows (Jang *et al*., 2003). As an illustration, in order to perform an activity or carry out a task on site, certain conditions must be fulfilled. These conditions entail the availability of appropriately skilled labour, materials, access to work area, plant and equipment, design information, completion of previous critical tasks, acceptable weather conditions, and agreed safe work procedures. Should one or two of these conditions not be met or available, a task cannot be completed and the construction process is delayed.

In spite of this knowledge, the situation in the South African construction industry relative to logistics and its management is considered sub-optima. Specifically, based upon multi-case study research conducted in Cape Town a major South African city, Shakantu *et al*. (2008) pointed out that the logistics of building materials and construction and demolition (C&D) waste are not integrated, and that the movements for both materials delivery and C&D waste are inadequate. They affirmed that integration of disparate logistics would not only provide scope for utilisation of spare capacity, but would also ultimately improve the logistics of the construction industry as the utilisation of spare capacity would immediately increase the utility of vehicles, reduce unit costs, and also lower the number of empty vehicular movement in and about construction sites. Similarly, in Brazil, Nunes *et al*. (2009) observed that there is a need to introduce the concepts of reverse logistics so that municipal managers can improve the reuse of C&D waste, and recycle them by compiling a reverse C&D waste network that can optimise flows and activities.

Therefore, the research reported upon in this paper addresses the educational gaps that may be contributing to logistics related problems in South African construction. The optimisation of construction logistics management or rather the management of construction logistics is thus examined through the lens of construction management students that are expected to fulfil logistics related roles upon their graduation from the university. The study was undertaken in order to assess the readiness and / or ability of the students to improve the management of construction logistics in South African construction. Perhaps addressing the issue at the early stage of construction management education may have desired effects on how logistics related functions / activities are carried out in the industry.

2 Literature Review

Venkataraman and Pinto (2008) contend that project operations function creates value by converting raw materials and components into a finished product at every phase of the supply chain; it is responsible for ensuring quality, and reducing waste, and shorter process lead times. In fact, informed research findings indicate that active involvement in the management of construction logistics not only result in improved main contractor / subcontractor interface, but also enhance the subcontractor / subcontractor interface (Perera *et al*., 2009). The importance of managing construction logistics is in fact underscored by the 2003 report of the Building Research Establishment (BRE) that discovered that almost 30% of construction cost could be attributed to the transportation and / or movement of construction materials (BRE, 2003 cited by Shakantu, 2009).

The 2003 findings by the BRE should not be mindboggling as Udeaja and Tah (2005) contend that the characteristics of construction material supply chains include:

- Multiple organisations are often involved in the supply chain;
- Organisations are physically distributed, which may be across one site, across a country or even continents;
- In a project or inside organisations, there is a decentralised ownership of the tasks, information and resources involved in the supply chain;
- Different groups within the project or inside organisations are relatively autonomous. They control who, at what cost and in what time frame, consumes resources. They also have their own information systems, with their own idiosyncratic representations, for managing their resources;
- There is a high degree of natural concurrency. That is, many interrelated tasks are running at any given point of the supply chain process;
- There is a requirement to monitor and manage the project. Although the control and resources of the constituent sub-parts are decentralised, there is often a need to place constraints on the entire process, and
- Material supply chains are highly dynamic and unpredictable. It is difficult to provide a complete priority specification of all the activities that need to be performed and how they should be ordered. Any detailed time plans which are produced are often disrupted by unavoidable delays or unanticipated events.

The delivery of materials on most projects may therefore be delayed due to the inability to create transparency in terms of movement / transportation either on site / or elsewhere along the supply chain on the one hand; and the uncertainties that surround material availability for project tasks without unnecessary stockpiling on site on the other hand (Ala-Risku and Karkkainen, 2006). Thus, logistics management that focuses on material movement is intended to introduce efficiency in the construction process because project management is principally concerned with the effectiveness of the construction process, while logistics management is an approach concerned with optimising flows within an organisation (Fisher and Morledge, 2002). In general, construction logistics functions can be divided into supply logistics and site logistics. Supply logistics are related to activities in the production process that are cyclic in nature. These activities include the specification of supply resources such as materials, equipment, and labour, supply planning, acquisition of resources, transport to a site and delivery, and storage control. Site logistics are related to the physical flow of on-site processes such as the management of handling systems, safety equipment, site layout, defining activity sequence, and resolving conflicts among various production teams related to the on-site activities (Jang *et al*., 2003).

The diverse variety of cultural relationships, which has created what is often described as adversarial and fragmented industry, can be said to have fostered a fragmented and inefficient approach to logistics management in the industry (Sullivan *et al*., 2010). In fact the importance of construction logistics to project managers in the industry is exemplified in a number of empirical research findings. For instance, the work of Jang *et al*. (2003) demonstrates this importance, when they report that key construction material logistics factors such as personnel, material flow, schedule adherence, contractors' organisation, and information flow have significant relationships between

the construction logistics process and satisfaction of project managers. This indicates that the factors are significant predictors of overall satisfaction for the construction logistic process.

It follows that the realisation of efficiency gains in construction is dependent on reliable information flow and logistics related activities including the forward and reverse flows. Furthermore, clients' demand for project performance improvement necessitates the adoption of sound logistics management practices in the industry. For example, building information modelling (BIM) and information technology (IT) collaboration tools have set the stage for substantial change and by implication improvement in the design and construction process. BIM and IT collaboration technologies potentially facilitates standardisation / or modularisation in off-site locations that offers greatest production efficiency and quality.

In addition, with the use of IT tools such as vendor-managed-inventory (VMI) in construction, the time and work relative to logistics and administration functions to manage procurement of small items on construction sites can be reduced significantly (Tanskenen *et al*., 2009). Also, Song *et al*. (2007) report that the location of materials in motion as well as those in the stockyard can be tracked through the use of material tracker integrated with radio frequency identification (RFID) and Zigbee. Tracking-based method for solving the difficulties related to site inventory management and transparency can thus be considered a useful way forward because of its reported practical relevance in the construction industry context (Ala-Risku and Karkkainen, 2006).

To be succinct, the construction management literature suggests that efficiency gains accrue if the concept of logistics management is optimised in construction as logistics adds value to economic activities in the construction process through place and time utility (Coyle *et al*., 2003). Logistics provides place utility by moving goods from production surplus points to where demand exists and time utility by making sure the goods are available when they are needed. It therefore creates place utility primarily through transportation, and time utility through proper inventory maintenance and strategic location of goods and services.

3 Research Methodology

The research method adopted for data collection was quantitative in nature as all 2010 BSc (Hon) (Construction Management) registered students at the South African university are full time students who undertake lectures and / or reside in more than one campus of the institution. Hence, the structured questionnaire was hand delivered to the students and also distributed to them through their university e-mail addresses. At the end of the time allotted for the survey, all the registered students returned their validly completed questionnaire. In other words, 12 valid responses were received out of a total number of 12 registered students surveyed, which equates to a 100% response rate.

The questionnaire elicited for information related to the extent that the construction management undergraduate (BSc) and honours (BSc Hon) academic programme have contributed to an increase in knowledge in certain logistics related areas, and the understanding of the functions of site management functions relative to logistics with two (2) questions and eight (8) sub-questions. The questionnaire also sought perceptions

of the students in terms of how the academic programme has enhanced site management skills with nine (9) sub-questions that underpinned a question. In general, given the exploratory nature of the study, three (3) questions, and seventeen (17) sub-questions that were structured; and one (1) unstructured question constituted the basis of the findings.

Though the structured questionnaire was based on the literature reviewed and informal discussions with undergraduate students, it nevertheless provided opportunity for the students to express their views pertaining to their ability to confidently undertake logistics related responsibilities upon their graduation from the university. In particular, the last question in the questionnaire that requested for general comments from students provided the opportunity to express other views not captured in the structured instrument.

The quantitative method was used for data collection not because it is reportedly the dominate method in Construction Management Research (CMR) (Dainty, 2008), but primarily because of the need to provide an objective basis for in-dept future investigations that are intended to be driven by the dominant views of the respondents (construction management students). This position is supported by the positivism view, which states that all phenomena should be understood through the employment of a scientific method so as to create a theoretically neutral language of observation that remove subjective content from assumptions (hypotheses and theories) with the overall intent of arriving at deterministic findings that de-emphasise free will, emotion, chance, choice and morality (Collins, 2010).

4 Findings

The interpretations and discussions of the research findings are based on Mean scores (MSs) comparisons relative to percentage responses to five point likert scale questions in the form of MS ranges as indicated in Table 1. The ranges in Table 1 are computed based on the five-point likert-scale type questions as the difference between the upper and lower ends of the scale is 4.00 and there are five points, each range can be equated to 0.80 since the extent of the range is determined by a division between 4.00 and 5.

Table 1. Terms used to discuss mean score comparison

Mean score range	Meaning
> 4.20 ≤ 5.00	Near major extent to major extent / major extent
> 3.40 ≤ 4.20	Some extent to near major extent / near major extent
> 2.60 ≤ 3.40	Near minor extent to some extent / some extent
> 1.80 ≤ 2.60	Minor to near minor extent / near minor extent
≥ 1.00 ≤ 1.80	Minor to a near minor extent

Table 2 indicates the respondents' perceptions of the extent that BSc construction management undergraduate and BSc (Honours) academic programmes have contributed to an increase in logistics related knowledge areas in terms of percentage responses to a scale of 1 (minor) to 5 (major), and a MS ranging between 1.00 and 5.00. It is notable that out of the listed knowledge areas, only two achieved MSs above the midpoint score of 3.00, which indicates that the respondents are of the opinion that the contribution of the construction management academic programmes to these two knowledge areas are more of a major than a minor extent.

Though, there was no MS above 3.40, the MSs > 2.60 ≤ 3.40 indicate that the respondents perceive that the construction management academic programmes' contribution to increased knowledge in material handling and inventory related issues can be deemed to be between some extent to a near major extent / a near major extent. While the MSs > 1.80 ≤ 2.60 suggest that the contribution can be deemed to be between minor to a near minor extent / a near minor extent.

Table 2. Extent to which the academic programmes contribute to an increase in logistics related knowledge areas

Logistics knowledge area	**Response (%)**						**MS**	**Rank**
	U	**Minor…….....Major**						
		1	**2**	**3**	**4**	**5**		
Material handling	0.0	7.7	15.4	23.1	38.5	15.4	3.38	1
Inventory	7.7	7.7	15.4	23.1	46.2	0.0	3.17	2
Transport operations	15.4	23.1	30.8	7.7	23.1	0.0	2.36	3
Warehousing	7.7	30.8	46.2	15.4	0.0	0.0	1.83	4

Table 3 indicates the respondents' perceptions of the extent that BSc construction management undergraduate and (BSc) (Honours) academic programmes have enhanced logistics related site management skills in terms of percentage responses to a scale of 1 (minor) to 5 (major), and a MS ranging between 1.00 and 5.00. It is notable that only five (55.5%) out of the nine listed logistics related site management skills achieved MSs above the midpoint score of 3.00, which indicates that the respondents are of the opinion that construction management academic programmes enhance these five skills more to a major than a minor extent.

Yet again, it is notable that no MS is above 3.40. However, the MSs > 2.60 ≤ 3.40 indicate that the respondents perceive that construction management academic programmes enhancement of the following skills can be deemed to be between some extent to a near major extent / a near major extent: delivery of material; material

storage; material ordering; material handling; movement of vehicles into and off site; removal of waste, and material sourcing. In addition, the MSs > 1.80 ≤ 2.60 indicate that the respondents are of the opinion that construction management academic programmes' enhancement of material tracking and reverse logistics related skills can be deemed to be between minor to a near minor extent / a near minor extent.

Table 3. Extent to which academic programmes enhance logistics related site management skills

Skill	Response (%)						MS	Rank
	U	Minor……Major						
		1	2	3	4	5		
Delivery of material (Just in Time)	0.0	15.4	0.0	30.8	38.5	15.4	3.38	1
Material storage	0.0	23.1	0.0	23.1	38.5	15.4	3.23	2
Material ordering	0.0	23.1	0.0	30.8	30.8	15.4	3.15	3
Material handling	0.0	23.1	7.7	23.1	30.8	15.4	3.08	4
Movement of vehicles into and off a site	0.0	15.4	15.4	38.5	7.7	23.1	3.08	5
Removal of waste (Construction & Demolition)	7.7	15.4	7.7	46.2	15.4	7.7	2.92	6
Material sourcing	0.0	23.1	23.1	30.8	15.4	7.7	2.62	7
Material tracking	7.7	23.1	15.4	53.8	0.0	0.0	2.33	8
Reverse logistics	38.5	30.8	7.7	23.1	0.0	0.0	1.88	9

Table 4 indicates the respondents' perceptions of the extent that BSc construction management undergraduate and BSc (Honours) academic programmes have contributed to an increase in students' understanding and appreciation of the functions and activities of site management relative to logistics in terms of percentage responses o a scale of 1 (minor) to 5 (major), and a MS ranging between 1.00 and 5.00. It is notable that all the listed functions / activities achieved MSs above the midpoint score of 3.00, which indicates that in general, the respondents are of the opinion that the contribution of construction management academic programmes to the understanding and appreciation of these functions / activities can be deemed to be more major than minor.

The MSs > 3.40 ≤ 4.20 suggest that the respondents perceive that construction management academic programmes' contribution to increased understanding and appreciation of forecasting logistics requirements for a project, decision-making relative to construction logistics, evaluating and correcting logistics policies site management related functions can be deemed to be between a near major extent to a major extent / a major extent. In addition, the MSs > 2.60 ≤ 3.40 indicate that the respondents are of the opinion that construction management academic programmes' contribution to increased understanding and appreciation of coordinating and organising construction logistics related functions can be deemed to be between some extent to a near major extent / a near major extent.

More importantly, it is notable that none of the MSs recorded in the survey achieved a score above 4.20, which indicates that in general there is a gap that must be bridged with respect to construction management undergraduate and honours academic programmes and construction logistics management.

Table 4. Extent to which academic programme contribute to improved understanding of logistics related functions

Function / Activity	Response (%)						MS	Rank
	U	Minor…….Major						
		1	2	3	4	5		
Forecasting logistics requirements for a project	0.0	7.7	0.0	15.4	53.8	23.1	3.85	1
Decision-making relative to construction logistics	0.0	7.7	0.0	30.8	53.8	7.7	3.54	2
Evaluating and correcting logistics policies	15.4	7.7	0.0	23.1	53.8	0.0	3.45	3
Coordinating construction logistics	7.7	15.4	7.7	30.8	30.8	7.7	3.08	4
Organising construction logistics	7.7	15.4	7.7	30.8	38.5	0.0	3.00	5

This argument is supported by the general comments incidental to the study. Such comments include:

“This area was not touched at all in honours or undergraduate”;

“Logistics should be lectured extensively just like quality management”;

“If possible a semester module should be dedicated to construction logistics and supply chain management”, and

“We did not do much of these parameters at university, however in our practical year we did.”

These findings perhaps explain why employing a logistics specialist is often undertaken during the execution of major projects such as the Heathrow Terminal 5 (T5) in the UK. Because firms in the construction industry generally do not train home-grown logistics managers, and also as logistics is gradually becoming a specialised and professional function, it can be argued that it seems possible that some knowledge of the discipline will soon form an important part of the training of a would-be construction or project manager (Sullivan *et al*., 2010). The industry while generally perceived to be traditional in nature, is capable of making impressive leaps forward in some aspects of its logistics related performance in the same way it has managed to encourage improvement in culture and H&S in the past decade (Sullivan *et al*., 2010). Although change in terms of logistics is much slower than expected, change is nevertheless a necessity that will take some time to be achieved (Ballard, 2010).

In other words, since construction / project managers and / or site agents may be the *de facto* in-charge of logistics on a traditional construction site, having necessary foundational knowledge of logistics can ensure that they are able to devote the required time and attention to logistics issues meaningfully. Many construction managers could enhance their professional practice by developing a good understanding of the basic functions and benefits of a systematic approach to logistics not only for large and complex projects, but also for smaller projects (Sullivan *et al*., 2010). As indicated in Table 3, it can be inferred that reverse logistics related competency seems to be eluding students because this important area for the practice of construction management may have been under-explored by academics (Srivastava, 2008). In effect, processes

pertaining to the management of construction materials should be addressed so as to ensure increased cost / time savings and productivity since the CMR literature indicates that the process of delivering and handling construction materials are often so inefficient that they always lead to a significant amount of non-productive time on site (Ng *et al*., 2009).

5 Conclusion and Recommendations

Clearly, there is a need to address the BSc and BSc (Honours) construction management academic programmes with respect to construction logistics in the South African university in order to meet the aspirations of students and the industry. The implications of the findings may also pertain to universities that have somewhat overlooked the need to include logistics management related course contents in their undergraduate and honours academic programmes. In particular, gaps relative to the inclusion of inventory, transport operations, warehousing and material handling topics in construction management academic programmes should be addressed.

Given that fresh university graduates are often assigned site management roles in South African construction and elsewhere in developing countries, it is imperative that construction management academic programmes provide a veritable platform for developing skills relative to material sourcing, ordering, delivery, tracking, storage, and handling. Specifically, the programme should attempt to improve students' knowledge areas that directly enhance their ability to use concepts of reverse logistics when they become active in the industry.

Though, the disseminated findings relate to a single university programme, it is here argued that given the importance of logistics in the construction process, construction management academic programmes in general should endeavour to address any logistics related noticeable gaps in their programmes. For example, as a direct result of the concise investigation undertaken in the South African university, a module titled "Logistics management in construction" has been included in the course curriculum of the construction management honours programme for the year 2011. Evaluation and improvement of built environment academic programmes thus have to be consistently undertaken so as to make sure universities will continue to meet the needs of the construction industry that is constantly changing.

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Cross-cultural Training: The Importance of Investing in People

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Abstract:
Major international companies have established themselves in the United Arab Emirates (UAE) market by setting up their regional headquarters in Dubai. These international companies want to be in a growing market in a country where their companies are recognised and affiliated with a positive image. In addition, many companies have moved to the UAE for financial reasons as well. The UAE is an expanding regional market with the potential for future growth. However, there are cultural differences between Australia (and western countries generally) and the UAE (Middle Eastern). It is easy to have genuine and honest misunderstandings and, hence, it is simple to make innocent and sometimes mistakes. What those companies do not realise is that if they do not appropriately train and prepare their expatriates for their overseas assignments the expatriates are more likely to experience difficulties that can have a serious impact on their employees' effectiveness and on the company's activities.

This study considers project managers in the UAE, their experiences, their training and their needs and requirements. A survey of 100 Australian project managers based in the UAE was carried out to discover the dimensions of the cultural business environment.. The survey was followed by six case studies of senior management in large companies involved in project management, construction and property in the UAE. The results of these research investigations are summarised in this paper and recommendations on overcoming the deficiencies identified are discussed. Developing cross cultural training programs in line with the recommendations made in this research could lead companies to gaining a greater market share in the UAE and being recognised as an industry leader. Hence, investing in people is more likely to give the greatest return.

Keywords:
cross-cultural training, expatriates, investing in people, United Arab Emirates.

1 Introduction to Cross cultural training

In 1980 Hofstede carried out a study of top-ranking goals for professional technical personnel from a large variety of countries. In this study 'training' was ranked as number the one (1), priority (Luthans and Doh, 2009:74).

Mendenhall and Oddou (1985) as well as Stroh and Caligiuri (1998) have pointed out that for developmental and functional reasons successful expatriate assignments are invaluable to companies. This may explain why expatriate management literature has

paid a great deal of attention to the management of cross cultural adjustment of expatriates (Black and Gregerson, 1992). It is understandable that the expatriate management literature focuses on expatriate training and adjustment when so many expatriates fail. Expatriates are regarded as having failed in their overseas assignment if they return early from their assignment (Adler, 2001). There are also the non-financial effects of failure; things such as loss of business opportunities and damage to the company's reputation (Black and Gregersen, 1991; Naumann, 1993). Nevertheless, one should not forget that there are also psychological issues associated with failure; the expatriate most likely suffers lower self-confidence and damaged self-esteem (Mendenhall et al., 1985; Tung, 1987).

2 The Literature Review

Some researchers such as Shaffer and Harrison (1998) suggest that if the expatriate does not adjust to their life and to their international assignment satisfactorily they will be unable to function well and they almost certainly will return home or back to the parent company prematurely. Adjustment problems can be minimised through careful selection and training. Cross-cultural training as well as language training is especially important (Forster, 2000).

Stroh et al (1994) as well as Kramer et al (2001) support this argument by explaining that expatriates are more likely to complete their overseas assignment if they are prepared, which in return will lead to the expatriate being better adjusted to a foreign environment and more likely to successfully complete their overseas assignment. Mendenhall et al., (1985) categorized and introduced three (3) skills which are necessary for an expatriate to be successful in a cross cultural setting:

1. The self dimension
2. The relationship dimension
3. The perception dimension

2.1 Self Dimension

The self dimension refers to expatriate skills which enable him/her to be self effective in stress management, mental health and psychological well-being. Bandura (1977) also believed that expatriates need to believe that they are able to effectively deal with foreign surroundings. Mendenhall et al., (1985) add that expatriates need to be self-effective even when they may be experiencing uncertainty. A lot of researchers agree that people with high self-efficacy levels tend to be more persistent in learning and adopting new behaviors. Nicholson (1984) points out that those particular individuals adjust more quickly and are more successful in a foreign environment, because they are willing and are persistent to learn new behaviours.

2.2 Relationship dimension

The relationship dimension entails a variety of skills, which will enable an expatriate to be able to interact with ease with host nationals (Mendenhall et al, 1985). In addition, possessing relational skills can decrease the uncertainty related to an unfamiliar environment.

2.3 Perception dimension

The perception dimension constitutes a range of cognitive abilities, which help the expatriate evaluate the new unfamiliar environment. Mendenhall et al., (1985) believe that the greater the individual's perception skills the easier it is for them to understand the foreign culture and interpret it correctly. Additionally, perception skills help expatriates understand what is appropriate and what inappropriate behavior is and understand that it is of high significance when working in an environment such as the UAE.

However, even if expatriates have those three skills, in order to succeed in the UAE they will need to have suitable cross-cultural training. Cross-cultural training aims to assist expatriates enhance their knowledge and skills, which in turn will help the expatriate practice in an unfamiliar host country and to be more productive (Brewster and Pickard, 1994; Kealey and Protheroe, 1996; Harris and Brewster 1999).

According to Black and Mendenhall (1990) there is strong evidence that suggests that cross-cultural training is a critical factor in the preparation of expatriates on their overseas assignments. Tung (1979) suggests that the best and most effective cross-cultural training would have to be specific and should focus on a particular population and situation. For this reason it would be logical for Australian companies and organizations to provide their employees with specific cross-cultural training, which deals in detail with the UAE population and project management with reference back to Australian practice and attitudes.

This cross-cultural program would have to focus exclusively on the UAE culture, religion, and on how to practice project management in the UAE environment. This would have to cover laws in the UAE, leadership and ethics. Emiratis take business personally so it makes sense to learn as much as possible about the host country's culture in order to be able to avoid misunderstandings and conflict.

There are three phases of expatriate training; the pre-departure phase, on-site phase and the repatriation phase (Dunbar and Katcher, 1990). Many researchers in the area of cross culture agree that in order for expatriates to succeed in their overseas assignments they should have either pre-departure and/or on-site training (Warren and Adler, 1977; Tung, 1982; Black et al., 1990; Weaver, 1998; Gudykunst et al,, 1996; Ferraro, 1998; Caligiuri et al, 2001).

3 Research Methodology

This research commenced with an extensive literature review on cross-cultural training. The literature review led the author to believe that there is a lack of cross-cultural training provided to Australian expatriates who are working, or are about to commence work in the UAE. To analyse this proposition the authors designed an online survey, which was distributed to human resources managers and project managers already working in the UAE.

Once the online survey was analysed it indicated that there was a lack of cross-cultural training provided to those expatriates. To gain a better picture as to why this was the case and to find out what could be done to help expatriates the authors decided to

conduct six in-depth case studies to better understand expatriates and their training needs.

All six case studies are based on Australian companies that have spread internationally including to the UAE. The reason for choosing Australian companies was that this research focused on Australian project managers working and living in the UAE, and was limited to this defined population.

Once all the information from the case studies was collected, analysis of the case studies revealed that although the UAE had a large expatriate population of about 80 per cent, most expatriates live in segregated communities. In addition, the case study results confirmed the earlier survey; Australian expatriates were lacking cross-cultural training. The results and recommendations will be discussed in detail in the next section.

4 Results

Most respondents did not receive any cross-cultural training and the ones that received some type of assignment preparation claimed that it was not adequate. More importantly the case studies enabled the authors to make recommendations on what type of cross-cultural training should be offered, how it should be delivered and when it should be delivered to the expatriates for the best effect.

4.1 Expatriate preparation

The majority of the large expatriate population tend to congregate with people with a similar language and culture. For instance, Australians have their social private clubs, luxury beach clubs, sports clubs, bars and this is where they socialise with other Australians. Executive expatriates live in villas with pools, and they send their children to private schools, whereas the low paid manual workers, who are usually from India, Pakistan and the Philippines, live in bleak workers' compounds. The type of employment and salary levels ensures everyone moves in their own circles. Nevertheless, both well paid and low paid workers still need to adjust to an unfamiliar environment.

After analysing the relationships between host nationals and expatriates, Caligiuri (2002) reported that greater interaction with host nationals positively relates to cross-cultural adjustment. However, as demonstrated in Hofstede's (2003) findings the Arab World is very different to Australia. This indicates that interaction with host nationals could be challenging.

Hofstede (2003) points out that with an *uncertainty avoidance* (UAI) of 68 out of 100 and great *power distance* (PDI) of 80 out of 100, are the predominant characteristics for the Arab region. This indicates that it is anticipated that traditional leaders separate themselves from the group and issue complete and specific directives. This is due to the fact that these societies are more likely to pursue a caste or a class system that does not permit significant upward mobility of its people. They are also highly rule-oriented with laws, rules, regulations and controls in order to diminish the amount of uncertainty, while discrimination of power and wealth have been allowed to grow within the society. If one were to combine those two dimensions a situation would arise where the people on the top (the leaders) would have ultimate authority and power.

Additionally, a high PDI ranking suggests a high level of inequality of power and wealth within the society. This society has a belief that leaders will separate themselves from the group and this condition is accepted by the society as their cultural heritage. For example, Australia is relatively low in this dimension, with an index of 36, compared to the world average of 55. This is indicative of a greater equality between societal levels.

The high UAI ranking indicates that the Arab society has a low level of tolerance for uncertainty. In an effort to minimize or reduce this level of uncertainty, strict rules, laws, policies and regulations have to be, and usually are adopted and implemented. If those rules and regulations are strictly implemented and followed by the society, those people can successfully avoid and/or eliminate the unexpected. As a result most people from this region do not willingly accept change and are extremely risk adverse.

The third highest Hofstede Dimension in Arab countries is the *masculinity index* (MAS), with a ranking of 52 out of 100. This rank is about average on Hofstede's dimensions, which can be explained by the fact that when it comes to decision making people from the Arab World are more caring (feminine) then people with western values.

The lowest Hofstede Dimension for the Arab World is the *individualism* (IDV) ranking at 38 out of 100. The world average ranking for this dimension is 64. This translates into a collectivist society (the Arab World) as compared to individualist culture (Australia) and is apparent in a close long-term commitment to group and family. In a collectivist society loyalty is paramount and overrules most other societal rules.

Australia is the complete opposite when it comes to the IDV dimension. Hofstede's research indicates that Australia has very high levels of individuality. In fact, Hofstede scored Australia as 90 out of 100, the second highest score of any country in Hofstede's survey, the United States being the highest with a ranking of 91.

It is obvious from Hofstede's Dimensions that Australia and the UAE are very different. If expatriates are not prepared and do not attempt to learn and know about the different cultural, social, religious, legal and business rules they can easily fail and be unsuccessful.

It has become increasingly apparent that cross-cultural training is important in preparing expatriates for their overseas assignments. This training has long been advocated as a means of facilitating effective cross-cultural interaction between the expatriate and the host nationals. In the case where expatriates do not get cross-cultural training or inadequate training they could *"fail"* in their international assignment. An expatriate is considered to have failed if that individual has not completed the international assignment and if he/she needs to be replaced with a new expatriate. Expatriate failure does not only cause damage to the company, but it can also cause the expatriate to lose his/her job, limit future career prospects and encourage low self-esteem. In order to eliminate expatriate turnover this research has focused on cross-cultural training and preparation of Australian expatriate project managers working in the UAE.

4.2 Business and Arabic characteristics

Aside from meeting the challenges of new job responsibilities, Australian project managers also have to adjust to a new and unfamiliar social and business climate as well as a new culture. In this research adjustment has referred to the process of the expatriate's ability to fit-in, so that he or she can feel comfortable and at ease with the new surroundings. As discussed earlier, there are many reasons for expatriates to return home prematurely. Some of those issues can be dealt with if appropriate and adequate cross-cultural training is provided. *Culture shock*, for example, can be minimised if the expatriates are prepared for what to expect and the culture shock can last for a shorter time period when compared to the situation if the expatriate did not get any preparation. The faster the expatriate gets over the culture shock and adjusts, the faster that individual can work at full capacity.

Certain Arabic characteristics need to be studied and expatriates need to appropriately prepare before starting to do business in the UAE. The circular approach to meetings and debate, polychronic time management activities and timing, the emphasis on hospitality, the importance of networking and the preference for making use of contacts, should be learned, understood, appreciated and followed.

4.3 Time and Timing

The Arabs respect westerners who come on time to meetings even if they themselves are late. However, to Arabs time is not as important as to the westerners. In the Arab world there is more emphasis on harmony. This means that in order to maintain harmony being late to meetings, delays and interruptions during meetings are common and are tolerated.

However, the locals do recognise that delays, lateness, interruptions and that time is an unlimited resource can cost them money and perhaps lose them business deals with outsiders. Nevertheless, being time conscious and on time is hard for the Arabs as they cannot do that at the expense of personal relationships. In addition, Arabs are classified as being *"polychronic"* (multi-time) as opposed to most westerners who are *"monochronic"* (single-time). This means that the Arabs will have several meetings at the same time, and expatriates need to get used to constant interruptions during meetings.

Arabs put more emphasis on *"Timing"* than *"Time"*. Timing cannot be managed as it is sensed. Timing is all about how the parties get along, the mood of the meeting, and trust that must be established in previous visits. This is one more reason why it takes a lot of meetings and a long time to reach an agreement on an issue.

However, in some cases keeping someone waiting is used to demonstrate power, just like delays on a contract or a project can be a power tactic or a test of character. Expatriates need to learn to be flexible, patient and persistent when they want something done. Additionally, when expatriates are working out a project timeline it needs to be stressed that being conservative will work in the expatriate's favour and building in a big margin for error is equally important.

4.4 Risk and Decision Making

Most of the UAE, with the exception of Dubai, is very risk averse. Hence, this is why most company headquarters are in Dubai. The Kingdom continues to be the major force governing all aspects of the economy by having a high degree of regulation governing all areas of life and business. The UAE overall is reluctant to accept rapid change.

In the UAE the leader, or the Sheik, is seen as the *"father figure"* and that is also how he leads, his decisions are final and are rarely ever questioned. The *"father"* has the absolute power for his decisions and his vision and approach rules and dictates the success and failure of the group. He expects absolute loyalty and any type of criticism is rarely tolerated.

The patriarchal nature of the Arab society means that the delegation of power is rare and precarious for those on the receiving end. In the UAE decision making, power and wealth are concentrated in the hands of a few and they do not like to share it around. This is very obvious when it comes to labour laws and employment contracts, which usually favour the employer and the employees generally have no rights. Despite significant improvements there are still a lot of issues and the *International Human Rights Watch* has hundreds of cases reported every week.

Most of the labourers and contractors in the UAE are immigrant workers and foreign investors and business contracts leave them exposed, since they give power to the clients (usually an Emirati company).

4.5 Communications

Expatriates working in the UAE come from all over the world. This is why the language of most business is English. It is important, however, to learn some Arabic and master some basic Arabic phrases and expressions; this would be very much appreciated by the Arabs. Learning Arabic numbers the way that are written and spoken would also help expatriates to understand numbers/prices when negotiations are done in Arabic; it is also helpful for the basic task of getting around the city and in office buildings.

In some meetings there are people that do not speak English. In that case a fully accredited translator can be provided by the local chamber of commerce and should be used. Even when a translator is being used it is important to check that both parties understand what is happening. In cross cultural dealings 'it is not what you said, but what they have heard". In a foreign country one needs to listen with the ears, eyes and the heart. This means that paying attention to body language is very important in a society such as the UAE. Body language, such as gestures have hidden meanings. Since the Arabs are high context communicators there is a lot of broader meaning to the words that they use. For this reason body language and the mood of the meeting needs to be taken into consideration, not only what has been said. An example would be the word *"Inshallah"* (God willing) when an Arab says *"Inshallah"* it could mean a vast number of things, such as *"Yes"*, *"No"*, *"Maybe"*, *"Someday"*, or *"Never"*.

Additionally, Arabs do not place much emphasis on written communications as they are a highly verbal society. This can work in the expatriates favour as in face to face meetings the full meaning of what is said versus body language (e.g., eye contact, gestures, facial expressions, etc.) can be observed and at the same time it can be checked for mutual understanding. It is important to become an active listener.

This means that when it comes to communication (unlike the west that prefers written communication) the Arabs prefer personal visits, which have the biggest impact, or phone calls when visits are not possible and these have more impact than a series of emails. Emails often get ignored, overlooked or take very long time to be replied to.

Arabs are hospitable and place a great deal of emphasis on outward expressions, and the Emiratis are no different. They love to entertain and this is also a great way to form a bond with the Emiratis. This is why invitations need to be accepted graciously and expatriates should learn appropriate etiquette before attending the event. Once there is a bond established with the Emirati and an expatriate they consider the expatriate as a friend and business dealings can commence.

4.6 Relationships

The Arabs put a big emphasis on relationships and a reliance on absolute trust when they are doing business. This is the basis for doing business in the UAE and this too explains why they do not like to use formal written contracts.

In the UAE it is all about building and maintaining relationships. Once a relationship is established it needs to be nurtured with frequent visits. Business is highly personal and relationships affect everything from negotiations, getting approvals, cutting the red tape, getting things done fast, as well as recruiting and hiring. More than anywhere else preparation is of the highest importance before starting to build relationships in the UAE.

4.7 Training and Learning

Generally research on training has been limited to the U.S., and it is not always applicable to other countries. Therefore, this research has specifically focused on the UAE and Australia. This research has discovered that cross-cultural training facilitates faster adjustment of Australian project managers in the UAE and contributes to their success.

All six case studies agree that, *"yes, cross-cultural training is important"*. However, the training that was provided only touched on culture, customs and business. It did not go into enough depth to be helpful. It was more informative than helpful. Additionally, the training which was provided was not specific. It only gave the expatriates brief and superficial information about the UAE.

In addition, all six case studies agree that on-site departure training is important, but the six case studies also revealed that the training was non-existent, incomplete or insufficient. In fact, the online survey revealed that 76% of respondents did not receive pre-departure training. Additionally, 61.4% of respondents reported that even when they were on-site they did not receive any training. This means that 61.4% of participants did not receive any training at all. Cross-cultural training is vital to the success of expatriates overseas and it should not be ignored by human resource managers and executives. As indicated by the respondents, not providing effective, up-to-date and efficient cross-cultural training could have devastating professional and personal consequences for both the expatriates and their companies.

Many researchers have conducted extensive studies which indicate that there is a positive relationship between cross-cultural training and the expatriate's ability to faster

adapt to the new environment (Black et al., 1990, 1992; Naumann, 1993). In fact, cross-cultural training is critical for expatriates who do not know the host nation's culture, work ethics and social etiquette. Cross-cultural training can help those individuals not only to adjust faster to the new country, but also to be more efficient, effective and successful in their overseas assignment. Through cross-cultural training expatriates gain a better understanding and more knowledge about the host country and this in return enhances their self-efficacy; it reduces their anxiety levels and allows them to absorb culture shock. It thereby gives them an advantage over someone with no cross-cultural training, because the trained expatriates are familiar with the host country and this facilitates faster cross-cultural adjustment.

The training should include pre-departure training, on-site training and repetition training where every few months a refresher training workshop is offered. Training offers numerous advantages to the expatriate, by helping expatriates deal with culture shock and unexpected events better and it also lessens the uncertainty of interactions with host nationals. It is understandable that companies struggle to develop an appropriate mental frame of reference for their expatriates for dealing with unfamiliar cultures. However, they need to rectify this as expatriates need a frame of reference in the form of cross-cultural training and mentors.

Researchers such as van Reine and Trompenaard (2000) have discovered that different national cultures prefer different learning styles and environment, and the company needs to deliver the training in the most effective manner. However, Waxin (2004:69) also point out that the method of training should be specifically tailored "*to the cultural distance between the expatriate's country of origin and the host country*". Thus, an understanding of Hofstede's dimensions would assist in this process. In addition, Vance and Paik (2002) point out that for cross-cultural training to be effective it should be consistent with the cultural characteristics of the host country. Companies would also benefit from using their former expatriates as trainers, as those former expatriates have been there, and can put themselves in the shoes of the new expatriates (Harris, et al., 1999). Additionally, the former expatriates can act as mentors. A mentoring, coaching and development system can be developed and new expatriates can be trained in that way.

Most participants in this research have indicated that they prefer hands-on training and that they would like to have a mentor who they can approach and ask for advice when they need help.

Cerdin (1996) found that if cross-cultural training is not provided by the companies most expatriates will not attempt to train themselves. So the companies must conduct this training if they wish to see the benefits in their expatriate staff.

4.8 Host country national's advice for improvements

Research shows that many host country nationals would like to see changes and improvements in some styles of expatriate managers. Those changes include the expatriate manager's leadership, decision making, communication and group work. In terms of leadership, the following changes would be desirable; expatriate managers need to be friendlier, available, respectful of subordinates and their suggestions. In terms of decision making, the host country nations would like to be involved in the

decision making process by those who will be affected by the decisions made and have a clear definition of goals.

In terms of communication; there should be more group problem solving and teamwork as well as exchange of opinions and ideas between managers and subordinates. This indicates that the training approaches used need to reflect both the industrial and the cultural environment.

5 Conclusion

Our world seems to be becoming smaller and more people live and work overseas in countries which are very different to their home country. Hence, there are a vast number of reasons why cross-cultural training is important; it simply is imperative when it comes to helping and supporting expatriates in their development and success overseas. From a company perspective, if their personnel are adequately trained for the overseas assignment they will be more successful and contribute to increasing the overall efficiency and profitability. The company could avoid losing their financial investment and their investment in staff. In addition, the company can overcome the belief that their way of doing things is superior to that of others. The lack of training or no training at all, has been associated with higher expatriate failure rates.

The online survey as well as the six case studies in this research represented a variety of professional fields and activities; not only project management. This gave the authors a better insight into how, and if, expatriates are getting cross-culturally prepared. When asked about cross-cultural training all six case studies have agreed that it is of high importance to provide expatriates with adequate, appropriate and up-to-date cross-cultural training. Additionally, if the recommendations made in this paper are integrated and implemented into the cross-cultural training, it would benefit all parties, the expatriates as well as the companies. International companies need to understand that investing in people gives the greatest and most effective return.

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Alignment of Academic and Industrial Development Needs for Quantity Surveyors: The Views of Industry & Acedemia

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Abstract:
Education and training of Quantity Surveyors (QS) is subjected to conflicting pressures; firstly from Academic Institutions, which seek to address the academic learning of students; secondly from Industry, which is the graduate employer and thirdly the Professional Body, the regulator of the profession. This can cause tensions between these main stakeholders resulting in greater levels of employer and graduate dissatisfaction and obstacles to early career development of the Quantity Surveying graduate. These problems are further exacerbated in the current economic recession. The research investigates the changing developmental needs of QS within a post recession industrial environment. These must satisfy the aspirations of industrial, academic and professional stakeholders such as the RICS. The RICS provide a comprehensive list of basic, core and optional competencies for the QS. These were comprehensively reviewed to provide the basis for the survey questionnaires with the use of an Expert Forum and literature. Two detailed surveys were conducted; one to obtain views of the industry and the other targeting academia with respect to the RICS QS competencies and the debate of "training versus education". The research revealed that the stakeholders, mainly the employers and academics, hold diverse views of the development needs for graduate QS. There is wide spread variation in the interpretations, the expected levels of attainment and the perceptions of the level of actual achievement of competencies by graduate QSs. The research proposes a framework that enables to define expectations, ambitions, and practical constraints in QS education that will lead to better understanding, effective collaboration and greater satisfaction in producing a Quantity Surveying graduate who will be seen as fulfilling the requirements of all stakeholders.

Keywords:
academic, industry, quantity surveying competencies, QS graduate, RICS

1 Introduction

Entry of graduates and others into any faculty of the Royal Institution of Chartered Surveyors (RICS) as fully qualified Chartered Surveyors comes only after success in the Assessment of Professional Competence (APC). This is true of the Quantity Surveyor (QS) as for any other. A successful candidate must demonstrate that they have attained certain competencies determined by the Education and Membership Board of RICS. In

the case of the graduate, these competencies will have been acquired as a result both of their formal university education and (in some cases) workplace training which they have received, whether as Part time students in employment or during a work Placement. In either case, the applicant will have undergone a period of full time employment beyond graduating, further enhancing their overall skills profile. It will be appreciated that there is a balance to be struck between the level and type of competence which should be expected, and can be achieved, in the universities and that born of exposure to experience only available within the workplace. To some extent the two must be complimentary. It has emerged over the years that both Academia and Industry have certain expectations of one another, rightly or wrongly, as to what each can and will achieve as a vehicle for graduate learning. These are encapsulated within the "education versus training "debate that has dogged the relationship for as many years as formal Quantity Surveying education has existed.

It will be seen that, at best, there is scope for misunderstandings between the stakeholders as to what is being required and what is being achieved. At worst there may be actual gaps in the education and/or training being offered and received or, at least, some discrepancies between the levels of attainment. This study aimed at investigating the changing developmental needs of QSs within a post recession industrial environment that satisfies the aspirations of industrial, professional and academic stakeholders. The research sought to review competencies and analyse the views of industry and academia on graduate education aiming to ascertain and deliver a framework for alignment of different stakeholder views.

The research approached the problem from two angles; a literature review and two surveys of industry and academia. The surveys were comprehensive and simple descriptive statistics were used for analysing and presenting the results. It has become apparent that the diverse views of industry and academia can only be harmonised through active mediation by the RICS as the guardian of the profession. This research therefore, proposes a framework for alignment of views based on 5 key recommendations. The successful implementation of the framework for alignment of views requires a concerted effort by all stakeholders in the development of graduate Quantity Surveyors who are industrially relevant, professionally qualified and who have a sound academic background.

2 Development of the QS Profession

Significant growth in undergraduate level education of Quantity Surveyors (QS) stems from the late 1960's and early 1970's with the progression from Diplomas through to Honours Degrees. "The Future Role of the Quantity Surveyor" (RICS, 1971) identified specific competencies which led to the rapid development of the profession. In 1983, "The Future of the Chartered Quantity Surveyor" (RICS, 1983) further consolidated the professional status of the QS. The "QS2000" (Davis Langdon Everest, 1999) recognised a number of forces acting on the QS profession, highlighting both the changes to the client body and to the construction industry. The academic and training needs of QSs are pulled in different directions by three key stakeholders. Academics are interested in producing a rounded graduate with the basic foundation in knowledge for further development (RICS, 2009) whereas the industry is looking for a graduate who can contribute immediately both to the daily functions of business and to its growth. The RICS is interested in maintaining professional standards and quality benchmarks.

Hence, there is a three directional pull on the development needs of the QS. Professional body influence such as RICS is often reflected in academia through accreditation of degree programmes meeting its criteria and through the setting of the competencies required for the achievement of professional status. The present education system of the Quantity Surveyor does not recognise these opposing needs of the QS and hence often produces a graduate whom the industry sees as not fulfilling their requirements. This leads to problems, with greater levels of employer and graduate dissatisfaction.

Added to this is a more fundamental failure on the part of all parties to appreciate the dynamics of the market sector. Most new graduates appear to be entering more non-traditional quantity surveying routes. It has been shown both through research (Perera, 2006) and through 1st destination Surveys (UNN Returns, 2001 – 2008) that a large majority of new graduates find employment not in Private Consultancy Practice (PQS) or the Public Sector, as was the case until the mid 1980's, but with Main Contracting and specialised subcontracting organisations. Much of the academic content which reflects the structure of the RICS would seem directed at those employed in the former roles, paying less attention to the skills inherent in the latter. The emergence of Commercial Management (Lowe and Leiringer, 2006; Walker and Wilkie, 2002) as a distinct discipline encompassing the role of the Contractor Quantity Surveyor (CQS) must affect the traditional role of the professional QS.

3 Research Methodology

The research was carried out in two distinct data gathering phases culminating in analysis and reporting. A detailed literature review was carried out to explore the "training vs. education" debate, identify the QS competencies and their interpretation.

Expert forum: a ten member expert forum was established consisting of 3 academics, 3 PQSs, 3 CQSs and one RICS academic board member. The views obtained from this forum via a series of interviews inform the development of the questionnaire surveys.

Survey of the academia: a comprehensive web-based survey of 41 questions addressed academics representing all 26 RICS accredited QS programmes to capture views of academics on QS education. The survey was issued to 106 academics from which 65 responses were received, 45 of these being suitable for analysis.

Survey of the industry: A comprehensive web-based survey of 39 questions addressed PQS, contractors' QS, public sector and other specialists across firms in the UK using RICS member database to identify their perception of graduate QS. 2946 chartered surveyors were randomly selected from the RICS member database. A total of 615 responses were received whilst 301 of these, having complete responses, were analysed.

Both surveys were first piloted among a small sample of volunteers representing industry and academia. The review of feedback obtained through a discussion session led to modification of the questionnaires. The primary areas of investigation include: Role of the QS & related Developments, RICS Quantity Surveying Competencies, Quantity Surveying Education, Study & placement, and RICS Membership Routes & Training.

4 Findings and Discussion

4.1 The survey respondent profiles

The survey respondents for both surveys were well experienced in QS work, with over 90% having more than 10 years experience. 44% of the academic respondents were programme leaders. Just over half of industry respondents were PQSs, the rest equally spread between contracting (17%), the public sector (15%) and other (15%).

4.2 Role of the QS & Developments

The role of the QS is defined by current and future workloads and trends in development. The industry survey identified the key areas of work presently important for the QS. The top 3 core competencies: T062 Procurement and tendering, T067 Project financial control and reporting and T074 Quantification and costing of construction works directly map to the highest workloads identified. Both professionals and academics appear to agree that the largest growth area will be that of Refurbishment followed by Building construction and Building services. The rate of development of sustainability and e-business activities was also emphasised by both groups. The similarity in median scores together with low deviation suggests agreement amongst most academics. Practitioners, for their part, show a wider variety of opinion over this.

4.3 RICS Quantity Surveying Competencies

The RICS sets the competencies required for the attainment of professional status. The RICS Competencies are arranged into three groupings, depending upon their perceived relevance to the role of the QS (RICS, 2009b):

Mandatory Competencies: personal, interpersonal, professional practice and business skills common to all pathways and compulsory for all candidates.

Core Competencies: primary skills of the candidate's chosen [RICS] pathway

Optional Competencies: selected as an additional skill requirement for the candidate's chosen [RICS] pathway from a list relevant to that pathway. In most cases there is an element of choice, though driven, usually, by their employer's specialism.

These competencies are expected to be attained at three possible levels:

Level 1: Knowledge (theoretical knowledge)

Level 2: Knowledge and practical experience (putting it into practice)

Level 3: Knowledge, practical experience and capacity to advise (advising)

There are 10 Mandatory competencies, 7 Core competencies and 7 Optional competencies (two to select). The RICS stipulates that an APC candidate needs to achieve all Mandatory competencies at Level 2 or above, all Core competencies at Level 3 and 2 Optional competencies at Level 2 or above. This section analyses the views of the respondents to establish the expected level of achievement by the graduate QS. In the absence of a threshold benchmark standard for graduate competencies, it is important to ascertain what key stakeholders perceive a graduate should achieve. This section aims to establish a consensus view on the level each competency should be

achieved at by a graduate from an RICS accredited degree programme. The overview comparison of all competencies between Academia and Industry is given in Figure 1 and Figure 2 respectively. In overall terms academics' expected levels for all three types of competencies are higher.

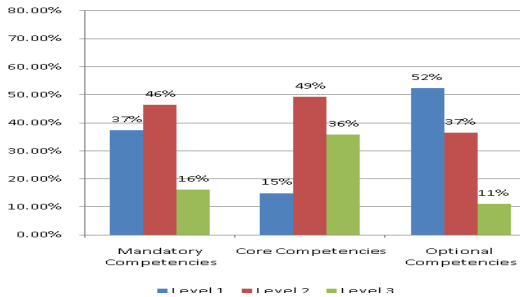

Figure 15. Overview - Expected Graduate Competency (Academic)

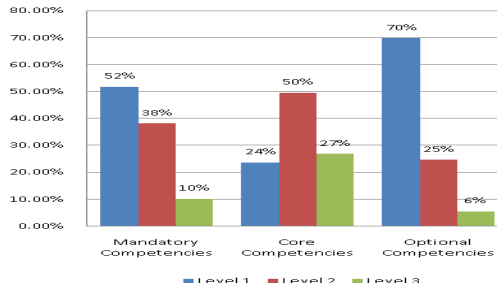

Figure 16. Overview - Expected Graduate Competency (Industry)

4.3.1 Expected level for Mandatory Competencies

Whilst academic responses to this section appear somewhat biased towards Level 2, the industry response appears more logical, expecting the highest level of experience to be at Level 1, falling to the least being at Level 3. In both cases the highest ratings were given in the areas of M010 Team working and M004 Communication and negotiating and M007 Data management, all being transferable skills. Of those competencies that do feature at Level 3 within both industry and academic assessment, M010 Team working appears once again. This acknowledged degree of expertise may stem from its increasing use as a vehicle of teaching and assessment within university programmes of study. Final assessment of Mandatory Competencies is presented in Figure 3 & 4 below. The majority view indicates that in general those Mandatory competencies are being achieved at Level 1 except for M006, M007 and M010. This is very much in line with RICS recommendation.

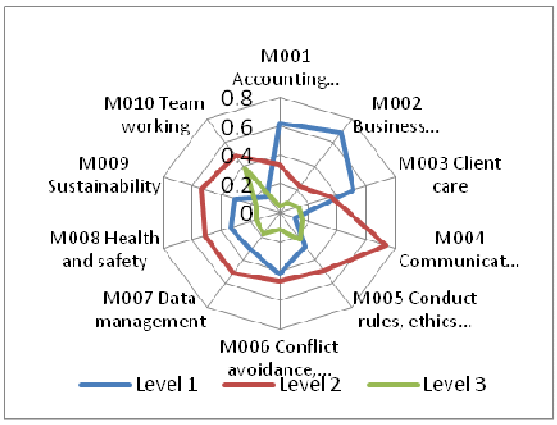

Figure 17. Expected Level of achiev. of Mandatory Competencies for New graduate QS (Academic)

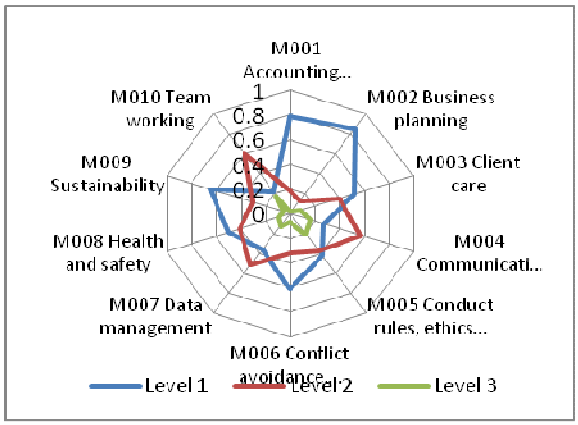

Figure 18. Expected Level of achiev. of Mandatory Competencies for New Graduate QS (Industry)

4.3.2 Expected level for Core Competencies

In this, the most discipline-specific area, both academics and industry most frequently seek competency at Level 2. Respondents from academia display a higher expectation at Level 3 than do industry.

As above industry are being more realistic in their expectation, as a new graduate is unlikely to be in a position immediately to advise clients etc. as the acquisition of Level 3 suggests. Academia is either perhaps exhibiting wishful thinking, or else is unaware of the actual requirements of Level 3. What is disconcerting in both these analyses is that a considerable number expect Core competencies to be achieved at Level 3. The academic survey indicates Level 3 expectancy at 36% whereas the comparative figure for industry is 27%. Both these are very high and indicate possible misinterpretation of level classifications or unrealistic expectations. The final assessment of core competencies that can be deduced from this analysis is given below.

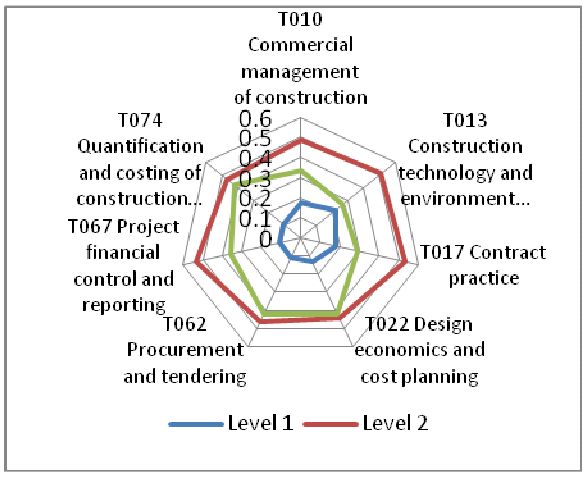

Figure 19. Expected Level of achievement of Core Competencies for graduate QSs (Academic)

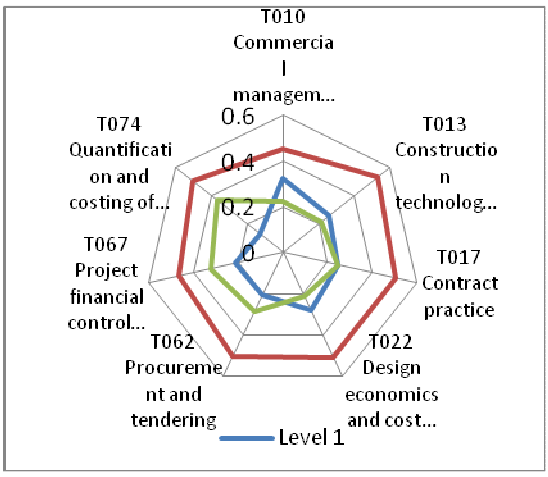

Figure 20. Expected Level of Achievement of Core Competencies for Graduate QSs (Industry)

Core competencies largely define the primary role of the quantity surveyor. However, there is no consensus view on achievement of core competencies, with some in industry stating it should be at Level 1 and some academics stating it should be at Level 2. Therefore, it is recommended that Core competencies be achieved at Level 2 in part as indicated. This is also justified by the fact that most programmes have the capacity to proceed to Level 2.

4.3.3 Expected level for Optional Competencies

With regards to Optional competencies the rankings of both respondent groups show much the same pattern, their most likely expectation of attainment being Level 1 only, expectation of Level 3 being by far the least. Again, industry responses are far less at Levels 2 and 3 than those of academia, reflecting a more realistic picture perhaps, one born of experience. The specialisms of T008 Capital Allowances, T045 Insurance, T025 Due Diligence and T020 Corporate recovery and insolvency each are being the highest in ratings by both respondent groups. Both academia and industry attach greater significance to T016 Contract administration giving it an expected ranking of Level 2, born of the fact that it is often considered a key function of quantity surveyors. The final assessments of optional competencies are presented in Figures 7 & 8. There is considerable argument for T016 Contract administration, T063 Programming and planning and T077 Risk management to be achieved at Level 2 mostly arising from academics. It is recommended that Optional competencies be achieved at Level 1 for all competencies and extending in part to Level 2 for some competencies.

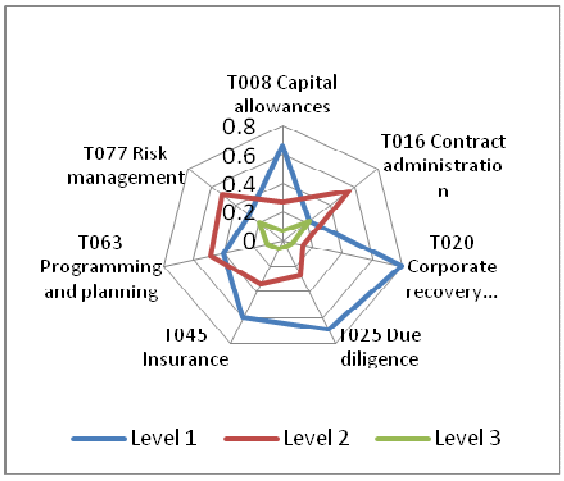

Figure 21. Expected Level of achievement of Optional Competencies for Grad QSs (Academic)

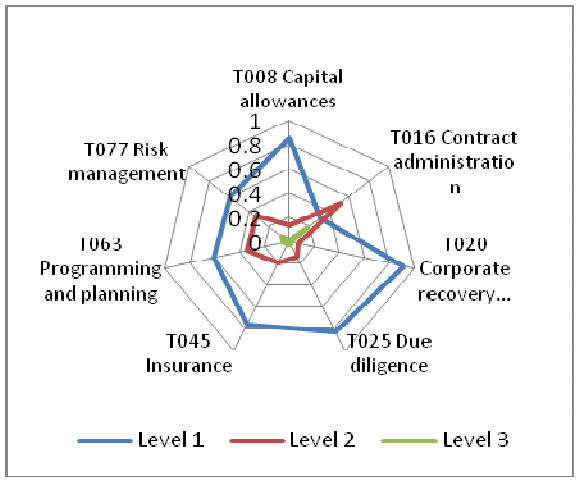

Figure 22. Expected Level of Achievement of Optional Competencies for Graduate QSs (Industry)

4.3.4 Cross comparison of levels of expectation, achievement and importance of competencies

A comparison of industry survey respondents' views on the Expected level of attainment, the Importance and Level of achievement of competencies by graduates is cross plotted to evaluate relationships between these criteria (Figure 9).

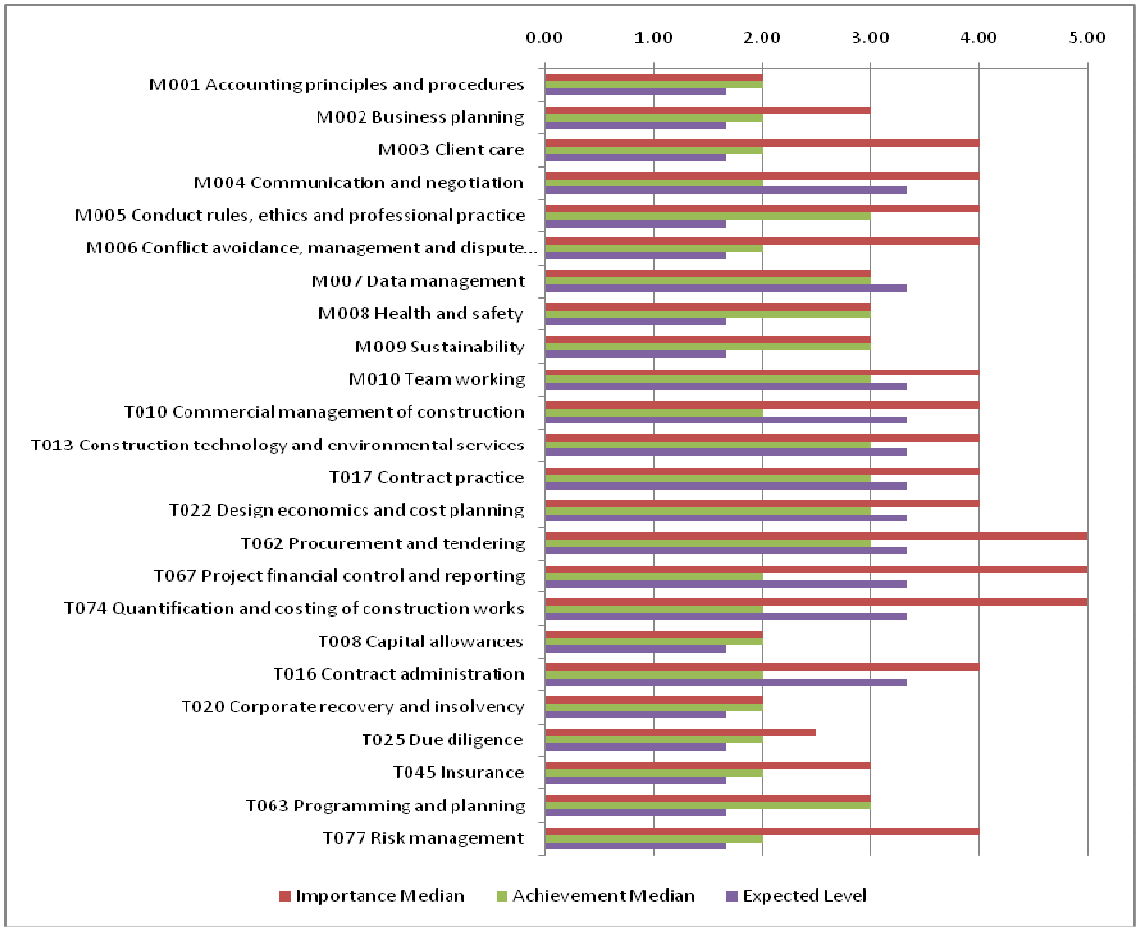

Figure 23. Cross comparison of competency expected level, importance ranking and graduate achievement

The Expected level has been re-scaled to 1 to 5 to graphically compare with Importance ranking (scaled 1to5) and perceived Achievement (scaled 1 to 5). From this comparison it is clear that whilst high importance is attached to a competence there may be a comparatively lower level of achievement. This is clearly evident with T067 Project financial control and reporting and T074 Quantification and costing of construction works competencies. Other clear gaps in expectation and achievement are with M002 Business planning, **M003 Client care, M004 Communication and negotiation,** M005 Conduct rules, ethics and professional practice, **M006 Conflict avoidance, management and dispute resolution procedures,** M010 Team working, **T010 Commercial management of construction,** T013 Construction technology and environmental services, T017 Contract practice, T022 Design economics and cost planning, **T062 Procurement and tendering, T067 Project financial control and reporting, T074 Quantification and costing of construction works, T016 Contract administration,** T045 Insurance, and **T077 Risk management.**

Those competencies highlighted in bold above show the greatest gap between achievement and importance. These include 9 of the 24 competencies (3 mandatory, 4 core and 2 optional competencies) which have a significantly high importance in the role of the quantity surveyor.

4.4 Quantity Surveying Education

The surveys probed in detail the views of both academia and industry as to their level of understanding and awareness of aspects of education, university industry collaboration and other. Only half of the industry respondents felt themselves to be either reasonably or fully aware of the content of the curricula. As to their satisfaction with curricula content, 60% expressed dissatisfaction or partial dissatisfaction with the curriculum. This begs the question whether their dissatisfaction might be linked to their self confessed lack of awareness of the detail. Industry generally displays reasonable to full confidence with the level of lecturers' academic knowledge, QS Practice and use of teaching materials. Academics themselves indicate a very high level of confidence in the programme delivery capacity.

Industry and academic collaboration in the delivery of QS programmes is vital to the success of graduates. Therefore, academics perceptions of industry's willingness to collaborate were matched against the willingness of the industry to collaborate. A less promising picture emerged; 75% of academia saw the possibility of collaborative activity as likely or very likely but the equivalent figure for industry amounted to only 28%. Further, 47% of academics perceived the RICS – University Partnership Agreement process as successful while 22% saw this as partially so or unsuccessful whilst 31% were undecided. This suggests consensus on the overall concept of the partnership but a considerable amount of scepticism about the partnership process, which warrants further investigation.

Regarding the role of universities in producing a graduate quantity surveyor, there was a clear difference in perceptions between the two sets of respondents. Industry were almost equally split (57% to 43%) as to whether universities should produce surveyors for immediate QS employment upon graduation (Training) or, rather, graduates with overall knowledge and a good foundation in Quantity Surveying (Education). Academia took the opposing stance, preferring the Education approach by a ratio of 73% to 27%.

This mirrors quite closely the traditional perceptions within the "education versus training" debate. This crucial aspect sets the ethos for university programme provision and industry aspirations. It is abundantly clear that the industry prefer their graduate recruits to be more directly employable than they are today, an explanation perhaps for the high level of dissatisfaction expressed in graduate performance by Industry. But, the question is on the boundary of demarcation between university and industry as to producing a professional and converting a graduate to a professional.

4.5 Modes of Study and Placement

Asked to rate the importance of a structured placement training model, there was considerable agreement between both sets of respondents. Industry's ranking of this as either very or extremely important came to 64% whilst academic gave this 80%. This may reflect the fact that whereas academics are used to training students within strict curricula, industry does not always perceive itself as providing structured training but, rather, a generalist training opportunity? When asked about their perceived opinions on the benefits of offering a placement, 90% of industry respondents proclaimed this to be, above all, a good test-bed for potential staff after graduation. 59% saw it as affording opportunities for a two way flow of knowledge between university and industry while, 44% saw it as a source of new ideas from current education.

4.6 RICS Routes of membership & Training

The graduate route was the clear preferred route to RICS membership of both industry and academic respondents, with 91% of academics and 71% of industrial respondents supporting this. Appreciation of the other routes (Assoc. RICS and the Senior Professional route) was fairly evenly distributed across both sets of respondents. Not surprisingly, those involved in delivering education tended to have a greater understanding of this matter. When evaluating the appropriateness of the routes to membership, a marked difference emerges between the two groups. Whilst the most favoured by both is still the Graduate route there is also a marked tendency by industry to support both the Senior Professional and the Assoc. RICS routes.

When considering the importance of attaining Chartered status in one of the leading professional bodies, both industry and academia are in agreement that by far the most important is the RICS with 56% and 62% of respondents respectively rating it extremely important. This is perhaps not surprising considering the survey population reflects full members of the RICS. With respect to the importance of a Structured Training Programme (STP) for APC, 95% of academia considered this to be either very or extremely important as against a total of just over 70% from industry. The level of provision of STP in industry is markedly low when compared with its perceived importance. A staggering 44% of industry respondents indicated that their organisation have no STP. Whilst it should be remembered that the sample sizes varied quite considerably there were 8% (24) of respondents from industry who ranked the STP to be not important at all as against 0% from the academia. There were a further 6% (19) from industry who thought it was of little importance. These are significantly worrying figures when APC guidance clearly champions the need for a comprehensive STP.

4.7 Alignment Framework

The research primary focus was to evaluate the views of the three main stakeholders in education of graduate QSs, the universities, industry and RICS. The universities were

represented by academics responsible for programme delivery whilst industry was represented by PQS, contractor or commercial (CQS), public sector and other specialist quantity surveyors. The views of these stakeholders and their relationship with the RICS and its role were also investigated.

There are considerable differences in views and levels of responsibility from all stakeholders, born mainly of inaccurate interpretations of competencies and lack of commitment. For example both industry and academia view structured training programmes for APC candidates as important but very few provide these. This is lack of responsibility.

There is no defined level of competency achievement for graduates. This leads to academia interpreting it in one way and industry interpreting it in another, resulting in discontent for both parties. This is lack of definition. The levels of achievement of competencies required for attainment of Chartered status is well defined by the RICS (2009a). But the expected level of achievement of competencies by graduate QS of a RICS accredited programme is not defined. This lack of a common benchmark for the interpretation of achievement of competencies clearly contributes to the dissatisfaction and false expectations on the part of the industry and demoralisation of the graduate.

In order to address this situation and thereby align views of industry, academia and even the RICS the following alignment framework with 5 key elements is proposed.

1. *Graduate competency threshold benchmark (GCTB):* A clearly defined graduate competency level achievement threshold should be created that is clearly aligned with APC threshold benchmarks defined with graduate career progression in mind.
2. *Re-evaluation of status of competencies:* A detailed study should be undertaken to re-evaluate RICS QS competencies.
3. *University-Industry collaboration:* Greater levels of university and industry collaboration in developing and delivering QS programmes should be made an essential part.
4. *RICS-University-Industry partnership:* The current RICS-University partnership should develop more of a tripartite relationship with regular industry representatives forming part of the partnership.
5. *Review of stakeholder roles and responsibilities:* A radical review of how a Chartered Surveyor is developed from their early stages to Chartered status must be undertaken where the role of each stakeholder is well defined to avoid wrong interpretations and subjugating responsibility.

The dilemma of attracting high calibre people with good knowledge of industry practice to academia and retaining them is one which both universities and industry will have to resolve for the sake of development and enhancement of the profession.

5 Conclusion and Further Research

The research aimed at investigating the changing developmental needs of Quantity Surveyors within a post recession industrial environment that satisfies the aspirations of industrial and academic stakeholders. A review of RICS QS competencies was initially conducted followed by a survey to ascertain views of academics on QS education and a

survey to ascertain views of industry (consultants, contractors, public sector and other specialist chartered quantity surveyors) on similar subjects.

The RICS has formulated clear and detailed documentation (RICS, 2009) identifying, classifying and explaining QS competencies. These are primarily aimed at providing guidance to APC candidates seeking full professional membership of the institution. There are 24 QS competencies classified as Mandatory (10), Core (7) and Optional (7) achieved at prescribed Levels of 1, 2 or 3. There is no such systematic approach or guidance as to what level of competency need be achieved by a graduate completing an RICS accredited honours degree programme. At present, it is an estimation of whether core competencies are addressed accordingly. What was clearly found in this research is that the absence of a threshold benchmark that clearly defines graduate level of competence has led industry to have unrealistic expectations, and academia to aspire for unattainable levels of competence producing a less than satisfied graduate that lacks direction.

Diverse views were found on key elements of research relating to QS competencies, education and development. The primary reason for dissatisfaction with any process comes from the difference between expectations and outcome. There were very high expectations of graduate competencies but the outcome does not seem to satisfy these. There were several endemic problems related to QS competencies both in academia and industry, originating mostly from the absence of defined or prescribed levels of graduate competency. There were diametrically opposing views on the ethos of graduate education, industry seeing it more as training graduates for direct employment whilst academia saw it as educating graduates with a core knowledge base for professional employment. This issue is further aggravated by the industry having less trust in the curricula used and the academics knowledge of current practice. The industry is faced with the dichotomy of greater collaboration but lack of a suitable mechanism and commitment to proactively influence the process of graduate education.

The proposed alignment of views framework takes account of the underlying situation presented above (Perera & Pearson, 2011). Therefore a framework with 5 key elements was proposed and they include: Graduate competency threshold benchmark (GCTB), Re-evaluation of status of competencies, University-Industry collaboration, RICS-University-Industry partnership and Review of stakeholder roles and responsibilities. The outcome of successful implementation of the proposed framework requires a concerted effort by all parties for the development of Quantity Surveying graduates who are industrially relevant, professionally qualified and with a sound academic background.

The implementation of the key elements of the alignment framework will require further research in the development of the Graduate Competency Threshold. Further research will also be required to re-model the RICS partnership process as envisaged in the framework. RICS competencies need to be re-evaluated to find currency and relevance considering current and future developments of the profession. The final element of the alignment framework will also involve a considerable degree of research to fully establish the roles and responsibilities of the key stakeholders in the profession (industry, academia and the RICS) and to create a holistic view of the profession and how it develops the professional.

6 Acknowledgement

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Culture of External MENToring – using alumni to support current students

Dr Fiona Grant BSc (Hons) PhD FRICS MCIOB FHEA

Abstract:
This paper reports on a pilot project of mentoring students which has been run by Dr Fiona Grant, School of the Built Environment, Heriot Watt Univeristy. It describes the difficulties faced by full time UG students trying to develop and gain industry experience whilsts completing their studies. The Culture of External Mentoring (CEMENT) initiative paired current students with alumni who had completed the same or similar degrees and who could provide support and guidance on course content, it's relevance and career advice. The outcome has achieved much more than previously anticipated with the relationship between student and mentor developing quickly and resulting in work placements, site visits, coursework case study material etc. The paper presents the mentoring scheme and the achievements so far in the areas of student employment opportunities, links to industry, course development and increased student motivation. It concludes by showing that involvement and collaboration between HEIs, employers and professional accrediting bodies is a key factor in creating a graduate with skills relevant for the 21st century.

Keywords:
confidence, employability, mentoring, opportunities, relevance,

1 Introduction

The current economic climate impacting on the construction industry has resulted in fewer undergraduate students finding work placements and gaining work experience as they complete their studies. The recession has led to contractors and private practices reducing their staff workforces and the slow recovery from recession has led to increased competition for the few vacancies available. Staff who have remained in employment during these unstable times are under increased pressure to deliver projects with minimal workforce and are working to capacity, resulting in them having limited time available to provided support, guidance and nurturing to the student/graduate who are keen to gain invaluable experience to support their studies. These circumstances have created a situation which is forcing current built environment graduates to turn to other careers, leading to a potential for large skills gaps in the industry.

When the market was buoyant and graduate employment was high, recruitment to the built environment profession was secure. Summer work experience, sponsorship, sandwich placements, graduate recruitment and part-time study had reached all time highs. Graduate positions were being offered to undergraduate final students in December of their final year, the job was secure and not resultant on the final degree classification obtained, merely on how quickly the graduate could commence work. This situation led to students having three or four job offers available and becoming strategic in the completion of their final year studies. Why work extremely hard to aim for a 1st or 2:1 when a lower classification was sufficient to secure employment?

This set of circumstances could not continue and the impact of the recession has certainly changed the situation. Employers have vigorously reduced graduate opportunities available, sponsorship schemes have faded away due to lack of employer commitment and summer work experience is extremely difficult for students to secure. Lack of response from employers to students' enquiries relating to work experience (many offering to work unpaid) are being ignored and unanswered. This behaviour is having an impact on students, getting them to question their choice to pursue a career in the built environment, with many opting to move to other professions once graduating.

This has led to:

- Limited opportunities for students to undertake work experience, thus receiving a poor return on CV enquiries;
- The relevance of the course material not being appreciated as practical application in industry is lacking;
- Students requests to have opportunities for site visits, guest lectures etc being hard to achieve;
- Students satisfaction of learning experience – low motivation due to lack of work experience;
- Students lacking confidence in their skills and knowledge, readiness for the workplace.

Some HEI websites suggest that the lack of placements became particularly acute in 2009. 'The impact of the recession on construction professional services' which found that 46% of such firms had made redundancies contributing to Office for National Statistics findings of a 400% redundancy rise for construction professionals between November 2007 and November 2009. Architects and quantity surveyors were affected the most. (Williams et al, 2010)

Employers are realising that due to a lack of work experience, graduating students need to be supported and introduced to the workplace. The theoretical knowledge gained at university needs to be out into practice (many for the first time after graduating) and this causes concern on the relevance and content of university degree programmes.

The lack of communication between academic, industry and professional bodies needs to be addressed and the three stakeholders need to be brought together to reduce the impact of the recession on current graduates.

Partnership universities foster stronger linkages with industry through the recognition of new knowledge or other advanced scholarship created in professional or equivalent environments. Recommendation – Research funding, teaching and accreditation. The future of Surveying Education, a report commissioned for the RICS Education Trust golden jubilee, March 2006.

This paper investigates one approach adopted to try an achieve this and evaluates its success.

2 Project aims

The aim of this initiative was to strengthen the links between construction management and surveying (CMS) undergraduate students and built environment professional practice by inviting previous CMS alumni; to mentor current students, providing support and contributing to their discipline knowledge development. In addition this helped to maintain the programmes position at the forefront of providing CMS provision and strengthened the awareness of the quality of our graduates, increasing their profile in the built environment profession, ultimately resulting in increased employment opportunities.

The pilot asked recent graduates to mentor students studying on the CMS programmes. This allowed current students to see the relevance of the course content and provided an opportunity to network with industry professionals.

The objectives were:

- Link programme content to industry practice – applied nature of degree
- Increase the opportunity to gain relevant employment – Summer and graduate employment
- Strengthen the links to companies and organisations who have employed current and past graduates
- Build the reputation and confidence of current student cohort as they complete their studies
- Encourage academic staff development and inclusion of employability in the curriculum.

3 Literature Review

The lack of employment opportunities is a result of the economic climate. In a report by Roberts it was stated that 'In the current climate, there are limited opportunities for graduates. While there is a realisation that the industry needs to look forward two or three years, to a point in time when it is known there will be a need for graduates again, a lack of confidence is currently preventing this. There was evidence that input from industry in the form of guest lectures, awards, placements and sponsorships have been reduced due to financial cost in the current market condition.' (Roberts et al, 2009)

Accordingly this has led to reduced opportunities with some programmes of study removing work experience as an explicit credit bearing part of the degree programme. Williams commented 'Reasons given for the decline in sandwich courses include; placements become an optional variant in courses rather than compulsory. Lengthy placements reduce the fees that HEIs can charge to students and lengthen the study period for the student. Integrating work placements into the programme, quality assurance and assessment, proved difficult.' (Williams et al, 2010)

'Employers are recognising that this is a growing problem and have indicated that 'In the current climate, that there are limited opportunities for graduates.' (Roberts et al, 2009) Mentoring of students is one method of trying to address this situation and the impact this can achieve has been supported by the mentoring scheme employed in other areas. The ASME Professional Practice Curriculum enables engineering graduates and

early-career engineers to enhance their soft skills and make the transition into the workplace. They have found that ‘many young students lack sufficient experience to imagine what kind of work they might do as professionals’. One of their goals is by the use of mentors from industry to guide and support an undergraduate student and ‘provide a "map" of the terrain and a "travellers’ guide" to the professional universe they may someday encounter’. (ASME, 2011).

The impact of the current climate specifically on Scotland has led to major projects being put on hold or stopped. Williams reported in December 2010 ‘Famously, Scottish undergraduate degrees are at least four years and perhaps more in vocational subject so longer than is usual in the rest of the UK. In Scotland during 2008-2009, plans for major building projects were put on hold or collapsed, and house building ground to a standstill – though both of these happened across the UK. It was reported that Scotland lost more than 8% of its construction workforce 2008-2009, approximately 20,000 jobs.’ (Williams et al, 2010)

The impact of recession has varied across the regions. In January 2010, a Federation of Masters Builders survey suggested regional disparities in the recession’s impact on small to medium sized firms (Federation of Master Builders, 2010)

Existing sponsorship opportunities have had to be discontinued and employers are finding it difficult to commit to offering work placements. ‘An example was given where once practice had given guest lectures, awarded two to three sponsorships and taken students into the firm for 2+ weeks experience. If suitable, the students were given the opportunity to join the firm after graduating. This had initially worked well but interest from institutions and students had been lost. This, along with current market conditions, resulted in the scheme stopping.’ (Roberts et al, 2009)

Another impact is the Browne Report (2010). It is possible that clear expression of employment prospects by HEIs will become increasingly critical once the changes proposed by Browne as accepted by Government are in place. (Williams et al) This is further acknowledge in the work undertaken by The Built Environment Skills Alliance and was presented in their recent report ‘The Future of Higher Education’, it stated that ‘Percipitate cuts by HEIs in the lead up to the new system in 2012 may create mismatches leading to failure in graduate supply and built environment provision., It further concluded that there ‘is a need to a more closely coordinate and avoid inconsistencies of interpretation in planned changes to higher education funding across the UK leading to an intended consequence that could reduce capacity and deliver what is needed by the built environment industries and so ensure future opportunities for future graduates.’

The relevance of course curriculum to employment is a key component to ensure students are graduating with the appropriate skills. Although this can be partially achieved by work-based projects and case study material, this is not as effective as the realism of working on a live project in a work environment.

Experience of ‘real work’ being introduced in a phased way to younger students, for example, site visits being integrated into the final year programme, practical approaches to the final year projects where these are set up round a work based problem. It was said solutions derived from such projects had been taken up by employers. (Towards a Construction and Built Environment Higher Education Strategy)

The work undertaken by Roberts et al for RICS Scotland, The Future of Built Environment Higher Education in Scotland reviewed the role of professional body input in the curriculum. The Executive summary stated – High value was placed by students on input to programmes from industry professionals and industrial placements. A recurring theme in the focus groups was the need for students to link theory from their course modules to practice. Linked to this, the benefits of industry scholarships schemes were stressed by the students and postgraduate representatives, in particular, suggested more practical experience in their programme would enhance their learning experience.

This is further collaborated by the findings or Srinath et al (2010) investigating the relationship between HEIs, professional accrediting bodies and employers. 'Greater levels of university and industry collaboration should be made an essential part in developing and delivering QS programmes. Industry should take a more proactive role in collaborating with and actively providing feedback to the universities.'

The work of Witt and Lill (2010) comparing individual competences with education provision and industrial needs shows that there is a need to compare an individual's learning requirements (derived from the Industry – Individual comparison) with the available study programmes. This relates to the role of HEIs in defining and developing the knowledge area within which all these comparisons are being made. The HEIs' curricula must exceed the requirements of the professional standards in some respects because they not only provide education and training for current employment in industry but also aspire to address research and future industrial needs.

The author feels the role of HEIs is to provide relevant content and knowledge and develop Constructive Alignment – of learning outcomes, subject material and assessment methods referred to a course and module level now need to be considered at degree level. By aligning the requirements of HEIs, employer and professional accrediting bodies with the student at the centre it is feasible to nurture a built environment graduate relevant for the 21st century. Figure 1 illustrates this.

This practice is being encouraged across the built environment discipline, a scheme launched in 2011 called 'The Pledge', securing future talent in construction is a campaign which strives to solve the problem of unemployed graduates drifting away from the construction industry, it is aimed at supporting graduates by encouraging companies to take on internships. (CIOB, 2011)

CIC skills have also backed this initiative and state that 'The Pledge research has shown that if every firm took on an additional 2 of their staff as interns, this would be enough to give each currently unemployed graduate at least one placement, however to date built environment-related vacancies posted on the site are few and far between.' (CICskills, 2011) The encouragement and incentives are there but the collaboration and long term benefits for the graduate, employers and the future of the profession needs to be strengthened.

Figure 1 illustrates this relationship between the three parties with the student's development at the centre

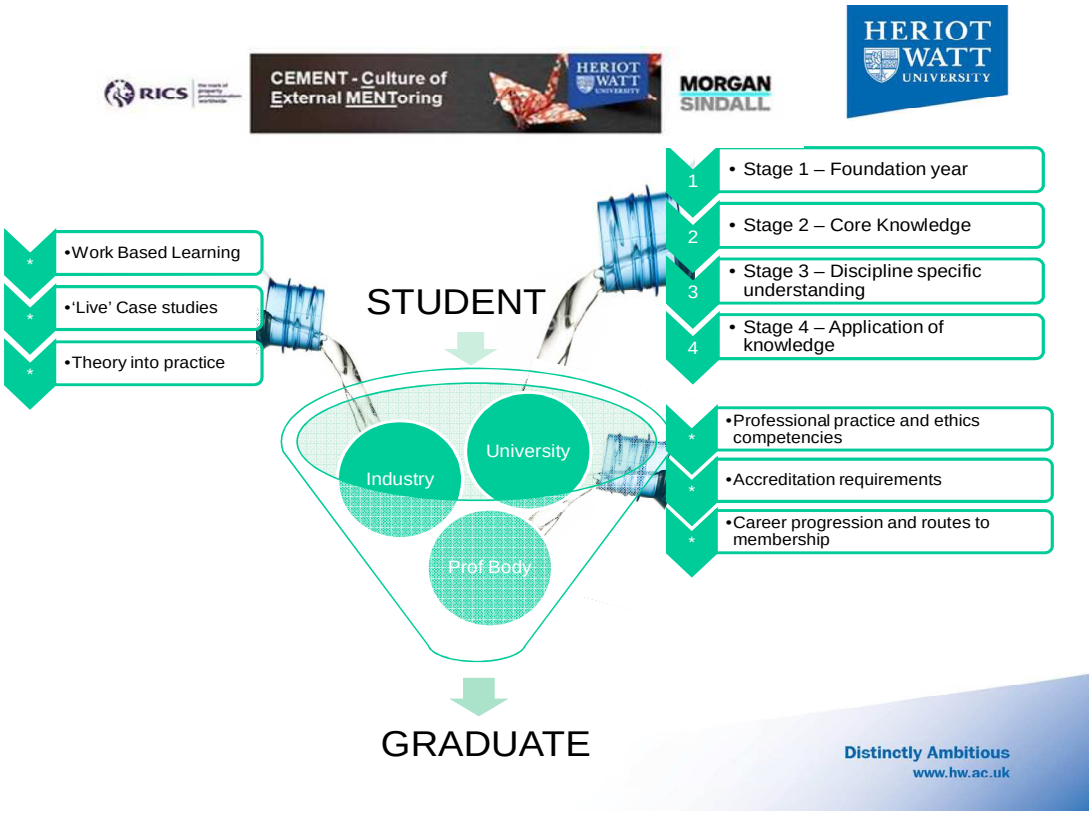

Figure 1: Development of relevant graduate skills

The findings from the literature review are summarised in the Table 1, it is interesting to note the various stakeholders concerns and issues with regards to the future of the built environment profession and the potential lack of graduate opportunities on offer due to the current influences from multiple factors impacting on education, career opportunities and students preparation for the world of work. The lack of collaboration between stakeholders is in many instances adding an extra layer of complexity to the problem and a more proactive and constructive effort to bring all together in working towards a solution has never been more important than at present.

Table 1: Stakeholders input in developing graduate attributes

Stakeholder	Relevance of course content	Opportunities for work experience during studies	Student employability skills
Student	This is not sign posted clearly enough and students are not confident in their abilities	Morale is low due to high rejection of CV enquiries and lack of opportunities and networking events	Students find it difficult to relate subject knowledge to work environment and find it difficult to describe their skills on their CV.
University	University documentation completed which is not directly linked to industry due to terminology used.	Sponsorship, sandwich degrees, work experience limited	This is sometimes difficult to promote due to students not liking theory with practice
Professional accrediting bodies	Course accreditation, competencies covered in curriculum and course content	Encourage students to undertake work experience and record competencies but this is difficult to achieve.	Low conversion rates from graduating students to full membership
Employer	Course content to meet the demand of the industry	Limited due to current economic climate	Students skills to meet the needs of the industry and the ability to develop in their career

4 Research Methodology

CEMENT has developed the opportunity for current undergraduate students studying Quantity Surveying, Building Surveying or Construction Project Management to have regular contact with industry through networking with Heriot-Watt past graduates and industry professionals.

By drawing on the School of the Built Environment's strong and well established links with industry and professional practice, a large number of CEMENT mentors agreed to participate. Many of our graduates are employed with the top ranked international companies; having successfully progressed in their careers, achieving senior roles, with responsibility for high value and complex projects completed around the world, the sharing of their experiences with current students has been invaluable. The achievement of our graduates is an outcome The School are very proud of and our aim is to continually strive to help our current students continue this high status and successful profile.

The relevance of the initiative to employability, professional competence and subject knowledge awareness has been a major factor in attracting both students and mentors to participate with such enthusiasm. It has played a key part in linking the taught course material with current practice, helping undergraduate students to establish the relevance of course content. The scheme has secured sponsorship from RICS Scotland and Morgan Sindall PLC (Scotland Region) who have welcomed the link and opportunity to participate.

4.1 Learning from mentoring

The objective of the mentoring relationship is concerned with facilitating learning. A useful model that explains how learning takes place is the Kolb's Learning Cycle shown in Figure 2 that stresses the importance of learners completing each of the four stages of

the cycle – **experience**, **reflection**, **generalisation** and **active experimentation** – before effective learning can take place.

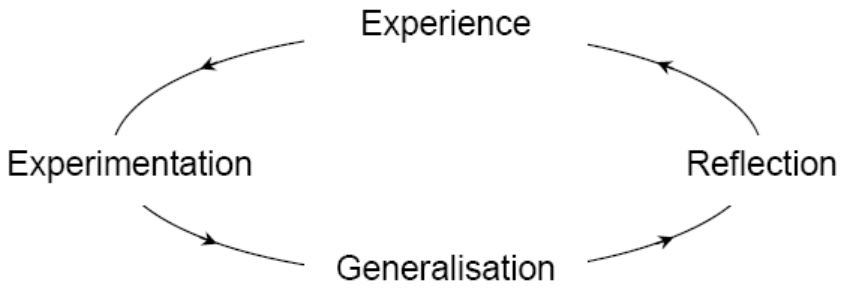

Figure 2: Kolb's Learning Cycle

Learning requires opportunities to have an experience and to reflect upon it. Opportunities to work out rules or generalisations from these reflections allow the learner to experiment with new ideas or ways of doing things. Incidentally, it does not matter at which stage in the Learning Cycle the learning commences and it is equally appropriate for learning about personal issues as it is for work related issues.

Mentoring therefore may involve the provision of opportunities at all of the stages of the learning cycle. The Mentor and the Mentee will jointly decide on experiences that may be appropriate for the Mentee's learning and the Mentor may be able to provide access to these. After the experience, the Mentor will play an important role in encouraging the Mentee to reflect on that experience, perhaps by asking appropriate questions, or maybe even by asking the Mentee to keep some written log of their views.

Generalisation can be achieved by input from the Mentor – perhaps by giving their own experience of the topic, or by the Mentee reading books or journals about the topic and Active Experimentation may be the provision of another opportunity from which experience can be gained, and so on round the Cycle again.

4.2 The main requirements to be an effective mentor are:

Mentoring is essentially a means by which individuals learn and develop. It is different from a number of other learning situations as it is a relationship between two people and this is highlighted in most formal definitions of Mentoring e.g. "a protected relationship where **experimentation**, **exchange** and **learning** can occur, and **skills**, **knowledge** and **insight** can be developed".

- **Commitment.** – to make the relationship work, Mentors need to be able to devote time and energy to the CEMENT initiative.
- **Action.** Mentoring requires action; results were only achieved by communicating with their Mentee regularly.
- **Skills required. –** Mentors were encouraged to work with their Mentee in objective setting, communicating, coaching and planning.
- **Effective networking. –** Opportunities to put their Mentee in touch with contacts, especially to develop wider industry awareness.

The diagram below shows the key characteristics of an effective Mentor.

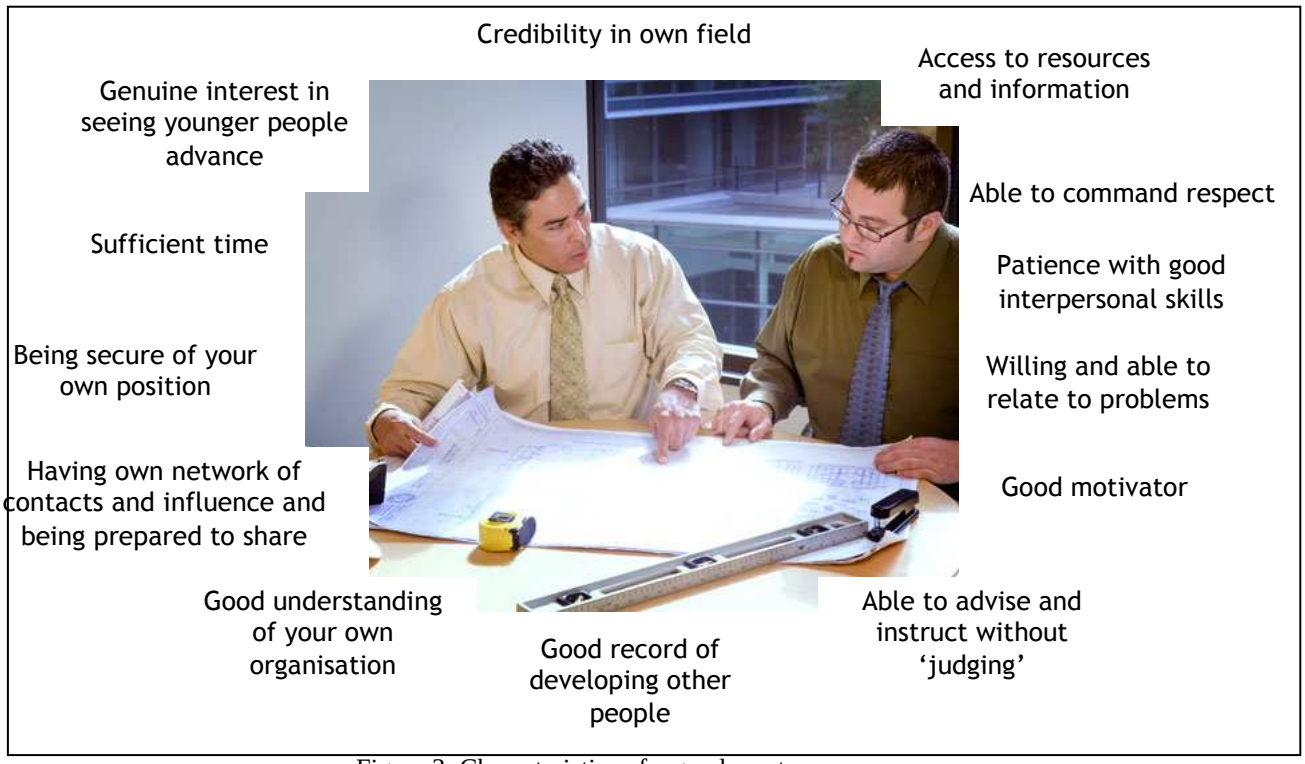

Figure 3: Characteristics of a good mentor

4.3 Stages of the CEMENT initiative

The several stages in this particular programme are shown below:

- **Selection of Mentees**: Mentees are in their third year of study. The programme was publicised and outlined by the department of Construction Management and Surveying. The students have been participating in the programme as an integral part of their professional development practice within their studies.
- **The Matching Process**: Students were matched to a suitable Mentor by the CEMENT Programme Coordinator. Both Mentors and Mentees were then notified of their match by email at the beginning of the academic year.
- **First Contact - Getting to know each other:** Students were tasked to arrange an initial communication with their Mentor as soon as possible for this purpose at the start of the year, beginning the mentoring relationship.
- **Communicating and working together**: There were no hard and fast rules about how this would work. Each individual mentoring relationship was anticipated to work this out depending on the commitment of both parties, bearing in mind that previous participants in other schemes valued additional contact in addition to the minimum expectation of a meeting twice in each semester.
- **Reporting back by Students:** Students then provided feedback information on how their mentoring relationship was progressing at Mentor meetings held with their 'Academic' Mentor on two occasions each semester.
- **Reviewing and Evaluating Progress**: This was undertaken by both parties on an ongoing basis. There was also a formal evaluation involving all parties at the end of the programme.
- **Saying Goodbye**: Bringing this particular relationship to a close through an evaluation meeting over lunch with all the participants on the programme.

4.4 Time commitment

There are a number of aspects to this as illustrated in Figure 4:

- An induction meeting was held at the University together with other Mentors to learn more about the programme;
- The initial communication with the Mentee (Week 2 during Semester 1).
- Regular contact – at least a further three communications completed during the academic year, Week 9 or 10 of Semester 1, Week 2 or 3, Semester 2 and Week 9 or 10, Semester 2. Contact was in the form of e-mail, telephone conversation, face-to-face meetings of one hour (maximum) or involved the Mentee shadowing their Mentor for a day at their place of work, and;
- Final Evaluation and Review, evening event held at the end of Semester 2.

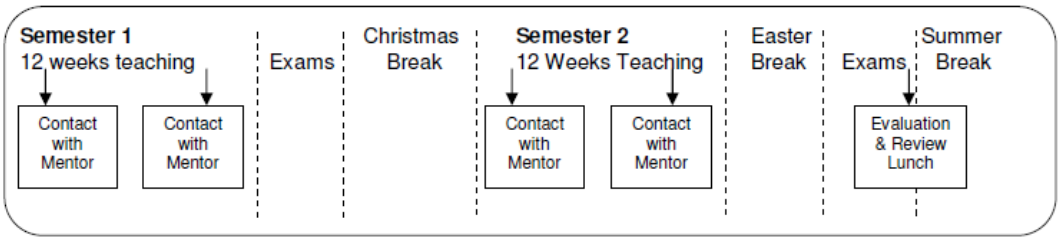

Figure 4: CEMENT time commitment over the academic year

5 Findings and Discussion

The CEMENT initiative has proved successful during the pilot year of delivery. The relationship between mentor and mentee worked and in many cases exceed the aims and objectives of the scheme. A selection of comments and feedback received from mentors and mentees is presented below:

"My mentor has been more than accommodating at responding to requests for information and a chance to meet and chat about his experience. We have recently had a day out and visited the head office and various current contract sites. The experience was invaluable and has possibly opened the opportunity to some Easter and summer work experience." Student

"I had a meeting with my mentor which went very well, he has offered to meet up every fortnight on site and will set some tasks. He was very positive about the mentor scheme and had a welcoming attitude towards me. I believe that I will benefit from the external influence and am looking forward to the experience." Student

"Excellent communication with students, he is very interested and is already looking at life beyond university and is asking how the modules he is studying relate to the industry." Mentor

"The CEMENT programme I have found to be very useful for both the mentor and student. I introduce the student to e-mailing lists for invitations to seminars which are valuable for learning and networking." Mentor

Additional benefits from the mentoring scheme have provided opportunities for guest lectures, site visits, case study material, review of course content and potential new course proposals, as well as CPD initiatives etc. Academic staff have also had the opportunity to clearly sign post to students the relevance of the course content and be able to relate this directly with the communication students have had with their mentors.

The success of this pilot has been the inclusion and involvement of the University Alumni and Careers Service to provide the contact details of past graduates and to assist in developing the role of the mentor. To duplicate this scheme in other institutions it needs to be led by an academic who has regular contact with the students (year tutor, programme leader etc) to keep the relevance and opportunities of the scheme clearly evident at the beginning. Once links to the mentor has been established by the student peer discussions on the rewards and benefits is sufficient for the student to take ownership and build the relationship with their mentor.

The rewards can be summarised as:

- Increased site visit opportunities
- Summer work placements being offered
- Industry Liaison Advisory Group - renewed momentum and involvement in curriculum design
- Higher profile of Construction Management and Surveying students in the built environment profession.
- Positive feedback from students; mentors; university and professional bodies

6 Conclusion and Further Research

The role of all stake holders in securing the future of the built environment profession has been examined in this paper and it is evident that a joint approach to addressing the current issues and circumstances is required to achieve a solution and create the momentum required for the solution to be long term and not based on only being successful when the market is favourable.

Encouragement and support to undergraduate students by industry mentors during their degree studies is key to developing a graduate who is prepared for the 21st century and can link the learning knowledge developed through their studies with the 'real' work environment. The earlier this can be encouraged in a student's learning process the greater the impact on their motivation and understanding of their future career potential.

The involvement of industry practitioners in a mentoring capacity has proved to have additional benefits for the HEI, the individual mentor and their employing organisation. It has helped mentors develop their skills in this area and has created a link between academic and university which is more structured and presented opportunities for dialogue not necessarily previously available.

The impact of having this clear link to industry has influenced the material content of courses and academic are now clearly signposting the relevance of the topics studied and the inclusion of employability skills in the curriculum, which in the past were there but never implicitly clear to students due to limited work experience.

It is planned to develop this initiative further to offer a similar opportunity for our postgraduate students during the next academic year; this will be a more challenging project due to the international cohort of students completing the degree programmes. To further investigate the benefits of the mentoring opportunities all students participating will complete a questionnaire at the beginning and end of the academic year to evaluate the impact of mentoring. This is similar to an exercise undertaken by Whiteside et al, when they introduced mentoring of undergraduate research assistants.

Achievements of the CEMENT initiative include:

- Increased opportunities for students to get out into the workplace.
- Relevance of the course material now appreciated as practical application in industry evident
- Students value opportunities for site visits, networking with industry, knowledge transfer etc
- Students increased satisfaction with their learning experience
- Students growing confidence in their skills and knowledge

We constantly hear that Universities, professional bodies and employers should be working in closer harmony to achieve the graduates of the future, even after the first year of operation this scheme is proving successful in achieving this as several students have gained placements with their mentors over the summer period.

7 Acknowledgements

Students for participating with such enthusiasm, sponsoring company Morgan Sindall PLC (Scotland Region) and RICS Scotland. The University Alumni and Careers Service for the assistance in developing the initial idea.

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Mapping of Sustainability Education to Construction Related Curricula: A Case Study of Quantity Surveying (QS) Degree Programme

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Abstract:
An effective response is required to climate change and the steady diminution of resources of our natural world. We are all situated within and dependent upon the Built Environment for our survival. We all benefit from buildings and infrastructure. The creation, refurbishment and maintenance of this environment is a £100 Billion industry. Each new build operation, every refurbishment and the operation of existing systems all consume resources, in many cases scarce and non-renewable. What is vital is awareness in those actually responsible for the creation and renewal of the facilities referred to above? There can only be a concerted effort at sustainable building when there is genuine, informed, concern on the part of all members of the construction team. Perhaps we should look to our providers of construction-related education to instil students with increasing awareness of the issues. The current study examines the extent to which there is appreciation of issues of sustainability amongst educators and the extent of their inclusion within the curricula of (in this case) Quantity Surveying students at a northern university chosen for the study. The literature review findings and results from the content analysis of the series of interviews conducted suggest the level of inclusion appears to be low. This supports findings from the recent RICS research, which suggested that sustainability may be evident across only 3-5% of the curricula of most Quantity Surveying programmes, and incorporated at a basic level only.

Keywords:
carbon, construction education, quantity surveying, stakeholders, sustainability development

1 Introduction

> "Construction has the potential to enhance rather than degrade the environment and to promote rather than exasperate social and economic equity. If this potential is to be realised, everyone within the industry will need to attain some level of sustainability literacy" (Murray and Cotgrave, 2007).

Given this statement, Murray and Cotgrave have set the stage for discussions on the future of the study of sustainability in the built environment. Many proponents in this area share this view and they believe changes are necessary to accommodate the needs of a changing world. The increasing emphasis on climate change has generated considerable interest in the sustainable development (SD) agenda throughout the world. In the UK, like any other country, there is increasing awareness of the significance and value of having a sustainable environment (Khalfan, 2006). The SD issue is one of the greatest challenges facing the world. In the built environment (BE), the challenges are large given the size of the construction industry, which account for 8% of GDP. The enormous amount of resources it consumes, the major impact of its products and activities on the BE in particular and the society at large, contribute to the economic well-being of the country; the social well-being of people and the impact on the environment (Cowling *et al*., 2007; BERR, 2008). Theron (2010) estimated that the BE in its widest sense is responsible for 40% of CO_2 emission, as well as 40% of all energy used. The Kyoto protocol, EU Emission Scheme, recent changes in building regulations and the Climate Change Bill all indicate a growing recognition of the need to minimise the consequences of human activities on the environment. These initiatives have created the need for major reform in the UK construction industry and educational systems.

There are many proponents in this area who believe that the green agenda and construction education are intricately linked (Walton and Galea, 2005; Cotgrave and Alkhaddar, 2006; Hayles and Holdsworth, 2008; Theron, 2010). The rationale therefore, for embedding green issues within the construction curriculum is a powerful and imperative one. The rationale has mainly come as result of policy drivers and in some cases existing research or surveys in this area, but the response from academics so far is patchy. However, it is increasingly recognised that the curriculum should incorporate sustainability or green issues and produce graduates that are confident of taking care of the environment without damaging it for future users. Hayles and Holdsworth (2008) argued that the 21st Century is seen as the time for the UK universities to embrace new ways of working. This is especially important if the educational system is to continue to be competitive and also meet the needs of its increasingly demanding stakeholders. A major challenge for the universities however, appears to be on the question of its ability to provide products and, to an extent, services that meet stakeholders needs and aspirations, especially in relation to the sustainability agenda.

This paper has been developed in response to a growing interest in the sustainability agenda in the educational curriculum. The authors of this paper are particularly interested in identifying the quality and quantity of sustainability-related materials within the quantity surveying curriculum. The study is intended to describe the current state of affairs through the examination of a North East (NE) case study and identify broad and specific changes needed to bring about more incorporation of sound sustainable quantity surveying practices. However, the research project outlined in this paper attempts to establish and map the sustainability activities within the quantity surveying (QS) programme. To achieve this, a review will be undertaken to determine the main areas of interest in sustainable construction particularly in relation to the QS field. Primary data will be collected using a case study of the QS staff in Northumbria University in the NE of England. The results will be used to qualitatively map the extent of sustainability-related features within the curriculum in the QS programme. The findings from this paper will be drawn from both the secondary and the primary data analysis showing limited application of sustainability-related education within the

curriculum. Further research will aim to quantitatively map the extent of sustainability education within the QS curriculum and also recommend strategies of how such sustainability-related education can be incorporated into the curriculum to aid in producing graduates that can confidently take care of the environment.

2 Literature Review

"Sustainability", "Sustainable Development" and "Sustainable Construction "are words that have become common currency in recent years. They are phrases that are interpreted in different ways, but the underlying suggestion is one of doing things differently and better. In the UK, with climate change high up on the government and industry agenda, sustainability arguments are in strong demand. Numerous definitions have been proposed by various proponents working in this area. Despite its ubiquitous use however, there is an apparent lack of academic definitions of what exactly sustainability is meant to be within the curriculum. This section will review the fundamental change of the Sustainable Development Education at Higher Education and identify the challenges the quantity surveying programme will face if the sustainability agenda is not addressed in the curriculum.

2.1 Greening the Curricula

In light of the above statement on the sustainability agenda, this paper explores the views of some academics of current sustainability-related education within the built environment curricula. A review conducted of research in this area found that there are a number of studies that have been done to explore the opportunity to embed sustainability agenda into the built environment curricula (Sayce *et al*., 2009; Iyer-Raniga *et al*., 2010; Hayles and Holdsworth, 2008; Cowling *et al*., 2007; Murray *et al*., 2006; Cotgrave and Alhadder, 2006; Fenner *et al*., 2005; Perdan *et al*., 2000). These studies have been carried out to encourage staff to make commitment to sustainability by making changes to their modules or provide new modules for student learning.

As early as 2000, Perdan *et al*. attempted to adopt a multidisciplinary approach to teaching sustainability for engineering students at the University of Surrey and they developed IT-based learning materials and case studies to facilitate students' better understanding of concepts of sustainability and how solutions could be developed. Fenner *et al*. (2005) did similar study; they reviewed the education for sustainable development (ESD) in Engineering Department at Cambridge University and encouraged students' self-reflective learning processes to obtain their own solutions for the challenges of Sustainable Development.

In the built environment, Cotgrave and Alkhaddar (2006) reviewed the undergraduates' construction management curricula at Liverpool John Moores University and established that the sustainable design and technology was superficial within final year study. Further studies found that the students' attitudes towards environmental issues were very low or non-existent. Murray *et al*. (2006) implemented a full curriculum to identify the gap in provision of sustainable construction education at Plymouth University. Their study found that although discipline-specific environmental aspects were being included in the curriculum, but few generic aspects of sustainability such as citizenship, poverty were being covered.

Cowling *et al*. (2007) argued that education for sustainable development has become increasingly significant within the built environment higher education curriculum at Kingston University. They explored students' familiarity, understanding and interest in sustainable development (SD) and how these developed over their time at the university. Their results showed that the school's emphasis on SD had an opportunity to contribute greatly to the students' awareness of the subject given that they entered the courses with interest but a low knowledge base.

Hayles and Holdsworth (2008) conducted an action research project at RMIT, Australia to embed sustainability agenda into the core curriculum of the school of property, construction and project management undergraduate programme. Their results showed how sustainability issues were embedded into three new modules. However, further exploratory research is needed to show how sustainability can be embedded within the whole of the built environment studies. In a more recent study, Iyer-Raniga *et al*. (2010) conducted research with construction management students at RMIT to compare students' sustainability activities between Melbourne and Singapore. Their finding showed that there does not appear to be any significant differences in the perceptions, knowledge and understanding of sustainability issues between the two sets of students.

While the list of previous works in the area of sustainability education in this review is not exhaustive, it does indicate the wide range of proliferation of research projects that should be considered in determining a more sustainable course of action to incorporate sustainability-related education within the quantity surveying programme.

2.2 Challenges facing the Quantity Surveying Professional

Having introduced the concept of sustainability in BE education, the following section of the review will report the challenges facing the QS professional.

Previous researches have provided some understanding of the meaning and significance of quantity surveying (Lee and Hogg, 2009; Perera *et al*., 2010; Simpson, 2010). The role of quantity surveyor as suggested by RICS (1971) cited in Nkado and Meyer (2001) is associated with measurement and valuation. They argued that quantity surveyors provide a proper cost management of construction project in the context of forecasting, analysing, planning, controlling and accounting. Other proponents in this area have suggested that competent quantity surveyors must have a range of skills, knowledge and understanding which can be applied in a range of contexts and organisations. What is clear is that the roles and activities of quantity surveyors have now become extremely diversified, with a range of employers to match. Ashworth and Hogg (2007) argued that their skills have been enhanced to meet these needs. However, within the same period, sustainability has emerged as area of growing importance to the construction industry. In the UK a number of construction companies have re-branded themselves to try and meet the needs of the sustainability agenda. The responses of the industry highlight that there is growing interest in the sustainability issue and that the sustainability issue is beginning to be taken very seriously.

Achieving progress towards sustainability is critical to the future well-being of society and this has long being recognised by HEFCE (HEFCE, 2010). They have placed sustainability as a major objective both organisationally and within their sphere of influence and activity. It is suggested that universities have a big role to play in tackling the sustainability agenda (Jones *et al*., 2008). In HEFCE (2010) report, it is argued that

the universities and colleges are in a unique position to lead the way and change the awareness of sustainability agenda. It is therefore expected that universities will be at the forefront of embedding sustainability both within their own institutional values and within the curricula that they deliver.

Dixon (2009) argued that there has been progress over the last two years in linking sustainability into professional practice globally, but he suggested that the key barriers continue to be lack of knowledge and lack of expertise from graduates and experienced professionals. This reflects the inadequacy of training and education in universities. In the recently completed EcoBuild conference in 2010, Paul Morrell, government adviser on construction stated that the government's greatest worry is how to satisfy the carbon and green agenda. He went on to state that the construction industry does not have the capacity to meet the sustainability agenda because the universities are not producing the graduates with adequate knowledge.

It is crucial for the whole construction sector to make strong contributions to sustainable development. Many construction professionals such as architects and engineers lead the sustainable construction in the world. The industry is continually raising its standards; however, there is lack of evidence showing that Quantity Surveying professionals are demonstrating sustainability leadership in the business and services environment. It is of paramount importance to identify what types of new skills are required by quantity surveyors in order to tackle the sustainability agenda. RICS (2007) in their review identified all kinds of surveyors' competencies and have also identified a number new skills required for QS to provide sustainability services through the life span of a building project. The identified areas are: value for money, whole life costing, cost of alternative materials, renewable energy schemes, recycled content schemes, the ethical sourcing of materials and labour. Other key elements also discussed in other literature include; sustainable procurement knowledge & skills and sustainability performance measurement. Furthermore, RICS also listed a number of responsibilities for QS in terms of sustainable development:

Protecting and enhancing the natural environment

Encouraging the sustainable use of resources

Reducing waste generation and responsible disposal of waste

Reducing energy consumption

Promoting community development and social inclusion

Minimise any negative social or environmental impacts of development

Promote sustainable land use and transportation planning and management

Promote sustainable design, development and construction practices, including whole-life costing

Much has already been written about the skills which will be necessary for QS to meet the challenges outlined above. However there is a huge skills gap between the quantity surveyor in higher education and new skills. So far there is little research conducted to

investigate the incorporation of sustainability-related education within the QS curriculum. Achieving sustainability education with the QS curriculum will require an exploration of the general definition of SD and its three spheres; the economic, the environmental, and the social. In addition, one must acquire knowledge of regulatory and technological issues that encompasses both the parts and the whole in dynamic interaction. Dale and Newman (2005) argued that the key to achieving these skills is adaptability, meaning the ability to change, particularly in a changed economic climate and the threat of global climate change. Clearly universities operating in the built environment field have a vital role in shaping the future pattern of practice and policy in relation to the sustainability agenda. So, it is vital to map the curriculum towards sustainability. As a high profile university in the UK, Northumbria University could make a substantial, exemplary and on-going contribution to sustainability education by aligning its curriculum to address sustainability issues within the QS programme. This will enable the staff to educate and inspire the new generation of quantity surveyors and influence them to be tomorrow's leaders in sustainable development.

3 Research Methodology

Two distinct data gathering methods were employed to develop the sustainability framework relevant to Quantity Surveying (QS) and to qualitatively map the extent of coverage of the identified sustainability knowledge areas in the QS degree programme of the School of the Built and Natural Environment at Northumbria University. These strategies are illustrated below.

3.1 Use of Published Sources

A detailed literature review was carried out to explore the sustainability agenda and its impact on construction related curricula in general and QS education in particular. The main areas of interest in sustainability and the RICS QS functions in the light of current practice and future roles were identified through the review. This culminated in the development of a framework which identifies the sustainability knowledge areas relevant to construction and QS roles. The framework triggered and provided the basis for the later strategy used in the research.

3.2 Sustainability Mapping Case-study

A series of interviews were carried out with key QS staff to review and verify the framework developed from the literature findings. Subsequently, their views on the extent of coverage of the identified sustainability knowledge areas in the QS degree programme at Northumbria University, which is the research case study, were probed.

3.2.1 Sample Population

The respondents include the subject director, construction economics professor, distance learning director, programme leader and the year tutors of the QS programme at Northumbria University. These persons were deliberately chosen based on their accurate knowledge of the programme as they play a significant role in designing and maintaining the curriculum used to teach the QS students. In their different capacities, they are familiar with the entire range of modules that make up the curriculum and also with the contents of each module. Based on the above and their appreciation of the

learning outcomes at every stage of the QS degree programme, they are able to advice on the extent of coverage of sustainability in the curriculum used to teach the students.

3.2.2 Quantity Surveying Degree Programme

The QS undergraduate programme is either studied as BSc (Hons) Full Time for 3 years full-time or 4 years sandwich. In Year 1, (otherwise known as Level 4), studies focus on the principles of knowledge on which quantity surveying is based including undertaking a UK-based residential field study visit. Year 2 (or Level 5) concentrates on the role of the Quantity Surveyor in practice and also prepares students for work in the optional placement year. Students are strongly encouraged to undertake a placement year as it gives them the opportunity to put into practice what they have learnt in the first 2 years of their study before progressing onto the final year. In Final Year (otherwise referred to as Level 6), the broader role of the Quantity Surveyor is investigated whilst further developing relevant academic skills and also undertaking an optional European-based residential study visit.

3.2.3 School of the Built and Natural Environment at Northumbria University

Being a major university of its kind in the North East of England responsible for training construction students for the professional world of work, its programmes have to be sound, up to date and at the fore front of knowledge. This is absolutely critical if these are to maintain their absolute relevance well into the future and to keep attracting applicants from within the region and beyond - not least its QS degree programme, which is RICS Accredited and the largest in the School. The adequate inclusion of sustainable development as it relates to construction and the current and future QS function is one of the principal elements that could enhance its construction related curricula of the School in general and the QS degree programme in particular. This is also an area within which the government hopes to increase academic funding in the nearest future as a means of promoting the global sustainability agenda. It is therefore necessary to examine the extent of coverage of sustainability within the QS curriculum, to enable the programme continue to produce seasoned graduates confident of taking care of the built and natural environments.

3.2.4 Interview Process

Each of the identified respondents was probed, using a predesigned question format, on the sustainability framework. The framework initially developed from the literature findings categorises those sustainability knowledge areas relevant to construction and the QS profession in particular, into 6 main categories with several subcategories. Based on their knowledge, the respondents were asked to explain to what extent each of the stated subcategories in the list is covered in the academic curriculum of the QS degree programme, perhaps covered as an outline, as a full lecture, or as a module on its own. If not in the syllabus, they were asked to explain whether such work is planned for the future as a learning objective or is considered not applicable based on their experience. Also they were given the opportunity to mention other issues which they think should have been included in the framework. Their opinions about the sustainability agenda in generic terms and in specific terms to the QS profession, programme and the industry were also captured.

The significance of using this process was to gather qualitative first-hand information from key staff members who have major input to and knowledge of the QS academic

curriculum, born of their experience of the profession. Their “take" on the sustainability agenda and its relevance to the QS degree programme were revealed. Content analysis of the interviews conducted helped to identify other issues not already included in the framework and served as a catalyst for its refinement. The extent of coverage of sustainability in the current QS curriculum was revealed and ideas on how better to incorporate sustainability education into the QS degree programme, where considered relevant, were suggested. The refined framework, which identifies the sustainability knowledge areas, considered relevant to the profession and the QS degree programme is presented in the following section.

4 Findings

The literature findings and the interviews led to the development of the final sustainability framework which identifies the knowledge areas relevant to the QS degree programme and the profession. The framework has been developed in the light of the current and future roles of the professional quantity surveyor as informed by the sustainability agenda. According to the findings from the research, QS graduates will need to have awareness and knowledge of the issues identified in the framework (though to differing levels of detail) to be capable of taking care of the built and natural environments now and in the future. The refined framework (see Table 1) categorises the sustainability-related knowledge areas relevant to QS education into 6 main categories (high level categories) with several subcategories (low level categories).

Table 1. Sustainability Framework relevant to QS Degree Programme

SUSTAINABILITY FRAMEWORK						
HIGH LEVEL CATEGORIES	CATEGORY A - BACKGROUND KNOWLEDGE AND CONCEPT	CATEGORY B - POLICIES AND REGULATIONS	CATEGORY C - ENVIRONMENTAL ISSUES	CATEGORY D - SOCIAL ISSUES	CATEGORY E - ECONOMIC ISSUES	CATEGORY F - TECHNOLOGY AND INNOVATION
LOW LEVEL CATEGORIES	Sustainable development overview and principles Climate change and global warming issues Impact of the construction industry on the environment Sustainable construction concept Role of QS in sustainable development	Changes to Building regulation, e.g. Part L (energy efficiency) and Part F (means of ventilation) Code for Sustainable Homes Energy Performance Certificate (EPC) The Kyoto protocol Relevant EU Directives such as the EU climate policy, EU ETS, etc Climate Change Act Sustainable Construction Strategy Sustainable Procurement Action Plan	Protecting and enhancing the built and natural environments Environmental Impact Assessments (EIA) Environmental Management Systems: ISO 14001 Environmental Assessment Methods: BREEAM, LEED, Green Star Reducing energy consumption, that is, emitted and embodied Reducing greenhouse emission such as methane, carbon, nitrous oxide and refrigerant gases Carbon Agenda (Carbon footprinting, Zero Carbon, Retrofit) Waste reduction principles (recycling, reduction, reuse, effective design) Brownfield development Natural resources, renewable and non-renewable materials Water usage and Sustainable Transportation Plan	Corporate Social Responsibility (CSR) Ethical issues such as ethical sourcing of materials and labour, for instance Equity and social justice Community development and social inclusion Health & safety Employment, training and education Social assessment methods (e.g. Design Quality Indicators, KPIs and benchmarking, etc) Cost Benefit Analysis (i.e. impact of human factors on the community)	Cost planning and management Value management or engineering (cost of alternative materials and designs) Sustainable procurement strategies Feasibility studies Whole-life appraisal/ Life cycle costing Financial incentives (such as subsidies, climate change level, aggregate tax, carbon credit, Brownfield land tax, etc)	Renewable energy technologies (Photovoltaic, Wind Turbine, Geothermal, Biomass, etc) Green Building Materials Rain water harvesting and Grey water collection systems Professional and management software packages such as BIM, etc Modern methods of construction: offsite production, use of precast material, lean construction, etc Passive design methods such as day lighting, intelligent facades, carbon storage and offsetting, etc Supply chain management Effective information control and management (using e-business)

Content analysis of the interviews conducted was carried out and this helped to identify other issues not already identified from the review, and also served as a catalyst for the refinement of the sustainability framework relevant to the QS degree programme. The

next section presents a critical discourse and summary of the sustainability education, QS degree programme and sustainability framework, extent of coverage and ideas on promoting sustainability education in QS degree programme based on the literature review findings and content analysis of the interviews conducted.

5 Discussion and Conclusion

Awareness is growing amongst the general public, encouraged by Politicians at Local, National and International levels, of the need to reflect upon the relentless consumption represented by maintenance and growth of the Built Environment.

We shall not survive by mere reflection and associated promises but, rather, by making best use of those scarce and sometimes non-renewable resources left to us and by seeking sustainable solutions for the long term future. Those involved in the construction industry will be key players. Specifically, the Quantity Surveyors, with their perspective on the economics of construction will be crucial. However, this "economic perspective" must be expanded beyond that of mere capital cost of construction (the traditional boundary of their skill) to embrace a perception of the life time cost of the buildings, of the districts, of the cities even in which we all live, together with the infrastructures which serve and link them.

The researchers have examined the core body of knowledge currently taught to students on a Quantity Surveying degree, the very people who in five or ten years time, with other construction professionals, will be responsible for shaping and managing the built environment. Through a series of interviews with key staff, those responsible for developing and directing the Programme, the study revealed the role which sustainability plays in the students' studies, and the importance afforded it by those who teach. More detailed work in future, through questionnaires issued to all staff responsible for the delivery of the degree, will look at specific module curricula.

The research findings so far appear to support those of earlier researchers in the area. The study results seem to indicate that there is quite a large sustainability-related void in the education of student Quantity Surveyors, and quite possibly those in other disciplines within our School, studying to be members of the construction team. The current research has indicated two possible causes. Firstly, it appears that realisation of the very real threat we all face is only just becoming apparent to Academic Institutions as a whole and to the Professional Bodies, who to a significant extent direct the pattern of our curriculum. Secondly, few existing academics have enough detailed knowledge of sustainability-related issues to incorporate the subject confidently within the materials which they deliver. They themselves were educated in and possibly also worked through times when the sustainability agenda had not yet been uncovered. Apparently there was no threat to address. To some extent, education on matters of sustainability needs to extend up the chain, to those doing the teaching as well as down it, to students now and in the future.

One practical reason cited for the apparent failure to recognise and address the significance of the sustainability issue, often given in apology and sometimes as an excuse even, is the lack of spare time or space within the existing curriculum. "So much to teach, so little time to teach it in" is the cry. However, awareness of the sustainability agenda and its importance to what we do is vital for our survival. Therefore, whilst it is

not suggested that academics should talk of nothing else, the research implications suggest that they might plant an awareness of its relevance to most things, emphasising it to a greater or lesser extent its importance across the whole of the existing curriculum. To certain subjects such as Law and Management it may indeed seem and be somewhat peripheral. To Construction Technology and Construction Economics, for example, it must surely be of fundamental importance?

The examination of the existing curriculum, and of curriculum leaders' perceptions of its content and delivery at one sample institution suggests some uncertainty as to exactly where, and how, sustainability-related issues should be delivered. It is hoped that eventually it will be possible to produce a template, illustrating the relevance of sustainability to each key subject area, and ways even by which it may be effectively incorporated. A number of specific suggestions were made by interviewees both as to the general direction which teaching might take, and on specific areas worthy of increased emphasis within the syllabus.

All (participants) agreed that an appreciation of the sustainability agenda should be a thread visible through all teaching at all levels. It was suggested more than once that where a multi-disciplinary School set-up existed every appropriate opportunity should be taken for students of differing disciplines to work through these issues together, as they will one day have to in their professional lives. There was agreement that, where possible, classroom work should take as its model, data from local schemes which exemplified good practice in the field. Also, current research within the School has much to offer. Opinions differed as to the value of studying in any depth the social costs of sustainability (as represented by exercises in Cost Benefit Analysis) – not seen by most as primarily the concern of the Quantity Surveyors. All were agreed however that the technological and cost implications were crucial, together with the ability to transmit these concepts effectively to clients.

Participants agreed that:

" [whilst] Quantity surveyors are not there to advise on designs for sustainable development, which is the designers' job really [they] should be trained to understand the technologies involved and their implications more in terms of costs."

As noted in a recent RICS research by Perera and Pearson (2011), sustainability ranks low in terms of the percentage part it plays in the curriculum at present, although other research has shown that a growing body of Professionals in practice do recognise the part it must play in their future workload. Surely academic institutions must do better than what has been done so far to equip the Quantity Surveyors of the future for what will surely be a pivotal role, in terms of the management of time, cost and quality in deciding the future costs to society of sustaining the Built Environment.?

As one interviewee remarked "SD is not going to go away... students are going to go out there in the next couple of years upon graduation to confront these issues which [are] out there and [are] not going to go away."

6 Further Research

This paper presents the results of interviews carried out with quantity surveying staff at Northumbria University to establish the sustainability-related content within the curriculum. The research is part of a larger research within the school which aims at diffusing sustainability into the curricula of all built and natural environment programmes at Northumbria University. This research and others have established that a holistic understanding across the disciplines is needed in order to accommodate the still evolving concept of sustainability. Consequently, future research is needed to extend or map the sustainability education within other construction related programmes in the school. This will enable decision makers to have a better understanding of the situation. Also, it is of paramount importance for further research work to consider and explore the link with other stakeholders. A key strategy for incorporating sustainability education within the construction related programme would be to include professional bodies, industry and students' perspectives in future research work. For any meaningful strategy to be later developed based on this research, the input from various relevant stakeholders is necessary to establish what is required and how the strategy will be implemented. Finally, it is anticipated that this strategy will lead to the development of a methodology that schools or universities generally can use to incorporate sustainability education within their curricula.

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Ethics, Leadership and Education

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Abstract:
The importance of ethics and leadership with respect to the education of young professionals as leaders within the built environment are perhaps not recognised as fundamentally important and therefore receive less attention than they should. Ethics and leadership form the basis of important management skills such as strategy and communication. Thus the education and development of students regarding ethics and leadership may effectively enhance the quality leadership in the built environment. A literature review and a pilot study were conducted prior to requesting students involved in the building industry to respond to various questions regarding the development of young professionals in the built environment. A structured questionnaire on the development of young professionals was sent to a selected group of students at the University of the Free State. The results may show how the current situation related to certain developments stands and may also indicate the importance of ethics and quality leadership. The value of the provisional study may lead to the understanding of the current development of young professionals as ethical leaders in the construction industry and may form the basis of a future comprehensive study on ethics and leadership strategy approach, ability and skills. It may also show development areas or inadequacies related to important skills, and may also encourage educators to place more emphasis on ethics and leadership, to ensure improvement in ethical communication towards successful outcomes of projects.

1 Introduction

Ethics and leadership education of young professionals within the built environment are perhaps not recognised as fundamentally important and thus receives less attention than it should. Ethics and leadership form the basis of important management skills such as strategy and communication. The education and development of students regarding ethics and leadership may effectively enhance the quality of leadership in the built environment.

2 Ethics

Ethics is the study and understanding of morality, moral principles, and the moral decision-making process (Fan, Ho & Ng, 2001: 20). Business ethics as an applied version of ethics typically involves two tasks: the normative task of providing justification for abstract standards of behaviour and the practical task of applying these standards to business conduct. Business ethics is the application of our understanding of what is good and right to that assortment of institutions, technologies, transactions, activities and pursuits which we call business (Velasquez In Fan, Ho & Ng, 2001: 20).

Ethics can be thought of as a person's ability to act in a socially acceptable manner and to make decisions based upon one's morals and belief structure (Lecher, 2002: 109).

Professional ethics concerns the study of the morality of the behaviour of professionals in their day-to-day practice. Professionals are primarily held responsible to the general public, but the morality of their behaviour is not only assessed in ordinary moral terms but also in terms of special professional norms. Dual standards of behaviour then arise from the particular profession and the general public. The training of professionals in ethics hence plays an essential role in socialising specific professional norms as well as predicting professionals' ethical considerations (Ho & Ng, 2003: 47).

Ethics are moral principles, which govern moral decision-making processes (Fan, Ho & Ng, 2001: 20). The abstact standards and practical application of ethical behaviour is important in business and the idea of what is correct should be applied to everyday working tasks (Velasquez In Fan, Ho & 2001: 20). Ethics determine a person's ability to act acceptably and make moral decisions (Lecher, 2002: 109). Professional ethics implies the moral behaviour of professionals in business. Professionals have to act ethically and have a responsibility to the general public. They are assessed not only on general ethical standards, but are also assessed on specific professional norms (Christabel Ho Man-Fong & Vincent Ng Chi-Wai, 2003: 47). A complex modern society and the increase in number of professionals making decisions necessitates that professionals act ethically and that the standards in which they work are upheld (Fan, Ho & Ng, 2001: 21).

Project management skill is the interrelationship of creativity, thinking and ethical behaviour (Helgadottir, 2008: 743). Even when professionals are inherently ethical, the pressure of the working environment may complicate and obscures their ethical course of action (Helgadottir 2008: 747). Professionals have to act lawfully and ethically. They have to fulfil their responsibility to their profession, colleagues, employers, clients and the public, an act which requires maturity of judgement (Fan & Fox. 2009: 60).

Some construction professionals have been involved unethical behaviour and found guilty of dishonourable conduct. A difficult economic climate adds to the stress of making ethical decisions. Professional ethical behaviour or lack thereof has subsequently come under the attention of the public who expect high ethical standards. This expectation has complicated and widened the study of professional ethics (Fan, Ho & Ng, 2001: 19).

Construction professionals face a number of ethical dilemmas specific to the construction industry. The conduct and practices of the professionals engaged in the South African construction industry are governed by the guidelines provided by the respective professional bodies and the South African Council for the Built Environment. Construction professionals are bound by the professional code of ethics to have a responsibility to society (Fan & Fox. 2009: 67). According to Donaldson (In Bowen, Akintoye, Pearle & Edwards, 2007: 631) ethical practices should promote economic efficiency by respecting others, avoiding negative practices such as nepotism and bribery, and to conduct business professionally.

The factors that make the construction sector prone to unethical behaviour include competition for contracts, bureaucracy for obtaining official approvals and permits, project uniqueness which makes procie comparison difficult, opportunities for delays

and overruns, and that most much work is concealed by concrete plaster and cladding (Transparency International, 2005 In Bowen, Akintoye, Pearle & Edwards, 2007: 631). The cause of organizational ethical failure can be traced to the culture and the failure of leaders to actively promote ethical practice (Bowen, Akintoye, Pearle & Edwards, 2007: 632). It is therefore important for young professionals in the construction industry to develop ethics, moral values and professionalism at an early stage in their careers.

3 Leadership

A leader has the ability to provide and communicate a direction and vision to an organisation, to motivate others and to contribute to the realisation of the vision (Russel & Stouffer, 2003: 229). Leaders should have strong ethical standards, know what they stand for, have character and have a sense of ethical direction (Carrol, 2009: 86). Moral leaders want to succeed within the confines of their ethical standards. People think leaders should make ethically based decisions and have certain ethical behaviour and traits (Carrol, 2009: 99). According to Carrol (2009: 101) leaders have four responsibilities, namely fulfilling the mission, obeying the law, being ethical and a good citizen.

The construction industry faces leadership challenges that comprise unskilled people, an ageing workforce, dealing with change, transition, teamwork, communication, and training and education (Toor & Ofori, 2008: 622). The need for improved leadership skills in the construction industry has become an important issue (Skipper & Bell, 2006: 68).

4 Professional development and education

According to (Carrol, 2009: 46) business ethics can be taught. College students sometimes say that their values are set by the time they reach college and that nothing that takes they learn will change their view. In business ethics education, the aim is not to change students' feelings, but to sharpen their thinking. Dulaimi (2005: 182) mentions that education may be a narrow learning process of a fixed syllabus to pass an examination, or it can be the individual's exposure to varied experiences.

Professional education and training is the main concern of academics, associations and society. Construction professionals should learn professional values, integrity and competence during their university education. There are certain basic and important skills that are expected in each profession, which are best learned at universities (Chan, Chan, Scott & Chan, 2002: 45). Construction education institutions should plan their curricula carefully to encompass the appropriate training and professionals should undertake lifelong learning throughout their career (Chan, Chan, Scott & Chan, 2002: 49).

Academics and professionals propose the close collaboration between academics, industry and professional bodies to educate construction industry students (Toor & Ofori, 2008: 280). In addition to university education, participation in extracurricular activities, leadership and social activities and work experience in organisations also contribute to the leadership development of professionals.

Several challenges face the development and implementation of programs that cultivate professional skills and traits among undergraduate students. It is important to understand and properly address the challenges to ensure the an adequate professional development program.

Although formal education does not solely determine the level of professional preparation it provides the background and understanding for the challenges, problems and joys of practice. Formal education is also where the most people develop their understanding of ethical standards in their profession (Russel & Stouffer, 2003: 225). Students should not only acquire knowledge but should be prepared for the practicalities of the construction industry (King, Duan, Chen & Pan, 2008:13).

5 Research Methodology

The literature review included international and local articles on the importance of ethics, the development of leadership and the role of education in the building industry. A questionnaire was constructed on the basis of the literature review and divided into three sections, which included personal, internship and educational information.

5.1 Questionnaire Construction

The first section (personal) comprised questions on profession, extracirricular activities, work experience, social activities, reading, self study, and participation in community and outreach projects. The respondents indicated their level of participation in the abovementioned activities, the importance of certain education elements, and contributing factors to their professional development. In the second section (internship), the respondents indicated whether they were currently employed by a firm related to their profession. In the third section (educational), respondents had to rate the importance of certain educational elements that contributed to their education, knowledge and professional development. The ratings were indicated on a five point Likert scale with one the least- and five the most appropriate. There were several open-ended questions, where the respondents could give their own opinions, views or comments.

5.2 Sample

Fifty-two questionnaires were distributed in November 2010 among Quantity Surveying and Construction Management post-graduate students and final year Land and Property Development students. All students studied at the University of the Free State, at the department of Quantity Surveying and Construction Management. The students took part in an ethics, professionalism and the professional course as part of their study . The questionnaire was handed to the students and they were requested to return the completed questionnaire within an hour. The students were assured that participation was voluntary and the information was confidential.

5.3 Data Analysis

The data were summarised descriptively using Microsoft® Office Excel® 2007 to generate spreadsheets, tables and figures.

6 Research Findings and Discussion

6.1 Personal Data

The sample does not represent all students in the construction industry in South Africa; this is only a pilot study conducted at the University of the Free State, Bloemfontein. Further research will be undertaken in the near future at other tertiary institutions.

All the questionnaires (n=52) were completed and returned. The respondents' comprised quantity surveyors (79%), construction managers (8%) and final year land and property developers (13%).

From the data it is an indication that 40% of the respondents are involved at other organisations, clubs or bodies during their final year of studies, 19% of them are already in leadership positions at these organisations. Clearly this is a good indication of our leaders of the future and specifically the modern building industry. Twenty one percent (21%) of the respondent indicated that they are involved in community and outreach projects.

Table 1 Respondents' personal data (n=52).

Questions	Frequency	Percentage
PERSONAL DATA		
Course		
Quantity surveying		79
Construction management		8
Land and property development		13
Organisation, club or body involvement		40
Leadership position		19
Outreach/community involvement		21

6.2 Internship Data

Twenty three percent (23%) of the respondents are currently employed at firms related to their profession. This is a good indication that these students find the time to gain experience during their final year of studies. Work experience is a contributor to leadership and also professional development.

Table 2 Respondents' internship data (n=52).

Questions	Frequency	Percentage
INTERNSHIP DATA		
Currently employed		23

6.3 Educational Data

Self study is an important indicator of leadership potential. Out of the fifty-two (52) respondents thirty (58%) of them were engaging in self study at a frequent basis. Eight

(15%) respondents were engaging at a less frequent basis and nine (17%) at a more frequent basis. The average rating is calculated at a 59% of the students are engaging in self study, related to their profession, at a frequent basis. This indicates that the respondents regard self study as important to their knowledge of their relevant profession. Self study is a contributor to leadership development. These percentage indications reflect the total percentage of the respondents.

The respondents were also asked to respond to certain elements contributing to their knowledge regarding their profession. These elements include practical classes, site visits, study material, group work, research projects, attending seminars and conferences and computerised assignments and classes. The respondents indicated that research projects are the single most contributing educational element. Research projects refer to respondents ability to work independently, manage time effectively, self discipline, and to produce certain outcomes within a certain period of time. The student is accountable for his/her own work thus bears a great amount of responsibility. The abovementioned can be identified as leadership traits.

Table 3 Respondents' impact level regarding certain educational elements (n=52)

		1 – least impact	2	3	4	5 – most impact
IMPACT OF EDUCATIONAL ELEMENTS						
Practical classes		5	6	18	15	8
Site visits		6	6	11	18	11
Study material		0	7	20	19	6
Group work		1	18	24	8	1
Research projects		0	4	18	28	2
Seminar and conference attendance		6	5	16	21	3
Computerised assignments and classes		3	5	16	22	6

Site visits (56%) and computerised assignments and classes (54%) are indicated as the second and third most contributing elements to education. Study material (48%) is indicated as the fourth most contributing element and has a moderate influence on sufficient knowledge related to the respective professions. The attending of seminars and conferences (46%) fifth and practical classes (44%) are rated sixth most contributing element. The respondents indicated that group work (17%) has the least influence of all these educational elements. The element of group work and the participation in group work need some attention because this is regarded as a contributor and indicator of leadership. Thus it is proposed that the impact of group work is important.

The majority (69%) of the respondents indicated that these elements were adequately addressed during their studies. The contribution of class attendance to the student's education is important, according to the respondents' responses. The majority (77%) indicated that the attending of classes contribute to their education and professional development. The majority (52%) of the respondents indicated that they are satisfied with the current educational methods.

The respondents were also requested to indicate the importance of several elements contributing to their professional development. These elements consist of the following: leadership, motivation, ethics, creativity, communication, and research methods and people skills.

Table 4 Respondents' satisfaction level of current educational methods and importance level of certain elements contributing to professional development (n=52)

		1 – least important	2	3	4	5 – most important
IMPORTANCE IN PROFESSIONAL DEVELOPMENT						
Leadership		0	0	16	19	17
Motivation		0	1	11	27	13
Ethics		0	0	3	29	20
Creativity		0	4	16	25	7
Communication		0	0	6	20	26
Research methods		0	2	11	35	4
People skills		0	0	8	20	24

Ethics (94%) is indicated as the most important element contributing to professional development. Communication (88%) and people skills (84%) are also indicated as important to the contribution of professional development. Motivation (77%) and research methods (75%) are of moderate importance and leadership (69%) is indicated as a less contributing element. Creativity (61%) is indicated as the least contributing element to professional development.

The respondents realise and acknowledge the importance of ethics in the construction industry. Communication and people skills are also important related to the professional development of young professional is the building industry. The importance of leadership and creativity must be stressed this is an area of concern. These elements are to be included in discussions with the students to broaden their vision and to enable them to become visionaries. These elements also enable them to develop as ethical leaders of the modern building industry.

7 Conclusion

Students are the future leaders of the industry and they need to be well equipped for the modern industry. The early involvement of the students in extracirricular activities, work experience, social activities, reading and self study, and participation in community and outreach projects is a clear indication of the respondents positive attitude regarding leadership development.

Research projects are seen as the biggest contributing element to the development of leaders due to the fact the research projects refer to respondents ability to work independently, manage time effectively, self discipline, and to produce certain outcomes within a certain period of time. The student is accountable for his/her own work thus

bears a great amount of responsibility. Research methods were also indicated as the important contributing factor to professional development.

Ethics are also seen as vital because leaders need to be ethical.

8 Recommendation

Students should place more emphasis on the development of ethics and leadership, people skills and communication during their studies and use the available opportunities to further their leadership abilities. This can also be supported by the introduction of more group work and group activities, which are build environment oriented. The students need to be confrontend with leadership situations as well as ethical dillemas. It is necessary to increase group work activities, practical classes and site visits during students' education.

Leadership skills of future professionals in the construction industry are important and that certain elements and activities during their study years contribute to leadership skill development. The students, providers, mentors, instutitions and councils should recognise the role of these elements as important building blocks to leadership qualities.

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Developing problem-based learning resources to encourage tomorrow's Professionals: The next stage - Fostering the Graduate Transition from Student to Professional

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Abstract:
Graduate employment continues to be adversely affected by the economic climate. In 2009 the project team set out to improve the employability chances of construction graduates from the University of Glamorgan [UoG]. The project evolved from a variety of Government policy documents from (Leitch, 2006), (Welsh Assembly Government, 2008) and the (RICS, 2010) Consultation Document on employability which emphasises the importance of soft transferable skills which are central to professionalism. The work forms part of an inter-faculty study on professionalism. The faculties consisted of Advanced Technology and Humanities and Social Sciences. This project was partly funded by The Centre for Excellence in Learning and Teaching [CELT] as part of an Innovation in Learning and Teaching initiative. The methodology employed involved the re-use of a previous questionnaire with students in the first and final years of undergraduate awards. Feedback on professionalism has also been obtained in formal and informal discussions with industry representatives. This ongoing action research project to improve the students' understanding of professionalism has highlighted several questions relating to course content and delivery. These questions include what needs to be incorporated in the curriculum, how and when this is delivered and assessed. Problem based learning has been identified as a vehicle to facilitate the programme. The need to address staff development issues has also been identified. The action research continues.

Keywords:
surveying, professionalism, problem-based learning, action research

1 Introduction

1.1 Aims

- To improve employability of students on completion of their built environment undergraduate awards.
- To increase an undergraduate's understanding of professionalism
- To address the RICS employability threshold expectations.
- To develop problem-based projects, in conjunction with employer representatives, that would help to satisfy the aims set out above.

1.2 Objectives

The objectives of the research were to:

- initiate an action research project
- establish baseline of students' knowledge and attitudes to professionalism
- establish what employers expectations are regarding professionalism from graduates
- use the findings from the student baseline study and the employer interviews to inform the development of a new RICS accredited undergraduate quantity surveying and commercial management award

1.3 Rationale

The economic downturn continues. One commentator (Green, 2011) reports construction lost a further 24,000 jobs in the first quarter of this year with the number of workforce jobs dropping to its lowest level since mid 2003t whilst another (Anon, 2010) predicts that the government's recent public sector spending cuts could result in a further 104,000 job losses in construction.

The gloomy economic outlook combined with the recent requirements from RICS relating to the development of graduates' employability skills and greater employer/industry engagement encouraged the academic staff concerned to continue a project within the curriculum that would enhance graduate employability through propagating a positive culture of professionalism.

2 Research Methodology

2.1 Research design

The methodology used was designed to elicit attitudes and knowledge of students in regard to the concept of professionalism.

The authors wished to establish the attitudes and knowledge of students on the undergraduate built environment courses as a base line.

In order to establish the students' knowledge and skills, a structured tool assessing their understanding of the concepts associated with professionalism was used. This tool was derived from a number of sources. These sources had used particular terms in their definitions of professions and professionalism. This tool tested both the students' knowledge of the terms and their attitudes to professionalism.

A structured tool, relating words to concepts, was devised to reveal knowledge of aspects of professionalism thus creating a baseline of students' attitudes and knowledge. This tool incorporated nine areas which related to professionalism [refer to Appendix 1]. These common themes were generated from many sources including (Oxford Dictionary, 2009), (Fewings, 2009), (Maister, 1997), (Haralambos and Holborn, 2008) and the RICS and CIOB codes of conduct.

A quantitative approach was felt appropriate to establish a base line of students' skills and attitudes in relation to professionalism. The method also allowed the majority of students in the population to be surveyed thus maximising the efficacy and validity of the study.

2.2 Population.

All students registered on the first and final year of the full time and part degree undergraduate awards in Quantity Surveying, Project Management [construction] and Real Estate and Development at the University of Glamorgan in the academic years 2009-10 and 2010-11.

2.2.1 Sample

Students were surveyed three months into the academic year. They were fully informed of the project's aims and objectives and were given the opportunity to opt out of the survey. The questionnaires were completed anonymously.

Table 1. Questionnaire sample

Cohort	Population	Sample	% of population
2009-10			
First year	108	59	54
Final year	60	43	72
2010-11			
First year	101	29	29
Final year	80	37	47

2.2.2 Research Strategy

In order to increase the match between the expectations and needs of employers and students' attributes in a dynamic setting, action research was employed.

Action research is a research strategy to enable researchers and practitioners to work together to achieve an optimal outcome (McNeill and Chapman, 2005). (Lewin, 1946) first described this structured cyclical process to enable change to occur within a controlled environment. The process involves different methods of data collection including surveys, interviews meetings etc. These results are fed back to the stakeholders to assess the impact changes have had on their practice and if any further changes need to be made, thus refining the process until an optimum outcome has been achieved. Similarly (McNiff, 2002) describes action research as "*a term which refers to a practical way of looking at your own work to check that it is as you would like it to be*".

3 Results

3.1 Questionnaire results

3.1.1 Knowledge of concepts associated with professionalism

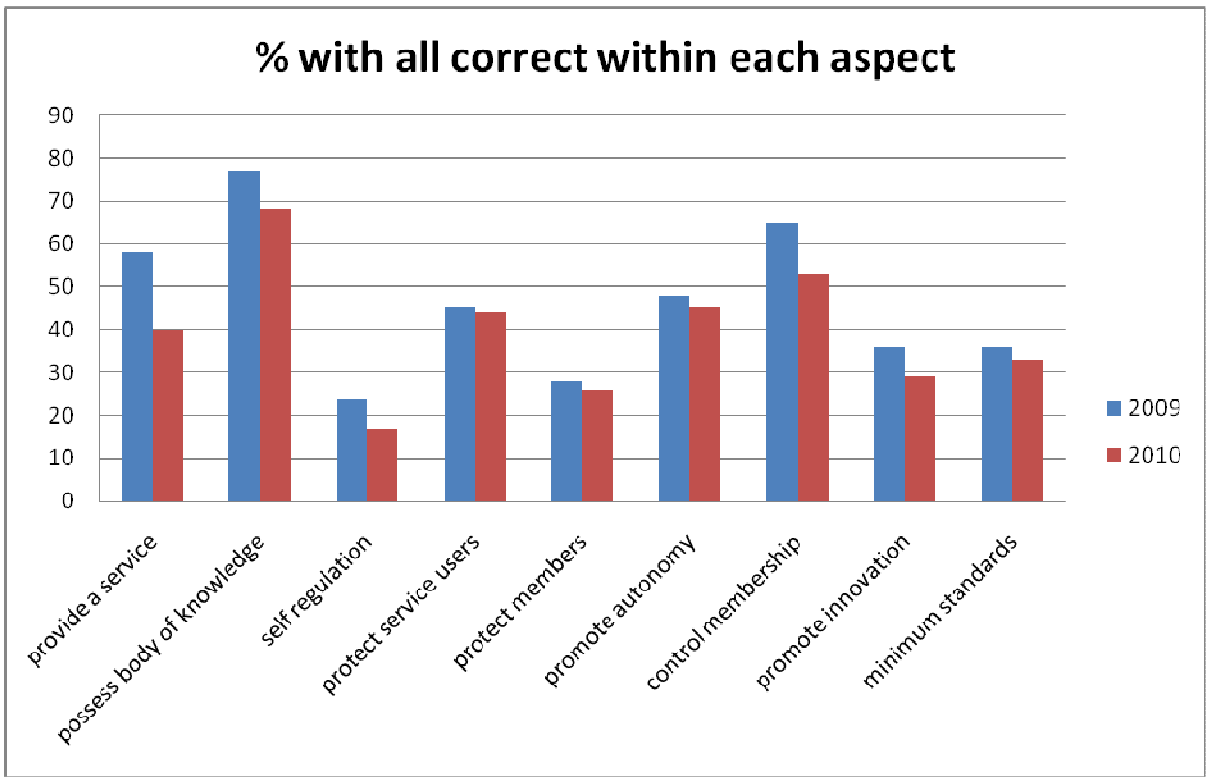

Figure 1 Results from questionnaire 2009 and 2010

Overall the results show that:

- There is a similar pattern of results over the two years with regards to the % of the cohorts that correctly identified the three correct phrases/terms associated with each of the nine aspects of professionalism detailed in Figure 1 above.
- Aspects that demonstrated the greatest understanding in both datasets were possess a body of knowledge; provide a service and control membership.
- Aspects that demonstrated the least understanding in both datasets were self regulation and protect members.
- In 2009 only three of the nine aspects produced a greater than 50% correct response. In 2010 this decreased to two of the nine aspects surveyed.
- No one correctly identified the three phrases/terms in all nine of the aspects.

Subsequent to distribution of the 2010-11 questionnaires the authors were invited to present their research findings in a seminar hosted by the university's Centre for Excellence in Learning and Teaching [CELT]. At this seminar feedback from participants highlighted that the terms "disciplinary measures" and "indemnify" may be ambiguous. The feedback suggested that whilst the terms were not considered to be incorrect there was a concern that participants may not recognise their significance in the context of professionalism. The authors note that these terms are contained within the two aspects which showed least understanding and will therefore re-evaluate the

questionnaire prior to further use. Despite their minor misgivings the overall feedback from the staff seminar was that the questionnaire was a useful tool to evaluate students' knowledge and attitude to being a professional.

The results also indicate consistency in the deficit of knowledge amongst the different student cohorts in relation to being a professional reinforcing the authors concern that this is an area that needs greater attention in the curriculum.

3.1.2 Results of questionnaire qualitative data

Two questions were included which asked the students to reflect on:

- What does being a professional mean to you?
- Why are you studying for your award?

Content analysis was used. The results provided a variety of statements which were grouped into key words. Results for both years are shown in Figures 2 and 3.

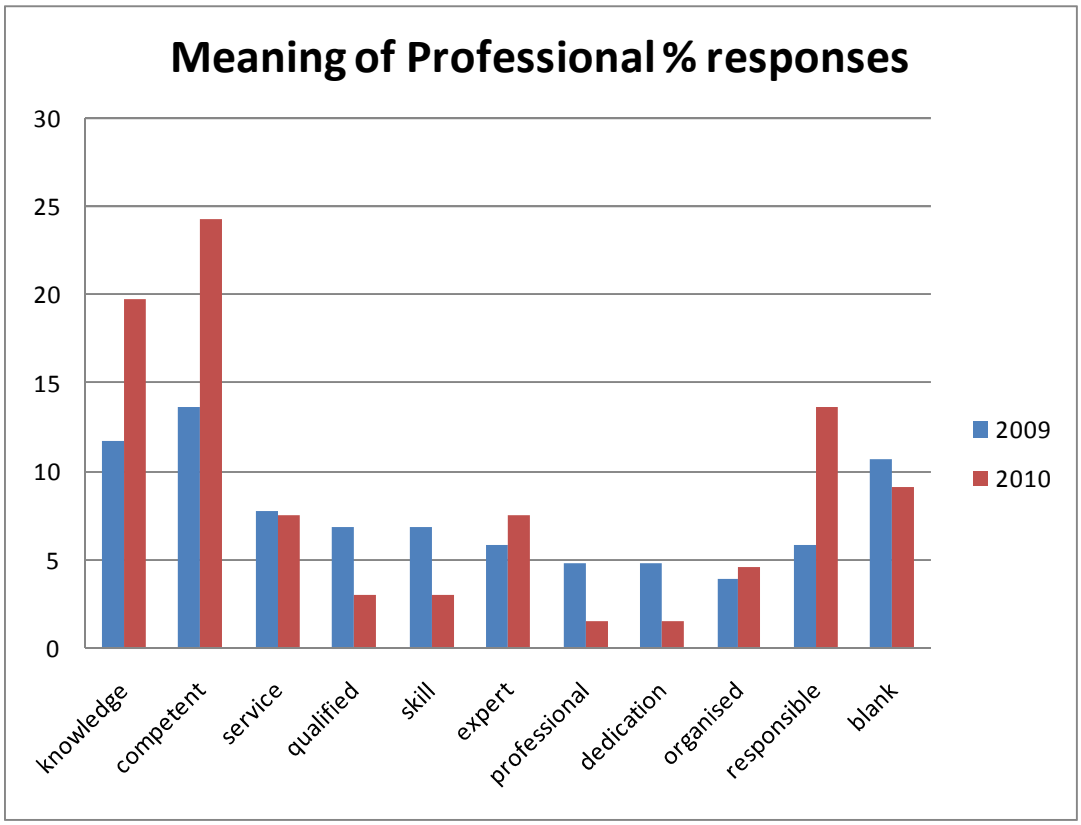

Figure 2 Meaning of Professional

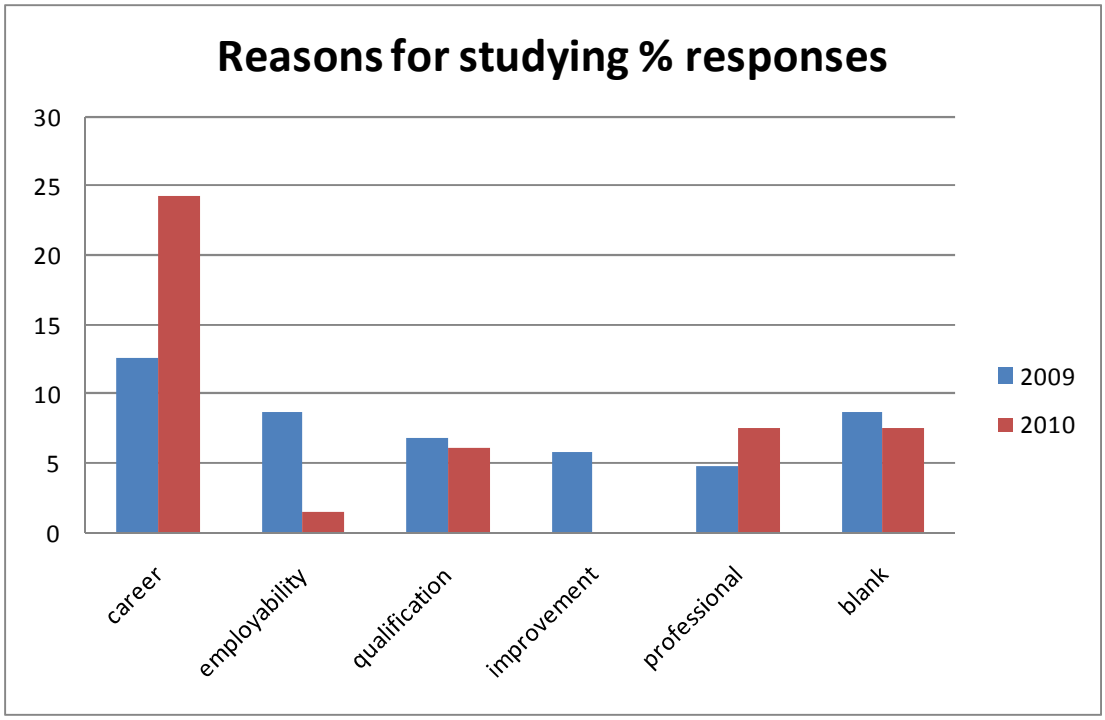

Figure 3 Reasons for studying

Whilst the terms identified from the content analysis remain similar for the two cohorts the percentage of responses for many of the terms differs considerably. This reinforces the results in the quantitative section of the questionnaire in as much as there is a clear confusion with regards to the meaning of the term professional and how it relates to their reasons for studying.

4 Discussion of results and review of relevant literature

4.1 Professionalism in the Quantity Surveying & Commercial Management award

In designing the new award it was decided that the use of project-based modules could be an effective vehicle to teach professionalism "themes" whilst at the same time influencing students' professional attitudes and behaviours. It was felt that these modules offered the opportunity, in conjunction with employer inputs, to deliver 3 core strands of professionalism ie professional competence [knowledge], soft transferable skills [eg communication, teamwork, problem-solving] and professional socialisation [personal values, belief in service to public/client, belief in self regulation etc].

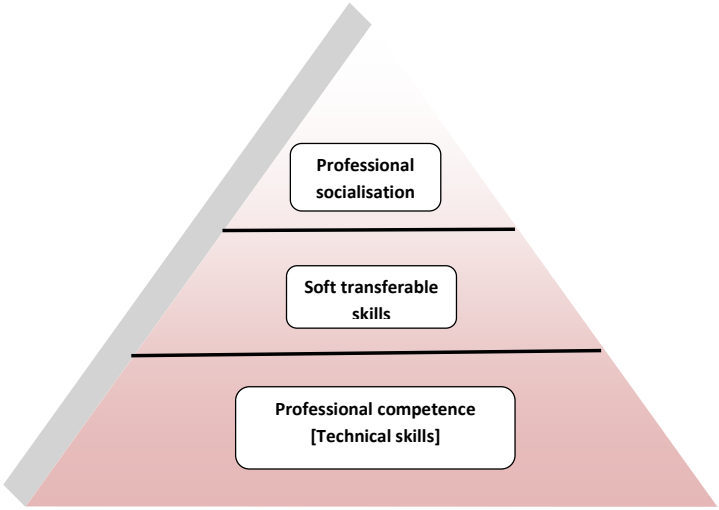

Figure 4 Hierarchy of professional development

The award contains a project based module in each of its three years. The project's professional competence and transferable skills content would be based on the adjoining modules from that year of study and the RICS employability threshold requirements. This content is the familiar territory of undergraduate education as outlined by (Duch *et al*., 2001 p6):

- *Think critically and be able to analyse and solve complex, real-world problems*
- *Find, evaluate and use appropriate learning resources*
- *Work cooperatively in teams and small groups*
- *Demonstrate versatile and effective communication skills, both verbal and written*
- *Use correct knowledge and intellectual skills acquired at the university to become continual learners.*

The teaching and assessment of professional socialisation presents the authors with more of a challenge. In her discussions on teaching professionalism to pharmacy undergraduates in America (Hammer, 2006) comments:

In discussions about students and professionalism, one question that often arises is whether professionalism can be ''taught.'' There is certainly a body of knowledge about professionalism that can be learned, but does that ensure that the learner will demonstrate professional behaviors? Probably not. Professional socialization, however, which is the process by which students learn and adopt the values, attitudes, and practice behaviours of a profession, can be taught or at least influenced.

Traditional lecture and tutorial approaches seemed inappropriate for achieving the required objectives therefore the authors decided to review the literature on problem based learning to see if it offered possible solutions.

4.2 Problem based learning [PBL]

The decision to facilitate the professionalism and employability of our graduates through using problem based learning was motivated by three main reasons:

Firstly, Problem based learning is increasingly seen within higher education as a necessary approach in education for the professions. (Boud and Feletti, 1991 p.14) see problem based learning as "*... a way of conceiving the curriculum which is centred around key problems in professional practice...*"

Secondly, there is the issue of context. The questionnaire surveys at Glamorgan and the interviews with employers identified a probable cause of the lack of undergraduate understanding of key facets of professionalism was the lack of a real world context. They were not able to ground facets of professionalism in real work situations or experience. (Boud and Feletti, 1991) suggest that one of the defining characteristics of problem based learning is that context is of central importance to this method of learning. They suggest that effective learning takes place only when students are actively involved; using knowledge they are developing in a relevant and meaningful context. The prevailing economic conditions have resulted in far fewer students undertaking a sandwich placement which has further reduced their opportunities to use their knowledge in a relevant and meaningful context.

Thirdly, Problem based learning has its roots and traditions in the teaching methods of the ancient Greeks. As (Boud & Feletti, 1991) and (Savin-Baden & Howell-Major, 2004) discuss; problem based learning is not new. It is a method of learning that predates the advent of classes and course programmes. However, it is the association with Aristotle's teaching methods discussed by (Savin-Badin & Howell-Major, 2004) that connect conceptually with the approach adopted in this research.

These three reasons will be further discussed in the sections that follow, but firstly it would seem useful to define problem based learning (PBL).

4.2.1 What is Problem based Learning?

(Duch *et al*., 2001 p6), agreeing with (Boud & Feletti, 1991) suggest that:

"...In the problem based approach, complex real-world problems are used to motivate students to identify and research the concepts and principles they need to know to work through those problems. Students work in small learning teams, bringing together collective skill at acquiring, communicating and integrating information."

According to (Savin-Baden and Howell-Major, 2004), problem based learning can be characterised more broadly by its student -centeredness in addition to its being focused around problems. They identify eight key features of problem based learning, five of which focus on the student experience and three that deal with PBL from the staff perspective. It is worth discussing the five student related characteristics:

Firstly, PBL takes into account the past experience of students.

Secondly PBL fosters student autonomy by encouraging them to take responsibility for their own learning.

Thirdly PBL centres on the processes rather than the products of knowledge acquisition. As Engel (1986) suggests problem based learning is a means of developing learning for capability rather than learning for the sake of acquiring knowledge.

Fourthly it achieves an interweaving of theory and practice.

Finally, the necessity for student's to work with others during problem based learning activities hones their communication skills in a way that enhances their interpersonal skills beyond their area of technical expertise.

4.3 Problem Based Learning as a method of educating professionals

Problem based learning came to prominence as a method of learning in universities within the field of medical education principally as a result of the seminal work by (Barrows and Tamblyn, 1980) in their book 'Problem -Based Learning: an Approach to Medical Education'. (Boud and Feletti, 1991) argue that this book changed the way medical education was taught at McMaster medical school in Canada and subsequently throughout medical education generally. The reason for this innovation was that PBL resulted in the creation of medics with enquiring minds and a desire to understand, rather than the traditional pedagogies which equipped doctors with a set of knowledge and responses that allowed them to earn a good living. Since then the use of problem based learning has begun to dominate within the arena of professional education because as (Boud and Feletti, 1991 p14) suggest, problem based learning is "*... a way of conceiving the curriculum which is centred around key problems in professional practice ...*"

Further, they see problem based learning within higher education as a necessary approach in education for the professions. They highlight the point that the ever expanding knowledge base of most professions precludes a novice practitioner being able to assimilate all the knowledge necessary in their undergraduate studies to become a fully autonomous professional. They also argue that it is more important for students to be able to research, discern and utilise information appropriately than to absorb all information academic staff deem desirable.

This argument is particularly relevant in the field of professional ethics where the code of conduct for a professional body cannot possibly cover every nuance or 'grey area' that a new practitioner could come across (see Hall & Williams, 2010). We would suggest therefore that in this arena it is even more important that students leave university having developed the knowledge, understanding and discernment necessary, coupled with humility to be able to apply a set of professional values and qualities to their professional work; and further to have the confidence to able to ask for advice in those situations where they are unsure of the 'right thing' to do.

4.4 The Issue of Context

We suggest that utilising the techniques of problem based learning may better serve the development of student understanding of their own professionalism because the knowledge which is valued in problem based learning is that which can be used in context and interrelated, rather than that of knowledge presented in discrete, often unrelated subject areas. (Boud and Feletti, 1991 p22)

(Boud and Feletti, 1991) suggest that one of the defining characteristics of problem based learning is that context is of central importance to this method of learning. They suggest that effective learning takes place only when students are actively involved; using knowledge they are developing in a relevant and meaningful context. They also suggest that one of the benefits of PBL is that:

"... Problem based learning is closer to the real world of the professional and as such has greater validity with practitioners/professionals than a course of discrete unrelated subjects. ..."

(Wood, 2003) also considers advantages of PBL to be:

- *Student centred —PBL fosters active learning, improved understanding, and retention and development of lifelong learning skills*
- *Generic competencies—PBL allows students to develop generic skills and attitudes desirable in their future practice*
- *Integration—PBL facilitates an integrated core curriculum*
- *Motivation—PBL is fun for students and tutors, and the process requires all students to be engaged in the learning process*
- *"Deep" learning—PBL fosters deep learning (students interact with learning materials, relate concepts to everyday activities, and improve their understanding)*
- *Constructivist approach—Students activate prior knowledge and build on existing conceptual knowledge frameworks*

Wood (ibid) also considers the disadvantages of PBL as follows:

- *Tutors who can't "teach"—Tutors enjoy passing on their own knowledge and understanding so may find PBL facilitation difficult and frustrating*
- *Human resources—More staff have to take part in the tutoring process*
- *Other resources—Large numbers of students need access to the same library and computer resources simultaneously*
- *Role models—Students may be deprived access to a particular inspirational teacher who in a traditional curriculum would deliver lectures to a large group*
- *Information overload—Students may be unsure how much self directed study to do and what information is relevant and useful*

Wood (ibid) also reflects on the impact of PBL on the teaching staff as follows:

Introducing PBL into a course makes new demands on tutors, requiring them to function as facilitators for small group learning rather than acting as providers of information. Staff development is essential and should focus on enabling the PBL tutors to acquire skills in facilitation and in management of group dynamics (including dysfunctional groups).

Despite the potential disadvantages identified the authors belief that overall PBL, by providing a real world context within which students apply their developing knowledge has many advantages; it can help foster not only the application of knowledge to actual practice but can also help develop professional behaviours and attitudes .

4.5 Links to Aristotle

Conceptually there are two links with Aristotle's ideas and this research. Firstly, our approach to understanding the notion of professionalism, (detailed discussion to be

found in Hall & Williams, 2010) is based around the idea that Professionalism may be better understood as a set of values and virtues that need to be internalised through a process of socialisation or formation. Aristotle thought that this process of developing values and virtues was difficult to teach and only developed over time. (Hammer, 2006) concurs with this idea that professionalism cannot be taught, but suggests that the values, attitudes and behaviours of a profession can be taught and influenced through the use of role models and reflection/discussion on real world situations. This provides further weight for the argument in favour of adopting PBL as an appropriate curriculum approach.

Secondly, (Savin-Baden and Howell-Major, 2004) highlight the link between Problem based learning and Aristotle's teaching methods. They suggest that for Aristotle teaching and learning was always focused around disciplined inquiry into some aspect of reality and that education should enable students to make rational judgements that interweaved and applied theory to the practical. Problem based learning in this context is a quest for knowledge where students use their reasoning abilities to manage or solve complex problems.

Overall the authors believe that the literature concerning Problem Based Learning (PBL) strongly supports their strategy for developing undergraduate professionalism.

5 Conclusions and recommendations

Action research has proved to be an excellent tool for continuous evaluation of the undergraduate courses in regard to development of content, implementation and evaluation of students' performance and facilitating industry/partner input. Action research often creates more questions than answers as ongoing evaluation and assessment of the project reveals the need to change in relation to perceived needs. This phase of the study has led to the following actions for the next cycle in the process.

1. There is a need to establish an end point for the "transition to professionalism" ie what basic professional attributes the industry would expect of a new graduate. This end point needs to be established in conjunction with employers and the professional bodies.
2. Having defined the end point it will then be necessary to design a coherent, logical progression from year one to year three of the award ie a journey to transition. This progression will include the nine aspects of professionalism referred to in the questionnaire.
3. Development of appropriate assessment tools and mechanisms, both formative and summative, to assess individual's progress on this journey. These mechanisms must be designed to emphasise the importance and relevance of the concept of professionalism to undergraduate development and employability.
4. Given the potential disadvantages of PBL identified in this paper it will be imperative to manage the changes involved in adopting this approach, especially in relation to staff and team development.
5. Last but not least there is the need to develop a framework whereby employers are fully engaged in the process of development, delivery and assessment. Thus

increasing the students' exposure to professional expectations and increasing their employability.

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Solutions to the pedagogical difficulties with measurement in quantity surveying

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Abstract:
A number of common difficulties previously identified are the process, calculations, technology, the rulings, the SMM and speed. Each problem has a different theoretical framework and a different practical solution which is described in detail.

Keywords:
difficulties identified, solutions proposed

1 Introduction

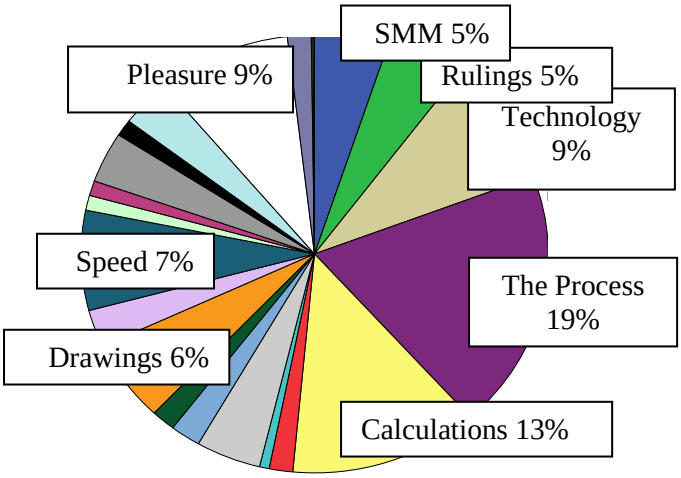
This paper addresses the problems identified in the publication 'What Students find difficult about Measurement' for the RICS/COBRA Conference in Paris 2010.

The intent is to find out how to teach Quantity Surveying. Part of this research was to find out the difficulties encountered by students in measurement. A series of common difficulties were identified and an outline solution to these difficulties was developed. (Ostrowski, 2010).

The pedagogical principles for QS teaching have been set out in Ostrowski (PhD Thesis, 2011). It is now possible to suggest some practical proposals to overcome the difficulties. The pedagogical principles, the difficulties that have been encountered and the proposed solutions form part of a synoptic pedagogy for QS that is being developed. The difficulties over 5% of the total are examined and are highlighted below. The category entitled pleasure is not a difficulty and is not examined. The difficulty entitled drawings concern inaccurate manual drawings which is resolved by producing accurate AutoCAD drawings. This is set out below.

Figure 1 The difficulties

The Process	19% of the total
Calculations	13% ditto
Technology	9% ditto
Rulings	5% ditto
Speed	7% ditto
SMM	5% ditto
Drawings	6% ditto .
Total	64% of the total



Each problem has a different theoretical framework and a different practical solution. Although Biggs (2003) does not consider teachers to be particularly interested in theories of learning he does consider that there is a need for a framework which is *"…broad based and empirically sound…that easily translates into practice."* The theoretical concepts that underpin these proposals are included in order to be able to identify the reason for the difficulties and provide the direction for the practical solutions to deal with them. They comprise a series of broad headings concerning epistemological, cognitive, psychological, environmental and emotional components. Their relationship is a bricolage of elements of inter-related matters which form a spiral of learning similar to an helix as the level of cognitive development rises. For each difficulty there is a different emphasis and those that are relevant are examined in detail. They are summarised in the table below.

Table 1 Cognitive Framework

EPISTEMOLOGICAL	COGNITIVE	PSYCHOLOGICAL	ENVIRONMENTAL	EMOTIONAL
Procedural Knowledge	Knowledge	Behaviourism	Facilities	Attitude
Contingent Instruction	Understanding	Cognitive Psychology	Collaboration	Motivation
Contemporaneous Feedback	Learning	Constructivism	Groups	Risk Free

Each column forms part of a coherent framework of pedagogy for QS work and enables the appropriate pedagogical modifications to current teaching practice for the difficulties that have been identified. A brief review here introduces each section.

The epistemological elements concern the nature of the different kinds of knowledge with examples of which kind of knowledge is applicable to the various stages of

measurement. The process of measurement mainly concerns procedural knowledge and this requires contingent instruction and contemporaneous feedback. The cognitive elements are the nature of technical competencies in terms of knowledge, understanding and learning and how they relate to QS work.

The psychological elements concern the conceptual framework in which QS is learnt. The first element is behaviourism which proposes an appropriate stimulus to provide the responses that are generated by measurement. Cognitive psychology describes how the brain can be trained and improved, like a muscle, to undertake this work. Constructivism concerns the role of the learner in acquiring technical competencies.

The environmental elements describe the nature of the physical, social and cultural requirements to undertake an aligned teaching programme for technical competencies. The emotional elements concern attitude, motivation and a risk free environment for QS teaching.

2 Literature Review

There is very little research on the principles of teaching QS. Published work is mainly concerned with the impact of various teaching programmes and empirical reviews of numbers of students involved. The literature that has been reviewed concerns the principles of education and how they relate to professional education and training. They are discussed in detail in Section 4.

3 Research Methodology

The research methodology is a comprehensive review of the literature on the principles of education and how to apply them. This is a complex area and what has emerged is a framework of interrelated principles that are particular to the teaching of QS. These principles are applied to the difficulties that have been previously identified (Ostrowski, 2010) to form a series of proposals as set out in Section 4.

4 Findings and Discussion

4.1 Problems with the Process

4.1.1 Theoretical framework for the process

The 'process' is the difficulty in knowing what to do next. It is 19% of the total. What is the epistemology, what kind of knowledge is this difficulty concerning what to do next? This is remembering how to do things and concerns the acquisition of technical competencies. Biggs (2003) calls this functional knowledge and Eraut (1994) uses the term procedural knowledge. The most significant part of procedural knowledge is that it is acquired by practice. A further element of procedural knowledge is contingent instruction described by Wood, Bruner and Ross (1975) as the cognitive development process for assembling complex model structures. The process only works when help is provided if it is requested or the student is in difficulty. The third element of the epistemology is contemporaneous feedback. Mervarech and Werner (1985) indicate that mastery of problem solving skills required practice and contemporaneous corrective feedback and Biggs (2003, p.141) states that it is "…*outstanding important…*".

The first item in the cognitive framework is the kind of knowledge in QS work and this has been described in the epistemology as procedural knowledge. Next is the nature of the understanding when trying to undertake this work. In the hierarchy of understanding (Bloom, 1956) the process of measurement is at the application stage of the taxonomy comprising progressive cognitive development. What method of learning is best suited to this problem? The process approximates to the conditioned response (Gagne, 1977) where a chain of procedures is implemented. He describes the conditions for learning of procedural knowledge as learning outcomes. It is characterised as participation and the typical activity is remembering how to do the taking-off. The capabilities that are required include grammar - to be able to put information in the right order - and translation, the transfer of the visual information on the drawing being converted to the format of the SMM. The internal condition that is required of the student is the intellectual skill necessary to carry out the work. The external conditions that are provided by the teacher are the opportunity for sufficient practice and a meaningful context.

Behavioural psychology provides a reason why the difficulty has occurred. The initial stimulus is that the subject is perceived as too difficult and this has a negative response. What is required is a positive conditioned response to provide the necessary motivation. Cognitive psychology (Woolfolk, 2004) indicates that the links in the synaptic nodes between the dendritic extremities can be developed and strengthened in practice. The direction of the development is provided by the teacher. The constructivist approach allows intellectual development that is specific to the individual with the teacher providing the necessary assistance. The scope for this development is restricted by the prescriptive nature of the SMM.

The environmental framework for this difficulty and those that follow is similar. The physical environment is that appropriate for practice of a technical competence with a large amount of documentation, and easy circulation of the teaching team to enable collaboration. The social and cultural environment is the requirement that the knowledge be experienced in the appropriate way for this subject with a diverse cohort of students.

The emotional requirements for these difficulties are also similar. The right attitude to enable cognitive development can be made available, the appropriate motivation, both positive and negative is required and these technical competencies are best acquired in a risk free environment where mistakes can be made without fear or ridicule from the teacher or the class.

The theoretical framework of not knowing what to do next provides indicators of the appropriate teaching solutions. The pedagogical modifications that are required are made up of the appropriate epistemological and cognitive requirements, the appropriate psychological input and the environmental and emotional factors. Each difficulty has a particular solution.

4.1.2 Practical solutions for the process

What are the particular teaching requirements to overcome this difficulty? There are three basic epistemological components. The first and most significant is that the 'process' requires to be taught as procedural knowledge, with contingent instruction and contemporaneous feedback. Procedural knowledge is taught by providing practice, which enables technical competencies to be acquired progressively, eg taking-off quantities for a particular trade by the use of a practical exercise. The second is contingent instruction. The later work of Wood (2001) confirms that there is a strong correlation between tutorial contingency and learning outcomes for procedural knowledge. What is successful is providing answers to questions when they are asked. What did not work was telling the students or demonstrating to them how to do it. This also means that the feedback needs to be contemporaneous, as the students carry out the practice. To ensure that all the questions are answered a suitable aligned teaching programme for contingent instruction includes the provision of supplementary instruction. The supplementary instruction is provided by using Peer Assisted Study Schemes (PASS) whereby successful students who are able and willing to participate provide answers to questions during discussions and workshops. The student tutors are able to provide the contingent instruction in the form of contemporaneous feedback in the time available and are perceived as more sympathetic to a diverse range of questions. Biggs (2003) describes PASS schemes for use in large classes and states that (p. 113) *"The cost-benefits of student-led groups in classes with higher enrolments are attractive."*

The most relevant level for understanding the 'process' is application, although the student will move up and down the whole of the understanding hierarchy. The requirement for application is the repetition of the practice using the same rules that are applicable to various trades, eg the taking-off is repeated for different trades. The appropriate method of learning is the conditioned response which requires the provision of a series of procedures in the correct sequence to allow the student to form a chain of correct responses. This means that the information comes from a previously established threshold and is contiguous with small amounts of information with small gaps between them. eg the taking-off is repeated in the same sequence for each exercise.

The problem of the subject being too difficult can be explained in terms of behavioural psychology. The stimulus is the perception that the subject is too difficult and there is a negative response which is not to try from the outset. This can be replaced by providing the stimulus that the subject is not an intellectual exercise, it is a process like baking a cake or addressing a golf ball. The information is collected, the drawings and specifications, they are processed in accordance with the SMM and the result is Bills of Quantities. The answer is not required at the beginning, it emerges at the end of the process. This stimulus provides the positive response which is to make a start and proceed as far as possible. Cognitive psychology treats the brain as a muscle which can improve with exercise. Low or missing abilities can be initiated and improved with practice. The teacher provides the appropriate initial guidance to activate the cognitive development in the form of an introductory lecture or demonstration. The constructivist approach to technical competencies is useful because it acknowledges the personal construction of a scaffolding of knowledge which is acquired by the student with the help of the teacher.

The environmental conditions include the provision of a classroom facility comprising sufficient space for collaborative group work with work stations that can accommodate large amounts of documentation and the easy circulation of staff, tutors and students and where the results can be immediately assessed informally, using self and peer assessments. This precludes the lecture theatre. A class size of 20/25 is the limit for an individual lecturer with supplementary teaching resources provided for classes above this size. The practical environmental requirements remain similar for the remainder of the difficulties.

The emotional requirements begin with the provision of the appropriate attitude. The formation of groups for workshops allows the practice to take place on a collaborative basis where knowledge can be shared. The psychological problem of fear as a response to the perception of a difficult subject is alleviated by the stimulus which replaces isolation with collaboration. Ensuring that the exercises are conducted in groups that have a mixture of ability, experience, gender and race demonstrates that equality of opportunity is seen to be available. The collaborative nature of these groups ensures that there is no domination and that those that require help are assisted by their peers. The provision of student tutors also provides emotional assistance with the use of perceived sympathetic responses from contemporaries. The emotional requirements include positive motivation to provide the opportunity for the best to shine by making presentations and demonstrating leadership. Technical competencies are an arbitrary positivist paradigm (Cohen *et al*, 2007) and there is either a right or wrong answer. Therefore a negative motivation is also appropriate to maintain minimum standards and this can be implemented by maintaining the fear of failure if the wrong answer is provided. The emotional element includes providing a risk free environment where practice allows errors and questions that can be asked without any consequences or ridicule from the teacher or the students. The emotional components remain similar for the remainder of the difficulties.

The basic practical requirements are practice and contingent instruction.

4.2 Problems with Calculations

4.2.1 Theoretical framework for calculations

The ‘calculations’ is not knowing how to do the numerical calculations that are required. It is 13% of the total. Difficulties with calculations is the most fundamental problem that has been raised by the research in ‘What students find most difficult about measurement’ (Ostrowski, 2010). In terms of epistemology the cognitive obstacles of mathematical calculations are based on the lack of experience, both of society and of individuals. Piaget (1950) has proposed that historical obstacles are reflected in individuals’ cognitive obstacles. For example the Victorians disbelieved the pictures of elephants because they were not in the collective experience of the nation. Mathematical equations are a cognitive obstacle to propositional knowledge individually, collectively and historically. Until they become common they will remain obstacles to the individual. Difficulties with mathematical calculations are a fundamental problem of cognitive development in this society. They will not be overcome by pedagogical modifications to teaching the technical competencies of QS work.

The cognitive framework commences with what kind of knowledge is this difficulty concerning calculations? This is propositional knowledge or intellectual skill (Eraut,

1994) which concerns discrimination and the capabilities in areas like language, mathematics and music (Gagne, 1977). In the hierarchy of understanding (Bloom, 1956) the process of measurement is at the analysis and synthesis stage of the taxonomy comprising mainly discrimination of concepts, rules and laws. In terms of methods of learning what kind of learning is best suited to this problem? Calculations approximates to association (Gagne, 1977) where links between the stimulus and the response are established, where a chain of procedures is implemented. The conditions for learning have been detailed by Gagne (1977) as learning outcomes and in this case is characterised by discrimination and the typical activity is the use of algebraic and trigonometrical formulas for calculating measurement areas. For propositional knowledge the capabilities that are required include numeracy. The internal condition that is required of the student is that student has learned the necessary mathematical skills and remembers how to use them. The external conditions that are provided by the teacher are a clear objective, the examples that stimulate recall, some guidance and demonstration and the opportunity for practise.

In behavioural psychology these calculations are again seen as too difficult. However this is propositional knowledge and a suitable stimulus to overcome this is problematical because the difficulty is a national, social and cultural problem. In cognitive psychology Entwistle (Ed. 1985) explains the work of Child and Eysenck and sets out the relationship between hereditary and environmental influences. There is a pre-existing facility for certain aspects of cognitive development like numeracy which inclines students to this kind of work. There may be links in the synaptic nodes between the dendritic extremities of neurological systems (Woolfolk, 2004) that need to be developed. The constructivist approach allows the individual to construct a scaffolding that has no prescriptive limitations although the extent of mathematical competence that is required is quite modest. The emotional framework overlaps with the epistemological and psychological components and the practical consequences are discussed below.

4.2.2 Practical solutions for calculations

What are the particular teaching requirements to overcome this difficulty? The teaching to help resolve these problems is a particular epistemology that is derived from the cognitive, psychological and emotional framework. The first is that ‘calculations’ require to be taught as propositional knowledge, described within cognitive psychology as the capability to train the brain. They can be significantly altered by environmental factors and they can be taught and practised and intelligence in this area can be improved, eg the use of the New Rules of Measurement (NRM) or how to deal with rogue items provide opportunities for propositional knowledge to be acquired. Within the understanding hierarchy that part most relevant to ‘calculations’ is analysis and synthesis. The requirement is the comparison of the results between different exercises, eg the working-up dimensions and the preparation of Bills of Quantities (BQs). The appropriate method of learning is association which is being able to infer links between the stimulus and the response (Gagne, 1977).This requires the close approximation of these links and their repetition provides this facility, eg the measurement of variations.

The emotional factor of attitude (Gagne,1977) concerning the poor ability with numerical calculations is also part of this framework. This comes mainly from the perceived inequalities of a substantial minority whose diverse backgrounds require

individual attention. Work in South Africa on foundation years for disadvantaged students has indicated that the range of problems encountered required a high level of resources and personal attention, (Grayson,1996 & 1997; Miabila, Maladje & Addo-Bedialo, 2006). The stigma of ignorance concerning numeracy is reduced where this is perceived to be a common problem. Availability and utility are provided by individual face to face teaching outside the classroom that is flexible and discrete from specialist teachers.

The basic practical requirements are that numerical fluency is generally at such a low level that individual remedial teaching is required.

4.3 Problems with The Technology

4.3.1 Theoretical framework for the technology

The 'technology' is not knowing the building processes that are being measured. It is 9% of the total. The problem lies within the concept of constructivism. Constructivism is that knowledge is based on personal experience and is described by Biggs (2003) as a scaffolding that can only be built by the student with the teacher encouraging this process of personal knowledge construction. The teacher provides the tools that are necessary with the provision of copious information. The advent of full time students severely limits the use of constructivism because they have no experience of the building site. Also the problem is the teaching of construction technology is usually taught as propositional knowledge, as an intellectual skill not a technical competence, is often very restricted and rarely deals with the details that are necessary for measurement exercises.

In the hierarchy of understanding (Bloom, 1956) the technology is at the 'knowledge' stage. The most appropriate way of understanding the technology is time spent on site. In the absence of this the input of vocabularies provides a vicarious knowledge of the technology. In terms of learning what method is best suited to this problem? The process approximates to the verbal association (Gagne, 1977) where a progressive increment of labels are learned using contiguity and repetition. The learning outcomes (Gagne, 1977) are characterised statements of information and the typical activity is remembering the name of things. For verbal information the capabilities that are required include vocabulary, visual identification and discourse. The internal condition that is required of the student is the memory and a cognitive strategy to improve the vocabulary. The external conditions that are provided by the teacher are provision of a context to stimulate memory with appropriate cues and variable repetitions.

4.3.2 Practical solutions for the technology

The 'technology' requires to be taught as verbal information (Eraut, 1994) eg the demonstration of particular technologies for a particular trade or the specific vocabulary of the SMM. In the understanding hierarchy that part most relevant for 'technology' is knowledge. The requirement is the provision of vocabularies, lectures, demonstrations, printed booklets and sketches, eg the identification of the same technology on layouts, elevations and sections. The appropriate method of learning is verbal association which requires the progressive increments of labels. This can become rote learning which is avoided by providing a suitable context, eg the identification of the technology on site provides the best method of learning by verbal association.

Industrial placement in a sandwich course provides the appropriate knowledge and method of learning. 'Thin' sandwiches, day release, provide a better interface between industry and teaching. However 'thick' sandwiches, placement for a full year, provide a compatible status to other professional degrees. Full time courses provide only propositional knowledge and are not appropriate.

There are three parts to the pedagogical modifications that are necessary. The first acknowledges that full time students are unlikely to be involved in the actual construction of a building or the measurement of the quantities involved. The solution is to confine the learning outcomes to propositional knowledge. The students will learn a little about construction and measurement but will not have a functional knowledge of these technical competencies. This means streaming part time and full time students. The second part of the solution is to provide procedural knowledge of construction technology. This requires the knowledge of skilled practitioners in the field to provide lectures on how to build buildings. This is a profound problem due to the lack of such resources. The use of specialist pedagogies like situated learning and experiental learning are being developed to try to address this problem. The third part of the solution concerns the simple timetabling of the teaching resources. The construction technology units need to be delivered before the measurement units to enable the vocabulary to be in place before the measurement is taught. The emotional elements are similar to those described in the section on process difficulties.

The basic practical requirements are substantial periods on site.

4.4 Problems with the SMM and rulings

4.4.1 Theoretical framework for the SMM and rulings

The 'Standard Method of Measurement' (SMM) is difficulty knowing how to use the book of rules for measurement. The 'rulings' is difficulty knowing how to use the specialist paper used for measurement. Both are 5% of the total and are similar problems with similar solutions. The reasons include constructivism and the emotional environment.

The personal knowledge construction has to be in compliance with the SMM and the rulings. This is particularly noticeable with non-cognate post graduates in the early workshops where it is often the case that their attempts to make personal interpretation of both the rulings and the SMM result in work that is a long way from compliance. The emotional element is the discipline of an arbitrary set of rules in a positivistic paradigm that leaves little flexibility in the use of the rules.

What kind of knowledge is using the SMM and the rulings? This is motor skills (Gagne, 1977) which concerns the use of specific tools. Fine motor skills include the careful application of dimensions onto the appropriate dimension paper in compliance with all the rules of the SMM and the identification of the specific application of a particular rule of the SMM for each and every dimension. These items of knowledge are often overlooked as teaching requirements in the hope that they will 'pick it up as they go along'. They make up 10% of the total difficulties and are persistent problems for some considerable time and they require formal teaching.

In the hierarchy of understanding (Bloom, 1956) the SMM and the rulings is at the application stage of the taxonomy comprising progressive cognitive development with some qualitative appreciation of the system. The most appropriate way of understanding the SMM and rulings is by repetition and contemporaneous feedback. In terms of learning what method is best suited to this problem? There are two methods of learning that are relevant (Gagne, 1977). The use of trial and error allows successive approximations. Although effective the repetition that is required is not a good use of resources. The second method of learning is the reward/reinforcement/motivation method. Positive motivation in the form of rewards comes from the provision of the correct response. There is also a negative motivation when the work is not in compliance and has to be repeated.

The conditions for learning motor skills have been detailed by Gagne (1997) as learning outcomes and in this case is characterised by simple execution of the required work. For motor skills the capabilities that are required include the fine motor skills of legible writing and visual co-ordination. The internal condition that is required of the student is the need to follow in the correct sequence and the necessary attitude to implement this. The external conditions that are provided by the teacher are instruction, demonstration, the opportunity for practice and contemporaneous feedback.

4.4.2 Practical solutions for the SMM and rulings

The SMM and rulings require to be taught as motor skills, the correct use of tools (Eraut 1994), eg the use of mensuration rules for SMM and physically applying them on paper or the screen. The application level of understanding requires repetition and contemporaneous feedback eg the physical dimensions and SMM references prepared by the students need to be reviewed and corrected before moving on to the next exercise. The appropriate method of learning is using reward/reinforcement motivation which allows right and wrong dimensions to be accurately marked and the necessary reinforcement to be implemented, eg the accuracy and presentation of dimensions is subject to a minimum standard. The use of trial and error can be effective for exercises that are easy to repeat. The use of proprietary software, eg CATO, Masterbill allows the easy implementation of successive approximations.

In the environmental framework the use of proprietary software is a problem because they require dedicated laboratories where access is limited, the number of software users is also limited and there are high charges for their use. These factors restrict the number of users and require repeating identical workshops, a significant waste of resources. Larger laboratories and the free use of the software for educational purposes would resolve this problem.

The basic practical proposals are the early use of simple motor skills exercises in the use of the rulings and the SMM.

4.5 Problems with Speed

4.5.1 Theoretical framework for speed

The ‘speed’ is the lecturer going either too fast or too slow. Both are well represented in the submissions. It is 9% of the total. The reason can be classified under various

headings. In terms of behavioural psychology the stimulus is the perception of the students that the information is provided at the wrong speed and therefore the response is negative in the form of anxiety or boredom. A large range of diversity and experience within the class also contributes to this problem. The appropriate stimulus is the adjustment of the speed and the response is the removal of anxiety or boredom.

What kind of knowledge is applicable to this problem? This remains procedural knowledge (Eraut, 1994) the acquisition of technical competencies. In the hierarchy of understanding (Bloom, 1977) the problems of speed concern the analysis and synthesis stage comprising mainly discrimination of concepts, rules and laws and the need to be able constantly to compare and contrast each piece of work until understanding is acquired. This is a personal process and the speed is different for each individual. In terms of learning what method is best suited to this problem? This is the process of the memory (Gagne, 1977) which comprises registration, short term memory, long term memory and retrieval.

The learning outcome (Gagne, 1977) in this case is attitude. For memory the capabilities that are required include obedience to the discipline and honesty concerning the results. The internal conditions that are required of the student are the necessary intellectual skills and a cognitive strategy to improve memory. The external conditions that are provided by the teacher are the need to overcome the emotional opinions of the students concerning whether the speed is good or bad.

4.5.2 Practical solutions for speed

The problems with speed initially concern the appropriate level of understanding and method of teaching but are primarily concerned with the epistemological factor of streaming.

In the understanding hierarchy the level most relevant to 'speed' is the use of analysis and synthesis. The requirement is the comparison of the results between different exercises, eg the working-up dimensions and the preparation of BQs. The appropriate method of learning is the development of the memory (Gagne, 1977) which comprises registration, short term memory, long term memory and retrieval, eg the teacher establishing the synaptic pathways by demonstration and the student strengthening them by repetition and retrieval.

The environment concerns the mix of full time and part time students. The question of the varying ability of students concerns the need for 'streaming' according to ability or 'setting' which is allocation according to ability in specific subjects. The effects are reviewed in Pupil Grouping: Literature Review Oct 2005 DfES Research Report RR680 which states *"…but low-achieving pupils show more progress in mixed-ability classes and high-achieving pupils show more ability in set classes."* In most large classes there are full time students with no industrial experience and part time students with substantial industrial experience. The streaming has already taken place. The teaching should reflect these differentials. The need is to stream the students into separate full time and part time classes. This is often a fundamental problem given the resources available. However the cause of the problem is mixing the streams and the solution is to separate the streams. Each has a different teaching solution. For the part time students

who have the industrial experience and require technical competence procedural knowledge is necessary. Those without industrial experience, who will not become active professional practitioners, will require propositional knowledge. Even when the mixed streams are formed into uniform groups the tendency to form cliques undermines the process of collaboration. Equality and diversity is maintained at the cost of inappropriate teaching, poor learning outcomes for the students, anxiety by the slowest and boredom by the fastest. The mixing of these streams is therefore inappropriate. In the emotional components the provision of student tutors provides an opportunity for the slower members of the class to ask questions that might be considered, by them, to be too simple without slowing down the rest of the class.

The basic practical proposal is the streaming of the students into full time and part time classes.

The following table summarises the proposals for each difficulty and provides some examples.

Table 2 Proposals

DIFFICULTY	TEACHING		EXAMPLES
THE PROCESS	Epistemology		
	Procedural knowledge	Practice	Practical exercise of taking-off quantities for a particular trade in collaborative groups
	Contingent instruction		
	Contemporaneous feedback		
	Cognitive		
	Understanding	Application	Taking-off repeated for different trades
	Learning	Conditioned response	Repeated in the same sequence for each exercise
CALCULATIONS	Cognitive		
	Propositional knowledge	Discrimination	Measuring rogue items, use of the NRM
	Understanding	Analysis and synthesis	Working up dimensions, BQ preparation
	Learning	Association	Measuring variations
	Emotional	Attitude	Remedial teaching in numeracy
TECHNOLOGY	Epistemology		Substantial periods on site
	Cognitive		
	Knowledge	Verbal information	Vocabulary of a particular trade, Vocabulary of the SMM
	Understanding	Knowledge	Identify the same technology on plans, elevations & sections
	Learning	Verbal association	Long term site work
SMM AND RULINGS	Cognitive		
	Knowledge	Motor skills	Physically applying the rules of mensuration and the SMM to the dimension paper
	Understanding	Repetition	Dimensions and SMM references are corrected before the next exercise
	Learning	Reward/ reinforcement	Accuracy and presentation of dimensions subject to minimum standards
SPEED	Cognitive		
	Knowledge	Procedural	Practical exercise of taking-off quantities for a particular trade
	Understanding	Analysis and synthesis	Working up dimensions, BQ preparation
	Learning	Memory	Demonstration
	Environmental	Streaming	Separate full time from part time

5 Conclusion and Further Research

The provision of QS teaching as technical competence in universities has been affected by the lack of a pedagogical foundation, increased student numbers and a greater diversity of students. It is hoped that this review of the basic requirements of teaching will help to ensure that the correct teaching is available despite the increasing restrictions on resources, space and time.

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Screening and Selecting Project Managers for the Middle East

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Abstract:
Cross-cultural training is of prime importance if the expatriates are to adjust speedily to the new environment and do well in the United Arab Emirates (UAE). Selecting the right people for the overseas job is important as the selected individuals need to have a desire and readiness to learn. Some researchers in this field referred to this as the "learning orientation" where people with high learning orientations like challenges and are ready to learn and people with low learning orientations like to play it safe and do not like challenges. The way the "right" people can be chosen for the overseas assignment is by pre-testing the employees. It is important that they are able to adapt to new and unfamiliar situations, many researchers believe that this characteristic is very important to success.

The mistake a lot of companies make is that they select staff that have been successful in the home country without testing them. These companies fail to realise that these employees need additional qualities such as being able to adjust quickly to new and unfamiliar environments and have the desire to learn about new cultures as well as being willing to change. Using six case studies this paper will analyse the importance of selecting the right people. All six case studies are Australian international companies operating worldwide including the UAE.

Keywords
cross-cultural training, learning orientation, selection criteria

1 Introduction

There are a vast number of reasons why cross-cultural training is important. From a company perspective, if their personnel are adequately trained for the overseas assignment they will be more successful by increasing the overall efficiency and profitability, and the company will avoid losing money (Cerimagic, 2010). In addition, the company can overcome the belief that their way of doing things is superior to that of others (Ono, 1992).

Cross-cultural training helps personnel to improve and to be able to interact effectively with local people and co-workers (Shenkar, 1995). Many researchers argue that companies have failed to pay attention to "screening, selection and training of potential expatriate staff and the non-technical skills they should possess." (Forster, 2000:63).

The mistake a lot of companies make is that they select staff that have been successful in the home country without testing them. These companies fail to realise that these

employees need additional qualities such as being able to adjust quickly to new and unfamiliar environments and have the desire to learn about new cultures as well as being willing to change (Porter and Tansky, 1999).

Another major error that the companies make is the lack of cross-cultural training that they provide for the employees.

The way the "right" people can be chosen for the overseas assignment is by pre-testing the employees. It is important that they are able to adapt to new and unfamiliar situations. Porter et al., (1996) believe that this characteristic is very important to success.

2 Selection Criteria for International Assignments

In the recent years international human resource management specialists such as Black and Gregersen (1991), as well as Bonache et al. (2001) have developed a model that helps underpin the effective selection of personnel for overseas assignments. This model helps to make the selection criteria more effective.

This model identifies two types of adjustment:

- the anticipatory adjustment, and
- the in-country adjustment.

Firstly, the anticipatory adjustment is carried out before the expatriate leaves the home country and it is influenced by a number of important factors such as pre-departure cross-cultural training, which is designed to familiarize expatriates with the culture and work life of the host country.

Secondly, the in-country adjustment has five factors that influence it; to begin with the expatriate's ability to stay positive, to deal well with stressful and high-pressure situations and to interact with the host nationals to better understand the host culture and values.

Thirdly, the expatriate should be clear about the job.

The fourth factor is the organizational culture, and how well the expatriate can adjust to it.

Fifth, is a no-work factor, and it is looking at how the expatriate faces the new cultural experience and how well the expatriate and his/her family/partner can adjust to the host country. The final factor identified in the in-country adjustment mode is for the expatriate to socialize and quickly find out who is who in the host organization.

After analyzing the relationships between host nationals and expatriate, Caligiuri (2000) reported that greater interaction with host nationals positively relates to cross-cultural adjustment when the expatriate possesses the personality trait of openness. Caligiuri (2000) also states that the personality trait of sociability was also positively related to cross-cultural adjustment.

According to Luthans and Doh (2009) anticipatory and in-country adjustment will have an influence on the expatriate's mode and degree of adjustment. All expatriates go through a transition period after they arrive in a foreign country. There are ups and

downs, but with appropriate cross-cultural training and support the expatriates can quicker adjust to the foreign country and integrate much faster too.

McCormick and Chapman (1996) consider that anticipatory and in-country adjustment will have an influence on the expatriate's mode and degree of adjustment. Figure 1 shows the transition which expatriates go through after they arrive in a foreign country. There are ups and downs, but with appropriate cross-cultural training and support the expatriates can quicker adjust to the foreign country and integrate much faster too.

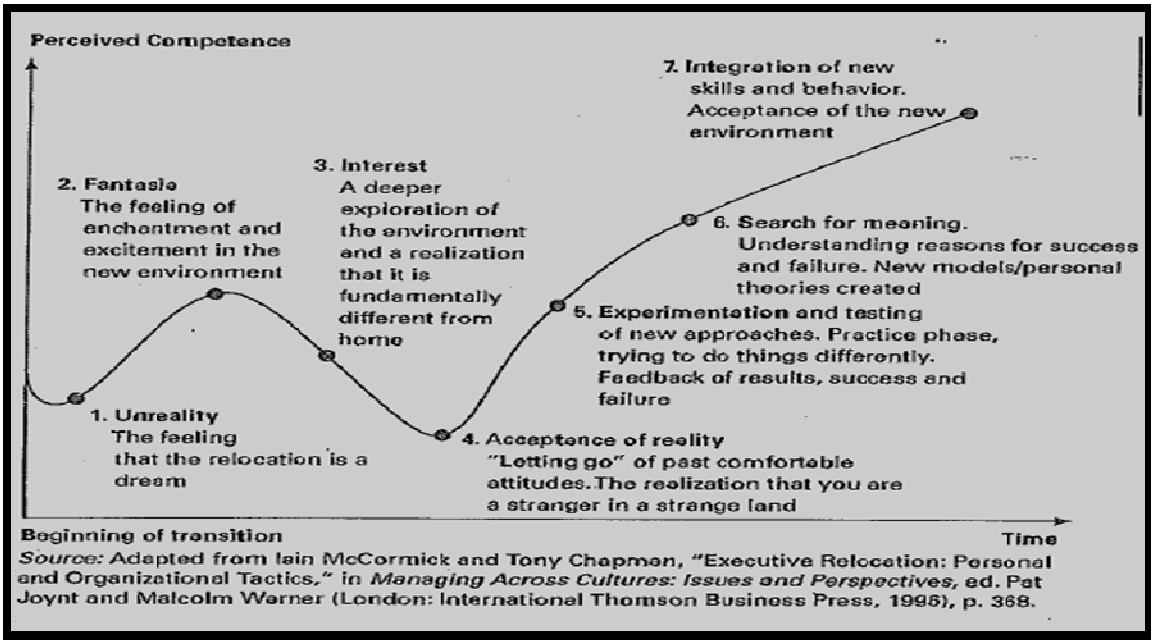

Figure 1: Transitions which expatriates experience
(Source: Luthans and Doh (2009:483)

Companies also need to consider both technical and human criteria when selecting expatriates. Expatriates that are sent overseas must be able to adapt to change.

Criteria that are important to be considered when selecting expatriates, are primarily their age, experience and education. Technical competence is important, but it is only one of a number of skills that an expatriate will need in a host country. If the company only selects an expatriate based on his/her technical skills the company may be setting the expatriate up to fail, because the expatriate will go overseas believing that he/she is project ready and they may not be able to deal with the challenges awaiting them. The chance of failure is likely to increase. In addition, companies usually want the personnel to have an academic degree as well as the desire to work abroad. Over the years companies have realized that balance is important and this is why they send both younger as well as older personnel overseas.

The literature suggests that cross-cultural training has long been advocated as a means of facilitating effective cross-cultural transfer of expatriates. While international organisations understand and acknowledge that cross-cultural training is important, in many cases they still do not offer any cross-cultural training to their employees. There are many reasons why companies to not offer cross-cultural training. Some believe that it is too costly and time consuming, or that training is not necessary, or effective. In

some cases it was reported that the project management industry is so fast paced that there is simply no time for cross-cultural training.

2.1 Learning

Once again selecting the right people for the job is important as the selected individuals need to have a desire and readiness to learn. Porter et al., (1996) and VandeWalle (1997) referred to this as the "learning orientation" where people with high learning orientations like challenges and are ready to learn and people with low learning orientations like to play it safe and do not like the same challenges. Those researchers argue that employees with high learning orientations are better candidates for overseas assignments as they want to learn and the training provided to them will have a high impact on them. Since no matter how good a training program is, if the participants are not willing to learn new skills and aptitudes the training is useless.

The way the "right" people can be chosen for the overseas assignment is by pre-testing the employees. It is important that they are able to adapt to new and unfamiliar situations, Porter et al. (1996) believes that this characteristic is very important to success.

Luthans (2004) wrote that another important area of consideration for developing good expatriates was the different learning styles of individuals. Learning is the acquisition of skills, knowledge and abilities that result in a relatively permanent change in behaviour (Luthans, 2004). Researchers such as vanReine and Trompenaard (2000) have discovered that different national cultures prefer different learning styles to match the environment and the company needs to deliver the training in the most effective manner. They have noted that Americans, for example, prefer an experimental approach while Germans prefer a theoretical-analytical learning style. It should be also noted that no matter how good the training was the new learned behaviours would not be used if they were not reinforced.

It should be noted that over the years better paradigms for social learning theory and cultural theory have emerged. This increases the impact and the likely success of cross-cultural training (Black and Mendenhall, 1990; Kim, 1993; Bhawuk, 1998).

Pruegger and Rogers (1994) suggested that interpersonal methods are more effective than didactic training programs. Waxin, et al. (2002) found that globally the most effective type of learning about a culture is by experimental training. However, Waxin, et al. (2005:69) also points out that the method of training should be specifically tailored "to the cultural distance between the expatriate's country of origin and the host country". In addition, Vance and Paik (2002) point out that for cross-cultural training to be effective it should be consistent with the cultural characteristics of the host country. Companies would also benefit from using their former expatriates as trainers, as those former expatriates have been there and can put themselves in the shoes of the new expatriates (Cerimagic, 2010).

3 Methodology

The case study approach has been chosen to conduct this research. Case studies have been used in many studies as a research method in many situations including such environments as sociology and business, and looking at individuals and groups (Yin, 2009). Interviews have been used to better understand the complex social phenomena

such as culture and its dimensions, for example. Each of the six case studies consisted of two in-depth interviews. This provided twelve interviews in total. Case studies allow researchers to "retain the holistic and meaningful characteristic of real-life events" (Yin, 2009:4) such as group behaviour, organisational and managerial processes. According to Grunbaum (2007) the case study approach has been used for several decades.

For the purposes of this research six companies were selected that had expatriate western project managers working for them (see Table 1). This research paper has been based on case studies because all the companies that have been lised in Table 1 (not named) have expatriate (western) project managers. The researcher had to control some of the environmental variations, while the focusing on large corporations allowed some variation and variety due to size differences (but not excessive ones) among the companies. According to the research carried out by Pettigrew (1988) the specifications focused on a particular population. In the case of this research it focused on expatriate western project managers and this reduced many extraneous variations and provided the potential to clarify the range (the field) of the findings.

Table 1: Summary Table of Cases

CASE	INDUSTRY
Case One	World's largest privately owned engineering and construction companies.
Case Two	Structural engineering
Case Three	Project management and construction company.
Case Four	A development company, working in the residential, commercial, retail, funds management and hotel industry segments.
Case Five	Global network of professional firms providing audit, tax and advisory services
Case Six	Consultancy and construction

The interview questions were semi-structured and interviews were in-depth. However, every interview focused on the following criteria:

- Challenges
- Recruitment and importance of selecting the right people
- Cross-cultural training

The interviews were all recorded, next they were transcribed and then analysed via cross-case analysis. The extent of the sample was expanded by asking each interviewee if there was anyone they knew, who was a project manager and could make a contribution to this research. The interviewer also interviewed those individuals too and expanded the sample by around 20%.

4 Results

4.1 Challenges

Most of the challenges were due to the lack of knowledge on how things are done in the UAE compared to Australia. Those mental challenges could be avoided or minimised with appropriate training and preparation of expatriates. A social network and support group (or groups) would be very helpful as well. The extreme heat outside and the ice

cold air-conditioned offices inside whilst it sounds trite, can also be a physically challenging and can be a source of irritation to even the most seasoned expatriate.

4.2 Selecting the "Right" People for the Job

Many researchers argue that companies have failed to pay attention to "screening, selection and training of potential expatriate staff and the non-technical skills they should poses." (Forster, 2000:63). This was a constant theme throughout the interviews and some interviewees confirmed this was the case with their colleagues.

Preparation of expatriate staff is important to help them be prepared for the unfamiliar environment, to have an rough idea of what to expect, as well as help them to avoid any major errors in business dealings and in the important social interactions. Even with adequate preparation expatriates will not be able to function at their fullest capacity as soon as they arrive in the UAE, as this is too soon in their assignment. This is why cross-cultural training needs to be an ongoing and reinforced process. Without it most expatriates will struggle in the new environment and may even return to their home country prematurely and feel bitter about their experiences.

As pointed out earlier, selecting the "right" people for the overseas job is important, as the selected individuals need to have a desire and readiness to learn. Porter et al., (1999) and VandeWalle (1997) referred to this as the *"learning orientation"* where people with high learning orientations like challenges and are ready to learn and people with low learning orientations like to play it safe. Hence, it can be argued employees with high learning orientations are better candidates for overseas assignments as they want to learn and the training provided to them will have a higher impact on them. What this research revealed is that, no matter how good a training program is, if the participants are not willing to learn new skills and implement those skills cross-cultural training will not help as these are not the 'right' people in the first place.

4.3 Recruitment

The expatriates in those case studies had all been recruited in different ways. Most had a phone interview while still in their home country and did not visit the UAE.

Case study firm five whose company has been in the UAE for the last thirty years did an initial phone interview where they ran through most of the difficulties that will come with working in the UAE. They look for people who have the necessary skills-set that is required to do the job. In addition, people who are known by the company's staff or who have worked previously on projects with staff from the company tended to have priority and these people are sourced or contacted to discover their interest in working in the UAE, on these projects for this company.

Additionally, many forms look at the age of the person and maturity level of the people that they were interested in employing. All of their senior managers do a personality profile, specially carried out by a consulting company to make sure that the person is more likely to fit the job. This again is a basic and simple process that can save a great deal of frustration and possible failure later.

4.4 Cross-Cultural Training

It was obvious from the six case studies that cross-cultural training was of high importance to the firms and the respondents and that it should be provided by the companies. The findings also revealed that preparation of expatriates for the UAE

climate was considered absolutely vital. Nevertheless, even though the companies recognised that expatriates require being cross-culturally trained, most of the case study forms in this research do not offer adequate cross-cultural training. This research revealed that most of the interviewees do not get any pre-departure training; additionally majority of the interviewees report that they did not receive any training on site either after they arrive in the UAE. There are many reasons why companies do not offer cross-cultural training. Some of the cases studies suggested that cross-cultural is seen as too expensive or simply not necessary, as there is a believe that "you learn by doing" or you 'sink or swim'.

Since proper and adequate preparation helps expatriates quickly feel part of the community, it is essential that such training and preparation is provided. However, preparation such as induction programs should be dynamic, up-to-date, relevant and interesting. The participants should feel that they are being well prepared and that the material being given to them is useful and very relevant. Neither the facilitators, nor the participants should feel that everyone is just going through the 'motions' or ticking a box. Senior managers should regularly check on the quality of these preparation workshops and encourage existing employees to attend to ensure their content is adequate and useful.

In the interview expatriates were asked what is important to learn about the UAE and the Emirates before starting to do business in the UAE. The respondents clearly noted that the culture was rated of high importance. Cultural awareness is the number one skill that is necessary in this environment and respecting the culture goes hand-in-hand with it. For example, expatriates need to learn everything about the country, its people, religion, customs, rules and regulations. Keeping updated with the rules and regulations is very important as they change very quickly.

Additionally, throughout this research it was found that personal relationships and trust are important. Hence, a lot of time and effort needs to be put in to establish that trust and confidence. Networking in the UAE is a must, and expatriates must maintain their integrity and reputation. A bad reputation will result in reduced work or no work at all, therefore learning by doing is not the best way to go about acquiring new and necessary skills. Being aware of the fixed and changing environment in these countries is essential and importing personal views, attitudes and prejudices can cause problems in these relationships. Assuming that the local person has the same views and attitudes as the expatriate about certain issues can cause embarrassing problems for the individual and the company. The expatriate has to be sensitive to this or her environment at all times.

4.5 Testing the Post Training Experience

The interview revealed that most participants agree that testing for post-training experience would be beneficial. This was a strongly held view by most of the interviewed staff.

The testing of the post-training experience can indicate if the training is working. If it is not for example, then the training can be modified. Additionally, the training can provide feedback and suggested improvements. This way the training is revised on a regular basis, it is updated and it is made up-to-date. In return this helps the company save money and have well trained workers who are able to deliver successful projects.

The post training experience can be conducted by either a mentor, who is mentoring the expatriate, or by the expatriate's manager. The expatriate would not be asked to do a

self assessment as most individuals are unable to be objective when conducting self-assessments. Post training experience was important and it should be carried out by someone who works with the expatriate and not by the expatriate as people see themselves differently than what they are perceived by others.

5 Conclusion

Project management is not solely a technical activity. It is also highly dependent on the people working on those projects. With the right and adequate cross-cultural training project managers have the ability to learn new skills and behaviour, and alter those behaviours when required and be a high-performing individual .

By using six case studies and conducting in-depth interviews it was possible to gain a rich picture on what challenges project managers face in the UAE. The case studies also provided the researcher with feedback on how they were recruited and why it is important of selecting the right for the overseas job. Additionally, the case studies revealed that in addition to having selected the 'right' employees for the job cross-cultural training is necessary as well to teach and prepare the staff for the unfamiliar environment. This too will help staff in dealing with challenges more appropriately and make the staff more contented and probably more successful in working for that company.

Since people play an important role in every aspect of project management it makes sense to equip them with the necessary tools to perform at their best. It was stressed by many that technical competence was assumed by the companies and clients and the critical dimension was the ability of the company's employees to deliver their skills in a work and culturally sensitive environment.

However, cross-cultural training alone is not enough, the right people need to be recruited. Those individuals need to have the desire to learn and embrace the new culture and environment, to challenge themselves, and to have a positive attitude even when work and life in a foreign country get frustrating. Companies should put in more effort and emphasise their recruitment strategies, because if the wrong employees are selected all the money and time that is allocated towards training them is likely to be wasted.

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Developing problem-based learning resources to encourage tomorrow's Professionals: The next stage - Fostering the Graduate Transition from Student to Professional

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Abstract:
Graduate employment continues to be adversely affected by the economic climate. In 2009 the project team set out to improve the employability chances of construction graduates from the University of Glamorgan [UoG]. The project evolved from a variety of Government policy documents from (Leitch, 2006), (Welsh Assembly Government, 2008) and the (RICS, 2010) Consultation Document on employability which emphasises the importance of soft transferable skills which are central to professionalism. The work forms part of an inter-faculty study on professionalism. The faculties consisted of Advanced Technology and Humanities and Social Sciences. This project was partly funded by The Centre for Excellence in Learning and Teaching [CELT] as part of an Innovation in Learning and Teaching initiative. The methodology employed involved the re-use of a previous questionnaire with students in the first and final years of undergraduate awards. Feedback on professionalism has also been obtained in formal and informal discussions with industry representatives. This ongoing action research project to improve the students' understanding of professionalism has highlighted several questions relating to course content and delivery. These questions include what needs to be incorporated in the curriculum, how and when this is delivered and assessed. Problem based learning has been identified as a vehicle to facilitate the programme. The need to address staff development issues has also been identified. The action research continues.

Keywords:
surveying, professionalism, problem-based learning, action research

1 Introduction

1.1 Aims

- To improve employability of students on completion of their built environment undergraduate awards.
- To increase an undergraduate's understanding of professionalism
- To address the RICS employability threshold expectations.
- To develop problem-based projects, in conjunction with employer representatives, that would help to satisfy the aims set out above.

1.2 Objectives

The objectives of the research were to:

- initiate an action research project
- establish baseline of students' knowledge and attitudes to professionalism
- establish what employers expectations are regarding professionalism from graduates
- use the findings from the student baseline study and the employer interviews to inform the development of a new RICS accredited undergraduate quantity surveying and commercial management award

1.3 Rationale

The economic downturn continues. One commentator (Green, 2011) reports construction lost a further 24,000 jobs in the first quarter of this year with the number of workforce jobs dropping to its lowest level since mid 2003t whilst another (Anon, 2010) predicts that the government's recent public sector spending cuts could result in a further 104,000 job losses in construction.

The gloomy economic outlook combined with the recent requirements from RICS relating to the development of graduates' employability skills and greater employer/industry engagement encouraged the academic staff concerned to continue a project within the curriculum that would enhance graduate employability through propagating a positive culture of professionalism.

2 Research Methodology

2.1 Research design

The methodology used was designed to elicit attitudes and knowledge of students in regard to the concept of professionalism.

The authors wished to establish the attitudes and knowledge of students on the undergraduate built environment courses as a base line.

In order to establish the students' knowledge and skills, a structured tool assessing their understanding of the concepts associated with professionalism was used. This tool was derived from a number of sources. These sources had used particular terms in their definitions of professions and professionalism. This tool tested both the students' knowledge of the terms and their attitudes to professionalism.

A structured tool, relating words to concepts, was devised to reveal knowledge of aspects of professionalism thus creating a baseline of students' attitudes and knowledge. This tool incorporated nine areas which related to professionalism [refer to Appendix 1]. These common themes were generated from many sources including (Oxford Dictionary, 2009), (Fewings, 2009), (Maister, 1997), (Haralambos and Holborn, 2008) and the RICS and CIOB codes of conduct.

A quantitative approach was felt appropriate to establish a base line of students' skills and attitudes in relation to professionalism. The method also allowed the majority of students in the population to be surveyed thus maximising the efficacy and validity of the study.

2.2 Population.

All students registered on the first and final year of the full time and part degree undergraduate awards in Quantity Surveying, Project Management [construction] and Real Estate and Development at the University of Glamorgan in the academic years 2009-10 and 2010-11.

2.2.1 Sample

Students were surveyed three months into the academic year. They were fully informed of the project's aims and objectives and were given the opportunity to opt out of the survey. The questionnaires were completed anonymously.

Table 1. Questionnaire sample

Cohort	Population	Sample	% of population
2009-10			
First year	108	59	54
Final year	60	43	72
2010-11			
First year	101	29	29
Final year	80	37	47

2.2.2 Research Strategy

In order to increase the match between the expectations and needs of employers and students' attributes in a dynamic setting, action research was employed.

Action research is a research strategy to enable researchers and practitioners to work together to achieve an optimal outcome (McNeill and Chapman, 2005). (Lewin, 1946) first described this structured cyclical process to enable change to occur within a controlled environment. The process involves different methods of data collection including surveys, interviews meetings etc. These results are fed back to the stakeholders to assess the impact changes have had on their practice and if any further changes need to be made, thus refining the process until an optimum outcome has been achieved. Similarly (McNiff, 2002) describes action research as "*a term which refers to a practical way of looking at your own work to check that it is as you would like it to be*".

3 Results

3.1 Questionnaire results

3.1.1 Knowledge of concepts associated with professionalism

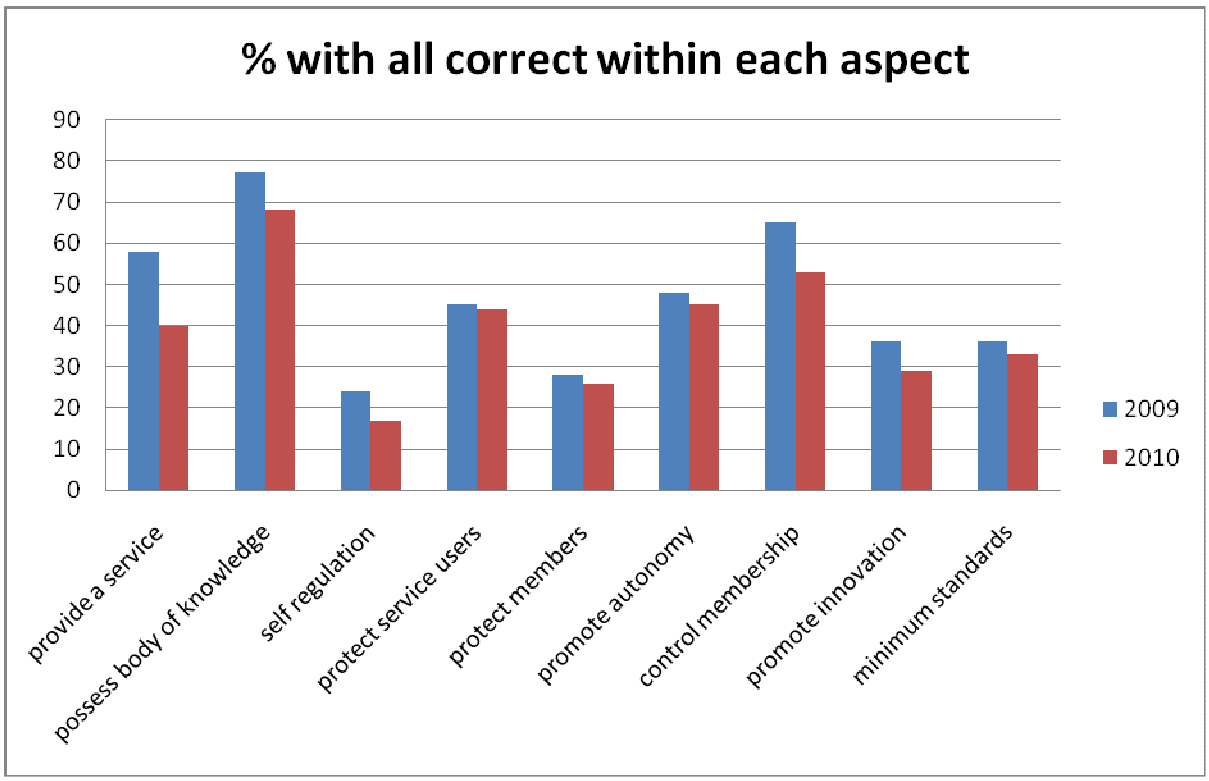

Figure 1 Results from questionnaire 2009 and 2010

Overall the results show that:

- There is a similar pattern of results over the two years with regards to the % of the cohorts that correctly identified the three correct phrases/terms associated with each of the nine aspects of professionalism detailed in Figure 1 above.
- Aspects that demonstrated the greatest understanding in both datasets were possess a body of knowledge; provide a service and control membership.
- Aspects that demonstrated the least understanding in both datasets were self regulation and protect members.
- In 2009 only three of the nine aspects produced a greater than 50% correct response. In 2010 this decreased to two of the nine aspects surveyed.
- No one correctly identified the three phrases/terms in all nine of the aspects.

Subsequent to distribution of the 2010-11 questionnaires the authors were invited to present their research findings in a seminar hosted by the university's Centre for Excellence in Learning and Teaching [CELT]. At this seminar feedback from participants highlighted that the terms "disciplinary measures" and "indemnify" may be ambiguous. The feedback suggested that whilst the terms were not considered to be incorrect there was a concern that participants may not recognise their significance in the context of professionalism. The authors note that these terms are contained within the two aspects which showed least understanding and will therefore re-evaluate the questionnaire prior to further use. Despite their minor misgivings the overall feedback

from the staff seminar was that the questionnaire was a useful tool to evaluate students' knowledge and attitude to being a professional.

The results also indicate consistency in the deficit of knowledge amongst the different student cohorts in relation to being a professional reinforcing the authors concern that this is an area that needs greater attention in the curriculum.

3.1.2 Results of questionnaire qualitative data

Two questions were included which asked the students to reflect on:

- What does being a professional mean to you?
- Why are you studying for your award?

Content analysis was used. The results provided a variety of statements which were grouped into key words. Results for both years are shown in Figures 2 and 3.

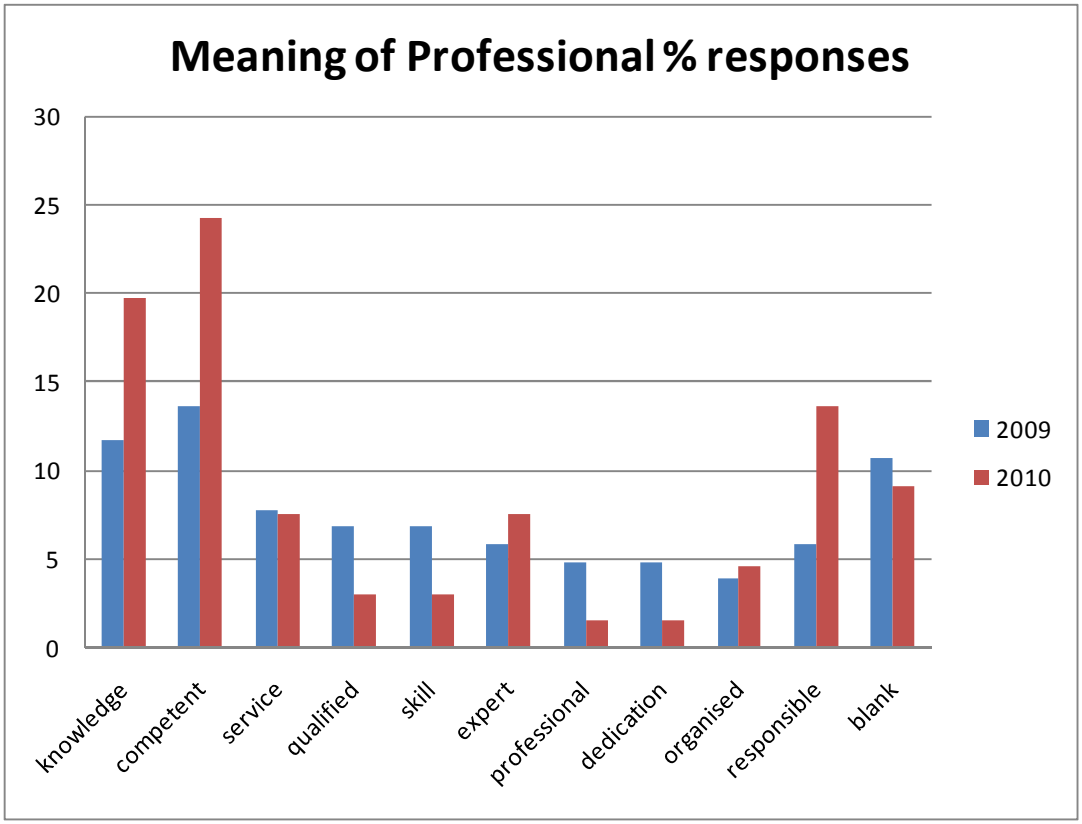

Figure 2 Meaning of Professional

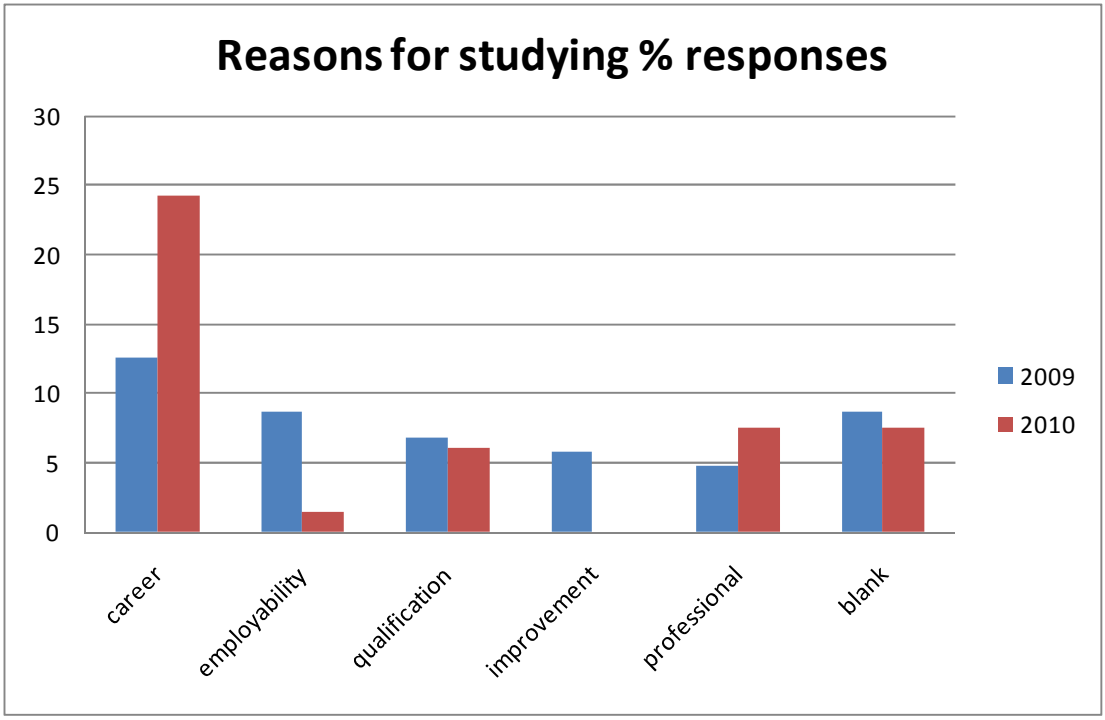

Figure 3 Reasons for studying

Whilst the terms identified from the content analysis remain similar for the two cohorts the percentage of responses for many of the terms differs considerably. This reinforces the results in the quantitative section of the questionnaire in as much as there is a clear confusion with regards to the meaning of the term professional and how it relates to their reasons for studying.

4 Discussion of results and review of relevant literature

4.1 Professionalism in the Quantity Surveying & Commercial Management award

In designing the new award it was decided that the use of project-based modules could be an effective vehicle to teach professionalism "themes" whilst at the same time influencing students' professional attitudes and behaviours. It was felt that these modules offered the opportunity, in conjunction with employer inputs, to deliver 3 core strands of professionalism ie professional competence [knowledge], soft transferable skills [eg communication, teamwork, problem-solving] and professional socialisation [personal values, belief in service to public/client, belief in self regulation etc].

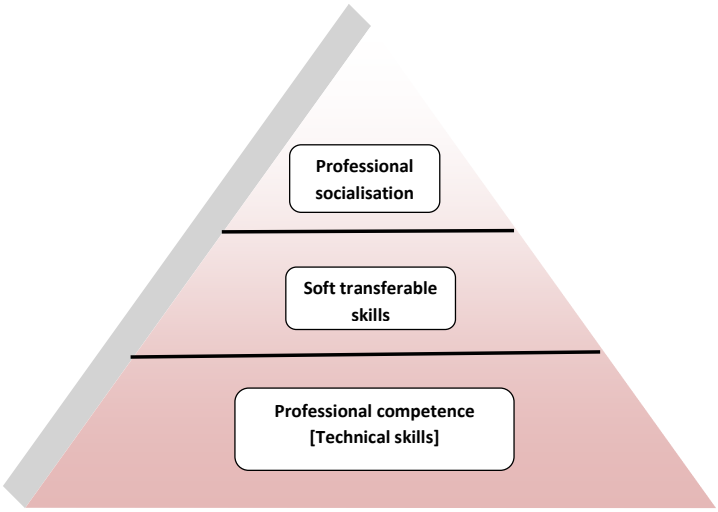

Figure 4 Hierarchy of professional development

The award contains a project based module in each of its three years. The project's professional competence and transferable skills content would be based on the adjoining modules from that year of study and the RICS employability threshold requirements. This content is the familiar territory of undergraduate education as outlined by (Duch *et al*., 2001 p6):

- *Think critically and be able to analyse and solve complex, real-world problems*
- *Find, evaluate and use appropriate learning resources*
- *Work cooperatively in teams and small groups*
- *Demonstrate versatile and effective communication skills, both verbal and written*
- *Use correct knowledge and intellectual skills acquired at the university to become continual learners.*

The teaching and assessment of professional socialisation presents the authors with more of a challenge. In her discussions on teaching professionalism to pharmacy undergraduates in America (Hammer, 2006) comments:

In discussions about students and professionalism, one question that often arises is whether professionalism can be ''taught.'' There is certainly a body of knowledge about professionalism that can be learned, but does that ensure that the learner will demonstrate professional behaviors? Probably not. Professional socialization, however, which is the process by which students learn and adopt the values, attitudes, and practice behaviours of a profession, can be taught or at least influenced.

Traditional lecture and tutorial approaches seemed inappropriate for achieving the required objectives therefore the authors decided to review the literature on problem based learning to see if it offered possible solutions.

4.2 Problem based learning [PBL]

The decision to facilitate the professionalism and employability of our graduates through using problem based learning was motivated by three main reasons:

Firstly, Problem based learning is increasingly seen within higher education as a necessary approach in education for the professions. (Boud and Feletti, 1991 p.14) see problem based learning as "*... a way of conceiving the curriculum which is centred around key problems in professional practice...*"

Secondly, there is the issue of context. The questionnaire surveys at Glamorgan and the interviews with employers identified a probable cause of the lack of undergraduate understanding of key facets of professionalism was the lack of a real world context. They were not able to ground facets of professionalism in real work situations or experience. (Boud and Feletti, 1991) suggest that one of the defining characteristics of problem based learning is that context is of central importance to this method of learning. They suggest that effective learning takes place only when students are actively involved; using knowledge they are developing in a relevant and meaningful context. The prevailing economic conditions have resulted in far fewer students undertaking a sandwich placement which has further reduced their opportunities to use their knowledge in a relevant and meaningful context.

Thirdly, Problem based learning has its roots and traditions in the teaching methods of the ancient Greeks. As (Boud & Feletti, 1991) and (Savin-Baden & Howell-Major, 2004) discuss; problem based learning is not new. It is a method of learning that predates the advent of classes and course programmes. However, it is the association with Aristotle's teaching methods discussed by (Savin-Badin & Howell-Major, 2004) that connect conceptually with the approach adopted in this research.

These three reasons will be further discussed in the sections that follow, but firstly it would seem useful to define problem based learning (PBL).

4.2.1 What is Problem based Learning?

(Duch *et al*., 2001 p6), agreeing with (Boud & Feletti, 1991) suggest that:

"...In the problem based approach, complex real-world problems are used to motivate students to identify and research the concepts and principles they need to know to work through those problems. Students work in small learning teams, bringing together collective skill at acquiring, communicating and integrating information."

According to (Savin-Baden and Howell-Major, 2004), problem based learning can be characterised more broadly by its student -centeredness in addition to its being focused around problems. They identify eight key features of problem based learning, five of which focus on the student experience and three that deal with PBL from the staff perspective. It is worth discussing the five student related characteristics:

Firstly, PBL takes into account the past experience of students.

Secondly PBL fosters student autonomy by encouraging them to take responsibility for their own learning.

Thirdly PBL centres on the processes rather than the products of knowledge acquisition. As Engel (1986) suggests problem based learning is a means of developing learning for capability rather than learning for the sake of acquiring knowledge.

Fourthly it achieves an interweaving of theory and practice.

Finally, the necessity for student's to work with others during problem based learning activities hones their communication skills in a way that enhances their interpersonal skills beyond their area of technical expertise.

4.3 Problem Based Learning as a method of educating professionals

Problem based learning came to prominence as a method of learning in universities within the field of medical education principally as a result of the seminal work by (Barrows and Tamblyn, 1980) in their book 'Problem -Based Learning: an Approach to Medical Education'. (Boud and Feletti, 1991) argue that this book changed the way medical education was taught at McMaster medical school in Canada and subsequently throughout medical education generally. The reason for this innovation was that PBL resulted in the creation of medics with enquiring minds and a desire to understand, rather than the traditional pedagogies which equipped doctors with a set of knowledge and responses that allowed them to earn a good living. Since then the use of problem based learning has begun to dominate within the arena of professional education because as (Boud and Feletti, 1991 p14) suggest, problem based learning is "*... a way of conceiving the curriculum which is centred around key problems in professional practice ...*"

Further, they see problem based learning within higher education as a necessary approach in education for the professions. They highlight the point that the ever expanding knowledge base of most professions precludes a novice practitioner being able to assimilate all the knowledge necessary in their undergraduate studies to become a fully autonomous professional. They also argue that it is more important for students to be able to research, discern and utilise information appropriately than to absorb all information academic staff deem desirable.

This argument is particularly relevant in the field of professional ethics where the code of conduct for a professional body cannot possibly cover every nuance or 'grey area' that a new practitioner could come across (see Hall & Williams, 2010). We would suggest therefore that in this arena it is even more important that students leave university having developed the knowledge, understanding and discernment necessary, coupled with humility to be able to apply a set of professional values and qualities to their professional work; and further to have the confidence to able to ask for advice in those situations where they are unsure of the 'right thing' to do.

4.4 The Issue of Context

We suggest that utilising the techniques of problem based learning may better serve the development of student understanding of their own professionalism because the knowledge which is valued in problem based learning is that which can be used in context and interrelated, rather than that of knowledge presented in discrete, often unrelated subject areas. (Boud and Feletti, 1991 p22)

(Boud and Feletti, 1991) suggest that one of the defining characteristics of problem based learning is that context is of central importance to this method of learning. They suggest that effective learning takes place only when students are actively involved; using knowledge they are developing in a relevant and meaningful context. They also suggest that one of the benefits of PBL is that:

"... Problem based learning is closer to the real world of the professional and as such has greater validity with practitioners/professionals than a course of discrete unrelated subjects. ..."

(Wood, 2003) also considers advantages of PBL to be:

- *Student centred —PBL fosters active learning, improved understanding, and retention and development of lifelong learning skills*
- *Generic competencies—PBL allows students to develop generic skills and attitudes desirable in their future practice*
- *Integration—PBL facilitates an integrated core curriculum*
- *Motivation—PBL is fun for students and tutors, and the process requires all students to be engaged in the learning process*
- *"Deep" learning—PBL fosters deep learning (students interact with learning materials, relate concepts to everyday activities, and improve their understanding)*
- *Constructivist approach—Students activate prior knowledge and build on existing conceptual knowledge frameworks*

Wood (ibid) also considers the disadvantages of PBL as follows:

- *Tutors who can't "teach"—Tutors enjoy passing on their own knowledge and understanding so may find PBL facilitation difficult and frustrating*
- *Human resources—More staff have to take part in the tutoring process*
- *Other resources—Large numbers of students need access to the same library and computer resources simultaneously*
- *Role models—Students may be deprived access to a particular inspirational teacher who in a traditional curriculum would deliver lectures to a large group*
- *Information overload—Students may be unsure how much self directed study to do and what information is relevant and useful*

Wood (ibid) also reflects on the impact of PBL on the teaching staff as follows:

Introducing PBL into a course makes new demands on tutors, requiring them to function as facilitators for small group learning rather than acting as providers of information. Staff development is essential and should focus on enabling the PBL tutors to acquire skills in facilitation and in management of group dynamics (including dysfunctional groups).

Despite the potential disadvantages identified the authors belief that overall PBL, by providing a real world context within which students apply their developing knowledge has many advantages; it can help foster not only the application of knowledge to actual practice but can also help develop professional behaviours and attitudes .

4.5 Links to Aristotle

Conceptually there are two links with Aristotle's ideas and this research. Firstly, our approach to understanding the notion of professionalism, (detailed discussion to be found in Hall & Williams, 2010) is based around the idea that Professionalism may be

better understood as a set of values and virtues that need to be internalised through a process of socialisation or formation. Aristotle thought that this process of developing values and virtues was difficult to teach and only developed over time. (Hammer, 2006) concurs with this idea that professionalism cannot be taught, but suggests that the values, attitudes and behaviours of a profession can be taught and influenced through the use of role models and reflection/discussion on real world situations. This provides further weight for the argument in favour of adopting PBL as an appropriate curriculum approach.

Secondly, (Savin-Baden and Howell-Major, 2004) highlight the link between Problem based learning and Aristotle's teaching methods. They suggest that for Aristotle teaching and learning was always focused around disciplined inquiry into some aspect of reality and that education should enable students to make rational judgements that interweaved and applied theory to the practical. Problem based learning in this context is a quest for knowledge where students use their reasoning abilities to manage or solve complex problems.

Overall the authors believe that the literature concerning Problem Based Learning (PBL) strongly supports their strategy for developing undergraduate professionalism.

5 Conclusions and recommendations

Action research has proved to be an excellent tool for continuous evaluation of the undergraduate courses in regard to development of content, implementation and evaluation of students' performance and facilitating industry/partner input. Action research often creates more questions than answers as ongoing evaluation and assessment of the project reveals the need to change in relation to perceived needs. This phase of the study has led to the following actions for the next cycle in the process.

1. There is a need to establish an end point for the "transition to professionalism" ie what basic professional attributes the industry would expect of a new graduate. This end point needs to be established in conjunction with employers and the professional bodies.
2. Having defined the end point it will then be necessary to design a coherent, logical progression from year one to year three of the award ie a journey to transition. This progression will include the nine aspects of professionalism referred to in the questionnaire.
3. Development of appropriate assessment tools and mechanisms, both formative and summative, to assess individual's progress on this journey. These mechanisms must be designed to emphasise the importance and relevance of the concept of professionalism to undergraduate development and employability.
4. Given the potential disadvantages of PBL identified in this paper it will be imperative to manage the changes involved in adopting this approach, especially in relation to staff and team development.
5. Last but not least there is the need to develop a framework whereby employers are fully engaged in the process of development, delivery and assessment. Thus increasing the students' exposure to professional expectations and increasing their employability.

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Critical Review: An investigation into the definition of non-cognate graduates in the context of professional quantity surveying education.

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Abstract:
This paper reviews the construction industry understanding of technocratic and generalist education. There exists a dichotomy in practice between cognate and non cognate graduates. Within this paper an exploration occurs around definition and context, themes are identified by critically appraising current relevant literature in a qualitative manner, with particular emphasis on analysis and interpretation. In particular, the rhetoric employed in the ethnography sample will be addressed through the definition of the terms cognate and non cognate. It is expected that this paper will act as a basis for future investigations into technocratic and generalist education for quantity surveyors bridging the terminology chasm and widening the debate into other professions.

Keywords:
non cognate, dichotomy, construction education, technocrat, generalist

1 Introduction

As an active chairman on one of the professional assessment panels, run on behalf of the Royal Institution of Chartered Surveyors (RICS), I have been involved in assessing professional competencies (APC) over a period of 16 years. From this activity, I have witnessed a trend in non cognate degree holders applying for assessment. This trend has grown and in the November 2009 assessments, held at Heathrow, the panel I chaired assessed non cognate degree holders only, 4 in total. I am particularly interested in this phenomenon as an educator and designer of an undergraduate degree specifically for the discipline quantity surveying.

I believe we require a debate upon the educational inputs and outputs of professionally accreditated degrees, and from the research I have undertaken so far, there is little specifically aimed at the quantity surveyor. I did realise there was no definition given for non- cognate candidates and this would be an area to address. I have investigated the definition of professional education and then described the professional construction education. The context of these investigations have been undertaken by taking a global perspective and by attention to the political will that has historically shaped education within the UK. The overall discussion becomes one of generalist education verses technocratic education.

With this framework in place a review of literature in the subject of construction education was undertaken as a result it was found most emphasis was found to be placed upon skills, knowledge and the subsequent measurements of these. Examples

and definitions of generalist education and technocratic education emerge. It from this basis I have drawn a definition of non cognate degree holders as those holding a generalist degree and the cognate degree holder as those holding a degree in quantity surveying accreditated by the RICS as a technocratic degree holder. This is reflected as a dichotomy in practice where a technocratic education is prescribed but a generalist education is also employed in growing numbers. This dichotomy is one which is worthy of investigation in further research and future papers.

2 Literature Review

2.1 Professional education (what is professional education)

I have focused upon professional education, the position of chartered quantity surveyor has been classed as a profession(Simpson 2010), hence the education pathway that emerged has followed the route of the professional and as a result can be viewed as technocratic in nature.

There is a plethora of information on professional education outside the construction industry particularly in the realms of teaching (Clifford & Guthrie 1990) and healthcare(?). Even 100 years after the first courses were set up in the profession of teaching the problems of vocational (work specific) educations fitting the constraints of the existing structure of higher education remain. The still relevant and pertinent discussions, regarding the fit of technocratic education held at the turn of the previous century, between Dewey and Snedden as cited in Garrison (1995) are still debated by Tan (2003), Tovey (1995), and Tribe &Tribe (1995). A long and many sided debate (Dewey 1916, Lodge 1947, Atkins 2003, Carr 1995, Garrison 1995) shows that professional education struggles with notions of an applied education rather than a generalist approach to knowledge. Professional education is shown to sit uncomfortably inside the structure of traditional seats of knowledge (Clifford &Guthrie 1998). This can be witnessed by the rise and fall of professional education can be easily plotted against the political and economic will of society at given times. (Carr 1995, Garrison 1995, Dewey 1916) Teaching in particular reacts to the changes in demographic changes that society makes, especially the birth rate but also the needs of a technological advanced economy. While quantity surveying education reacts to the economic cycles the construction sector weathers. (Hillibrandt 2000, Bonn). The view of Dewey as explained by Garrison (1995) is that education should be differentiated but that training should be left to the trainer and education should take the form of a generalist approach. However the model adopted within the USA and the UK is one where there is a mix of technocrat and generalist resulting in an unhappy amalgam. The offspring of this process emerges as class differentiation; of leaders and lead (Carr 1995), this, it could be argued, is reflected in the perceived status of graduates and their subsequent recruitment into the workplace.

2.2 A description of professional construction industry education

Construction professional education literature has been mostly in the remit of Architects and Engineers for both these professions have been in existence for several hundred years. They have a form of education and training with longer undergraduate programmes and extensive pupilage, indenture periods (Nethercot 1999) followed by a professional examination or later professional assessment which is made (RIBA, ICE).

This set pattern was adopted for surveying education and training, following the master and servant model. The Engineers were the first to move in 1977 to an accreditated undergraduate degree, with an independent board – Joint Board of Moderator (JMB) representing Civil, services and mechanical degrees (Nethercot 1999). Quantity surveying education under the remit of the Royal Institution of Chartered Surveyors (RICS) followed suit. This is referred to in the Table 1 below:

Table 1**:** Quantity surveying changing educational structure
(Source: Simpson, 2010)

Quantity Surveying educational structure Pre 1980	Quantity Surveying educational structure present 2010
Indenture, professional training Test of professional competence	Academic test- undergraduate degree Structured professional experience Assessment of professional competence

2.2.1 Politics and QS education

The political will towards education, has changed since the industrial revolution in the 17c, here the liberal ideas affecting the free marketplace arose with particularly attention to the ideas of Adam Smith(1998). The change from an agricultural to an industrial marketplace was undertaken and Smith's ideas influenced the type of education required to fulfil this political sea change. The market through the 20th century, particularly the quantity surveyor, (look up founding fathers info) moved to a conservative approach (Jarvis 1983) which suited the middle class professionals who are described as the service class (Simpson 2010, Jarvis 1983) and hence the style of education moving to address the market requirement, there was more emphasis is put upon tutelage, indentures and apprenticeships, the master and servant approach. In the later 20th century and into the 21st century attention has been moved to the monetarist approach, now referred to as neo liberal (Erant 2000, Denzin& Lincoln 2008), in the marketplace and was also evident in educational institutions with more growth in the polytechnics, now known as post 92 universities, this is important as the QS degree is solely found within these institutions and perhaps in two red brick universities. This can be witnessed by the rise of technocratic education under the conservative government lead by Margaret Thatcher (1978-90), an ardent pro monetarist, and a return to the free market with education driven to fuel market demand thus leading to a revival of professional undergraduate education. This didn't occur in isolation within the UK but can be evidenced in the international construction education scene.

2.2.2 Global view of construction education

Globally, a review of educational structures within the commonwealth countries and English speaking countries found an educational system which echoes the UK professional educational route (Chan et al 2000), as described before. There has been research into construction education in non English speaking countries such as China (Shirong 2001) and Japan (Tan 2003). The aimof this research has been to investigate how best to educate the future managers of the construction industry. The Japanese approach centred upon the historically driven generalist education structure, where the elite intellectuals are generally educated then trained into roles. This mirrors the trend

that has been identified in the UK QS education system, over this new 21st century. Larger practices employ graduates with degrees in disciplines from outside the Construction Industry and train them through structured training schemes and post graduate degrees to become chartered surveyors.

Atkinson (2003) highlights this trend and refers to the division as cognate and non cognate students. He also suggests there is a move to studying an undergraduate degree for self interest before training for the workplace. If students are wealthier, based in the UK studying fulltime, they choose to study for intrinsic, self fulfilment rather than employment. He also discusses the value of education being of immediate use to society (technocratic) or intrinsic (generalist) and of use later to society. Atkinson's view ignores the bulk of undergraduate quantity surveyors who study part time and are financed by their employer rather than themselves or the state. When examining this stance the class distinction of Snedden's argument may still be relevant over 100 years later.

2.3 Skills, Knowledge, Education and Competencies

The bulk of publication into professional education particularly in the Construction Industry is focused upon the hard, technical skills and knowledge that are currency (Bourdieu 1973), in the workplace. This can also be reflected in the sister professions of law (Tribe&Tribe 1995) and accounting (Hanlon). This is hardly surprising as the learning styles in these professions lean heavily to the quantitative where numeracy is valued. It is simpler to give answers in a single output entity; the answer to the ultimate question of life, the universe and everything is the number 42(Adams 2004). These publications can be conveniently divided up into Skills, Knowledge, Education and Competencies.

2.3.1 Skills and Competencies

Skills are having the ability to carry out tasks well (Oxford English Dictionary 2010) in this case specific skills to carryout professional quantity surveying works. Professional skills (O'Donnell et al 2008)can be generic and specific, indeed there is a split in publications on this point with some the RICS(1992), Poon (2006), Eruat (2000) emphasising the specific skills whilst a general view on employability and personal skills has also emerged (Wilkie & Giddy 2003, Doidge et al 2000) There is plenty of evidence about the skills required in property, construction and surveying as published by the QAA (2008), interestingly within this document there is emphasis upon generic and specific skills, ensuring the mix of the two types of skills. The RICS will refer to the specific surveying skills in the terms of competencies (APC assessment guide 2008), similar to the measures used in NVQ's where the candidate can or cannot do identified activities. Ellis (1995) discusses this in the terms of action based competencies, these are highly visible actions which are successful or are not successful. Returning to the idea of generic skills at this point within construction education the skills are described as communication skills, dialogue, presentation (Doidge et al 2008).The RICS view these skills as level 1 competencies with customer care, people skills, ethics as basic requirements but divorced from the specific skills although there is an awareness of the requirement of composite skills (RICS 1992). Generic skills which are relevant to the profession of surveying are as stated by Eraut (2000) analysis, appraisal, communication, documentation, evaluation, management, quantification, synthesis and are reflected in the QAA (2008) document. Skills, it is being argued, are both generic and specific for a successful quantity surveying undergraduate to be able to reach the point of graduation.

2.3.2 Knowledge

A question, then arises, are QS undergraduates any different from the sister professions of law and accounting at graduation. The answer must be yes, there is a difference, as the knowledge base of lawyers and accountants will be very different, they all have a professional education but the knowledge base will be different. Knowledge is the currency that professions use to sell their expertise and services (Tovey 1995) and also to differentiate themselves from others (Downie 1990, Hanlon 1998, Fong & Choi 2009). This differentiation and subject specific knowledge is in demand by clients (Chan et al 2000) and gives a market advantages to those professional bodies who offer conservative (Jarvis 1986, Simpson 2010)style service, in this instance the RICS.

Knowledge in this professional context is a seen as professional and codified (Goldthorpe 1982). Eraut (2000) explains this knowledge as implicit and explicit in nature. The discussion around competencies can address the explicit nature of certain knowledge but the professional is rewarded within quantity surveying for their implicit knowledge (Chan et al 2002, Bowen et al 2008, Simpson 2010), clients value personal tailored service rather than standard one size fits all approach. Yet another debate, around knowledge is that which is tacit Eraut (2000), simply learnt by doing, watching, listening and without conscious effort to acquire, perhaps reflected in the value of experience which again has no formal measure to substantiate the learning involved.

Within the debate around knowledge there is a drive in which to make implicit knowledge explicit so that is can be interrogated and measured. Ellis (1995) discusses this transformation of action based learning to measurable competencies and the desire to demystify the route to professional knowledge. The main drivers are political ensuring more transparency and accountability within the professions thus reflecting the political will of neoliberal education, to fit graduates for the marketplace.

2.3.3 Education

A whole discussion has taken place over the style of education being offered and the main arguments have been between liberal education (Tan 2003, Atkinson 2003, Dewey 1916) and vocational education (Carr1996, Garrison 1996). There needs to be a new discussion reflecting the political implications of the neoliberal approach being adopted in the education and training sphere where equipping undergraduates for any type of employment is now a requisite. Wilkie & Giddings (2003) discuss these phenomena as employability and personal skills, perhaps in recognition there is in the Construction Industry sometimes a skills shortage and sometimes a skill surplus, as witnessed in the current economic climate of the 2009-11 recession. Interestingly, Wilkie & Giddings (2003) discussions are reflective of generic and intrinsic education meaning that the knowledge base is not that highly significant in the world of work.

3 Research Methodology

The work carried out has been done in a desk top study with critical review of papers texts and journals published and unpublished. The use of the internet to source information has been noted particularly for the definition of terms. There were many more papers investigated but not used specifically in the writing of this paper, I also carried out an examination of each papers' and text methodological approach and stance. From these papers the overreaching suggestions regarding the selection of research methodology ,over which would derive the most effect within this area of

research would be a qualitative approach. However, few writers used this method even if they recommended it for further consideration. In carrying out this research I found cases of analytical (Tovey 1995), normative (Simpson 2010), empirical (Eraut 2000, RICS 1992, Tribe& Tribe 1995), narrative (Doidge et al 2000), cognitive (Chan et al 2002), action based (Ellis 1995, CIB 1996) and grounded theory (Simpson & Dye 2009).

This paper suggest three themes which affect professional quantity surveying education, these being divided into the general, then specific to professional education and finally applied to quantity surveying education. At this point in the research, the overall approach has been one of qualitative investigation. In the belief that a differing set of data will be generated to those previous investigations, a social science perspective (Hart 2008) has been adopted, in this paper. To validate this initial investigation a cross interrogation was undertaken upon the findings and then subsequently the classifying of topics and debates arising (Cresswell 2007). In future the research will be expanded into other sources of published data, particularly the political landscape surrounding vocational educational history (Morse et al 2002). The approach, presently adopted has been working towards establishing reliability by using the means of cross interrogation of different sources and also examining political and methodological differences (Denzin & Lincoln 2008), that arise. This use of cross interrogation of the different sources goes some way to tackle the question of research reliability. Additionally, I have stated my personal position in undertaking this research (Cohen,Manion & Morrison 2009) however it is very difficult to prove reliability in qualitative research as suggested by LeCompte and Preissle(1993)cited by Cohen et al (2009) but if reliability is taken to mean as Cresswell(2007) suggests, where the researcher has been consistent in their approach to collection and interrogation of data then this current research meets this criteria and can be viewed as reliable. The result of this methodological review is that a qualitative desk based research was undertaken and sits within the anticipated criteria of reliability and validity.

4 Findings and Discussion

A discussion can now take place about the skills, knowledge and traits that an undergraduate quantity surveying will need to be taught throughout her education and what professional training is required on completion of the degree to enable a professional quantity surveyor to emerge as I intend to explore in future research works. To do this it is important to define the terms cognate and non cognate within the context of quantity surveying.

What is a non cognate graduate within the context of quantity surveying?

The Royal Institution of Chartered Surveyors (RICS) QS division in their publication about skills and knowledge (1992) are first to mention non- cognates, but give no definition of this term. In the paper published by the Chartered institute of Building (CIOB) there is a nod towards non cognate intakes into training due to the skill shortage within the Construction industry (Wilkie & Gidding 2003). Atkinson (2003) refers to cognate and non cognates and defines them in the terms of cognates having undertaken applied, practical and technical subjects at undergraduate degree level, I would suggest a technocratic education. Whilst, non cognates have general and theoretical undergraduate degree, here I would add the label generalist.

On investigation, the Oxford dictionary doesn't list non cognate as a word or term. The meaning it suggests for cognate is that of "having the same linguistic derivation as another or related; connected" which bears little resemblance of term in use in RICS (1992) and Atkinson (2003) writings. The most reasonable approach would be to look at the Latin basis of cognate ; two terms being most similar cogito – to think or cognosco – to learn, (UCS 2010) following logically on from this stance non cognate would be- not think or not learning. This is not a very satisfactory description of the two terms.

Another approach is to examine the meaning in use of non cognate, as Atkinson (2003) discusses non cognate is a general and theoretical degree holder, Tan (2003) discusses education in terms of strategic education, whilst I would use the term generalist degree holder. If these understandings are accepted what then flows from this understanding of non cognate is the quantity surveying understanding of cognate, this can be understood as being the opposite meaning in an educational framework; that of applied, practical technical undergraduate education. This I would describe as technocratic education. Therefore, I would define a cognate degree holder as someone who graduates from a professional accreditated degree programme, in the case of the QS the RICS or CIOB. The definition of a non cognate degree holder would be a graduate holding a degree which is generalist in nature, and not accreditated by the RICS or CIOB.

This division smacks of Snedden's (Drost 1967) and Dewey's (1916) discussions about class distinction of those who lead and those who follow. Snedden proposed this distinction based upon use of vocational education, to ensure those who are lead are more efficient. This dichotomy exists in professional undergraduate education; it is also mirrored in the professional practices adopted by the QS employers.

It is important to define these meanings of cognate and non cognate as terms to enable, exchanges of ideas and clear discussions within the QS sphere and that of professional education in the round. Once these terms are defined then meaningful debate can occur within QS education and others involved in professional education. Lessons can be learnt from other professional education routes and applied with benefit to the educational routes of QS undergraduates and post graduates. Other professions identified as indicators of future trends and changes are lawyers and accountants (QS, RICS 1992) and indeed these would facilitate discussions and comparisons of practice models.

At this point it would be meaningful to discuss the role of language, in particular the language adopted by a grouping to communicate with a targeted audience (Benz & Shapiro 1998). A reasonable approach to adopt in researching this grouping would be to follow ethnography method, especially to give a sense of the complexity of the situation where preconceptions and patterns of behaviour are studied (www.nus.edu.sg), thus enabling meaning to be uncovered in a holistic manner. Boudieu (Asgeir& Popkewitz 2008) is well renowned for his views on knowledge as a power base, he also discusses the sociological studies and use ethnography to exhibit other points of his philosophy. These points on knowledge, holistic overview, rhetoric and ethnography will give further direction to future studies in this area.

5 Conclusions and Further Research

Within this paper a critical review of published data has occurred, the methodology I have employed is has been discussed, springing from this analysis three main themes

were identified and classified as the generic, the specific and the applied to professional quantity surveying education.

There was undertaken a review of professional education then professional education pared down further to quantity surveying education. A context of global and political drivers has been described to give parameters to the research. The main focus found within this critical review of literature has is found to fall into three camps- skills, knowledge and education. The result of this critical review has identified a lynch pin requiring a definition of non cognate and subsequently cognate terms used within the texts. A definition of a cognate degree holder is offered as someone who graduates from a professional accreditated degree programme, in the case of the QS the RICS or CIOB. The subsequent definition offered of a non cognate degree holder would be a graduate holding a degree which is generalist in nature, and not accreditated by the RICS or CIOB.

An attempt has been made to define these terms, thus enabling future discussions and debates to occur within the professional quantity surveying education and those of accounting and law.

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Emerging markets

Sustaining the Localization of Quantity Surveying Profession in Sultanate of Oman

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Abstract:
Oman shows a substantial development during the 21st century. The country has made a considerable growth on various industries which contributes to the growing economy of the state. Among which the infrastructure development contributes a significant value. The government of Oman has enacted a localization policy called "Omanisation" which aimed at replacing expat worker with trained Omani personnel. The implementation of Omani policy was applied to lower the unemployment rates for Omani citizens. Further, the Omanisation allows Oman to be self-reliant in human resources by decreasing dependency on expatriates. The Ministry of Manpower has taken considerable amount of steps to achieve the targeted omanisation policy through introducing the new laws and rules for the human resources recruitments. However, there are limitations induced by the factors which prevents to achieve the targeted localisation metrics. This paper aims at assessing the achievement of the policy has had over the years in various sectors. Further, this paper also discusses the factors against the implementaion of localisation which are pertained to omani Quantity Surveying (QS) profession in detail. The author has adopeted various data collection techniques such as interviews questionaire survey and archival data analysis to unwind the fact regarding the challenges of the localisation policy facing in recent past years for the QS profession. The paper also recommends the posible ways to overcome these difficulties and sustains the localisation in QS profession.

Keywords:
nationalisation, omanisations, factors influencing localization, quantity surveying

1 Introduction

During 1970s, GCC countries began investing heavily in labour and capital intensive sectors such as infrastructure and real estate to support their economic growth. However, with shortages in the number of skilled nationals, many of the jobs that were created ended up in the hands of workers who emigrated to the GCC from other Arab or Asian countries (Shediac, and Samman, 2010). But, at present Gulf Cooperation Council (GCC) is facing a challenge against its enormous population increase, and its knock on effect as high rate of unemployment. Therefore, these countries have engaged in localization programs based on positive discrimination for the nationals to integrate a larger share of them into their workforce. The programs have names such as Omanisation, Bahrainization, Emiratization and Saudization (Albayrakoglu, 2010).

These localisation process needs to be carried out with greater care as these may have a positive and negative impact on the country's political, social and economic aspects (Rees, 2007). Further, the prevailing political instability in Middle East region influences the local government to follow a stringent localisation process without compromising the economic growth of their country.

In the case of Oman, the employment is largely dependent on nationality in their public sectors. In the public sector, Omanis held 70% of the jobs in 1999 and 91% in 2009, while in the private sector which contains most of the lower paying jobs 90 % of the employees were from foreign countries in 1999 and up to the end of January 2011, it was estimated to be 84% (Ministry of National Economy, 2011). There are many reasons for these differential ratios between the public and private sectors. However, the government of sultanate of Oman enforced the rules and regulations on recruiting the locals through labour laws as stated in chapter two of Oman labour law under Part I of Employment of citizens in Article 11.

"An employer must employ Omani employees to the greatest possible extent. A decision from me Minister will specify the percentage of Omanis to expatriates in the different economic sectors or activities of each sector according to the requirements of the circumstances and activity of each sector or according to the availability of the required Omani employees.

Employers must put all employees on the same footing when the nature and conditions of their work are alike."(Oman labour laws, Article 11, Decree no. 35/2003)

Unlike the other neighbouring countries, the sultanate has realized the human resource potential of their local people and used a mixed approach for setting different localization targets percentage for different sectors of their workforce depending on the market requirements and availability of resources that are likely to be met for each sector. On behalf of the government, the Ministry of Manpower (2010) had revealed the Omanisation target for each sector. For example, target has been set for travel and tourism sector is 90%, telecom sector is 62%, industrial sector is 35% and sales and distribution sector set was 65%. As far as the contracting sector is concerned, the target of Omanisation is 30% for second and above category contracting companies (Ashok Kumar, 2008). As the private sector holds skilled and professional positions the government has taken many steps to improve the skills of their local workforces by means of strategic planning on the education sectors, training and development. Though the strategies were efficiently adopted in the sultanate for the achievement of their localization targets, there is a supply- demand problem (the demand exceeds the supply) in some sectors such as infrastructure, petroleum, energy sectors etc. However there are some sectors such as banking, health and transport which meet the targets. Hence studying the factors which affects the localization in each sector is paramount importance for the effective planning.

The infrastructure in Oman contributes to the major part i.e. 12% in its annual contributions on GDP that is nearly to 5.25 billion US dollars as compared with 10.9% in 2010 which was budgeted for 5.32 billion US Dollars (Hasan, and AlYaqout, 2011). The increased investment expenditure decided by the government is a matter of policy to continue with key infrastructure and development projects. Many of these projects are carried out by the multinational companies. The government focuses on the on-going support for private sector as subsides to the sector is estimated at 1.55 billion US Dollars. According to the Ministry of National Economy, Oman is allocating 2.342 billion US Dollars during 2010 with the aim of creating jobs for Omani nationals as the

sector is heavily depends on the expatriates (Global research, 2011). This involves the decision making on the financial aspects of these projects, which has a higher stake on the above growth rate. The infrastructure project is one among the many sectors where the government has failed in achieving their localisation targets. The Quantity surveying profession in the infrastructure sector is one stream which holds almost all expatriate workers. This profession has a very big stake on making economic decisions on these multi-billion infrastructure projects. Hence preparing the locals for the future management is paramount importance. This paper takes the Quantity Surveying (Q.S) profession of infrastructure projects as a case for the study and investigates the factors attribute to the success of the localisation in this sector. The author used various data collection methods such as interviews and questionnaire interview to unwind the facts about the problem under study.

The paper consist of six sections, the next section discusses the literature on the general localization in middle-east region and the factors affecting the process. The third section explains the Oman's localisation on various sectors and its current status. The fourth section explains the methodology of the current study for the identification of the factors that endanger the accomplishment of localization target percentage with respect to QS profession. The data analysis and the discussion of the questionnaire interview and the focused interviews were discussed in fifth section. The last section discusses the conclusions with the recommendation for the successful future implementation of localisation strategies to achieve the planned targets.

2 Localization in Middle-East region

Middle-east region has not been modernized until the invention of the petroleum and its usage. Even after the invention of petroleum, the countries took a long time to realize the potential of their oil wealth. However, these countries have managed to modernize with the help of the expatriates for the past four or five decades. To sustain their growth, these countries were fully depends on the expatriates as there were no technical or administrative institutions to produce the suitable local work force until a decade before. Later, with the growing population and increased unemployment rate together with the vision to reduce the reliance of the expatriate workers, these countries decided to be self sufficient in all sectors of the workforce. The self- sufficiency in all the sector has not been achieved immediately, so many long-term strategic plans were proposed. The objective of these strategic plans is to replace the expatriates gradually with the competent local workforce over the years. However, the success of these localization were not been able to fully achieved in some sectors such as Construction, Oil and Gas, IT etc. but, it has been more than the target sets in some sectors such as banking, travel and clinical (Ashokkumar, 2008).

There are number of factors which affects the localization process in some sectors, these factors are inherited from the country's economy, tradition, education, culture, politics and foreign policies etc. Figure 1 shows the same. Further, these factors can also be categorized from the human behavioral aspects towards their prevailing social life to the complex professional and technical skills required for the profession. Many studies have been conducted to identify the factors affecting the localization with different perspectives in various sectors. Though all these literature listed out the same general factors in this part of the world, there are specific factors which pertained to the country and the sector under study. The picture depicts the various categories of these factors for enabling the readers to get a general framework of the issue.

In GCC region, the National Human Resources Development and Employment Authority have announced the findings of its latest study on the causes of long-term unemployment in GCC's economics related factors. The study concludes that labour market segmentation; falls of oil revenue and high remuneration in public sector were the main causes of unemployment of nationals in the private sector (Tanmia, 2006).

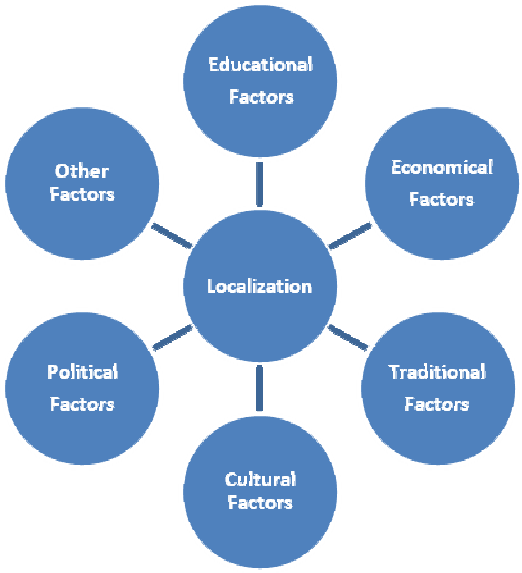

Figure 1 Factors affecting the success of Localization in GCC regions

Al-Dosary et al (2005) have also identified several factors which affects the Saudisation process such as 1. Saudi education system (Educational Factors), 2. Lack of enthusiasm(Cultural Factors), 3. Private sector's minimal interest on recruiting locals (Other factors) and 4. Lack of experience of local work force (Other Factors). Shaham, (2009) also reported that the GCC countries have a sponsorship system – kafala system (political factors), though this system have served its purpose during the initial stage, later produced its side effect such as over stay of the expat labor force. The lacks of enforcement policies along with the private companies were very much comfortable with these illegal low paid skilled labor force. Another study reported Gender inequality (Social Factors) is greatly influenced in many of the GCC countries (Metcalfe, 2006). Further, the private sectors have the following common opinion about the local workers; 1. Less productive, 2. Under skilled (Rowe, 1992) 3. Unmotivated 4. Lack of English proficiency 5. The expatriates favoritisms to their fellow country workers 6. Lack of experience and 7. The social demand on public company jobs (Naser, et al, 2006).

3 The "Omanisation" A Status Report

In 1988 the government of Oman has pursued a localization policy called "Omanisation" aiming to gradually increase the participation of qualified locals in the labour market. 1n 1995, the vision 2020 for Oman's Economy was launched, with a key focus on two main areas; one among the area is Omanisation and Privatization. This fact is aiming to replace migrant workers with Omani nationals, which will underpin education, training and employment policies and practice (Goodliffe, 2004). Within the initial years, the Omanisation targets were achieved in public sectors. Later, in public sector the supply exceeds the demand as it provides social security to local workers with perception of the provision for better incentives such as higher earnings, better working

conditions and pension benefits after the end of service. However, in the recent years, the inability of the public sector to absorb the Omani labour has led to a real problem of unemployment (Al-Nashif, et al, 2010).

As mentioned in Vision 2020, the government wants to encourage, develop and support the private sectors as the major driving force to develop their national economy. This increases more number of private participation in all the sectors in Sultanate of Oman. In response to this, at present, the private sectors become the major employing source but which practice to employ the expatriates as they are cheaper and skilled from Asian countries such as India, Pakistan, Bangladesh, Srilanka etc. However if the issue is further looked at closely, there are complex inter related issues with the countries policies on other strategic plans in the area of human capacity building.

Though an enormous encouragement exists from his Majesty and the government to enlarge the employment rates for Omani nationals. The government has established a High Committee for vocational Training, the Ministry of Social Affairs and Labour, and Ministry of Labour and Vocational Training to oversee the Omanisation process launched in 1991. Nevertheless, the government had also created a new Ministry of Manpower in 2002 and a new Labor Law was adopted in May 2003 that had advacened the policy implmented progressively (Albayrakoglu, 2010). Despite the government's considerable interest and active role in promoting Omanisation in the private sector, slow progress has been achieved and the ratio of Omanis to expatriates in the private sector is relatively low (Al-Lamki, 1998).

Based on the Ministry of National Economy (2011) the total manpower in private sector as at the end of January 2011 is around 1,148,477 workers where 84% represent the expatriate and 16% represent Omanis who are only registered with the Public Authority for social Insurance. Therefore, the question that needs to be considered is, why are employers continuing to take on more expatriate than Omanis, even when the government has openly declared a policy of preference towards companies that have Omanisation policies (Hutton, 2003).

In the recent years, all the public companies have achieved the planned targets of Omanisation percentage, in some sectors it exceeds more than the targets. However, the private companies lack in achieving the planned targets in most of the sectors. There are two perspectives on looking at the reasons for the less recruitment of nationals in private sectors; 1.The employee's perspective in selecting their employments in private or public sectors and 2. The private employer's perspective on recruiting the local people. The reasons listed out in the employee's perspective starts with their interest towards a government jobs for their lifelong employment, further educational opportunities, standard wages and benefits, working conditions, working hours and retirement benefits (Al-hamadi, et. al., 2007). The private sector employers are reluctant to recruit the locals since they are less productive, under skilled and unmotivated, limited English fluency, higher rate of absenteeism and increased expenses (Mashood, et al., 2009). In a nutshell, currently Oman is facing challenge to develop competent and effective Omani workforce, with limited dependence on expatriate expertise in some sectors where the Omanisation is not successful.

3.1 Oman's infrastructure growth

In Oman the construction industry is beginning to see returns from the diversification policies instigated under the Vision 2020 plan (Delotte, 2010-2011). Similarly, as

detailed in the 2011-2016 development strategy of Oman, there are two staple elements of escalation, first the emerging tourism sector and second the development of infrastructure.

Equally the UK Trade and Investment Office at British Embassy in Muscat also explained "In the current cycle there are many infrastructure developments such as roads, railways which will follow 2000km of coastline, ports and airports". Apart from this the government is keen to establish two 750MW power plant projects, desalination plants etc. All these projects are awarded to the private companies. This increased the demand for the qualified and skilled infrastructure work force. Due the quota system, the private companies are required to recruit the local workers in order to enjoy the benefits from the government subsidies for achieving Omanization. The idea behind the process is not only creates the employment but also to train them for their future projects, for example in the power plants projects, employing more Omani workers will offer a long-term role during the operation and maintenance phase of these plants in the future (The big project ME, 2011). However, the private sectors are facing difficulty in getting the well qualified, experienced and skilled labours. Though the prevailing condition such as the scarcity of experienced construction Omani labours, the country's construction private sectors are struggling to get fresh qualified and skilled local labours. Though the local labour and the private companies have least preference to select each other for their needs, there are other planning strategy related reasons which prevent the success of the infrastructure sector's localization process.

3.2 The impact of localization on Quantity surveying profession in Oman

QS is an important profession in infrastructure projects. QS profession can be defined as "Services that cover all aspects of procurement, contractual and project cost management". The competent QS personal has a stake on the following activities of any infrastructure projects; construction cost management, value addition throughout the life cycle of the project, budget allocation and control, decisions on the legal and contractual obligations and the success of producing a best value for money to their clients. The RICS (1998) has listed out the necessary competencies of a quantity surveyor as follows; Construction Contract Practice, Construction Technology &Environmental Services, Economics of Construction, Procurement and Financial Management, Arbitration & Other Dispute Resolution Procedure, Development Appraisal, Facilities Management, Insolvency, Insurance, Project Management, Property Investment Funding, Research Methodologies & Techniques, Taxation Allowances & Grants, Valuation,. Measurement, and Law, apart from the other interpersonal skills. However, most local people think that quantity surveyor is one who takes measurement and does pricing (Muscat Daily, 2010), but in reality a quantity surveying firm believes that the role and responsibility of this profession goes much beyond this as listed as above.

Oman has the wealth and vision to allocate the budget for the infrastructure projects, but most of the time that the government realized that they always not getting the value for their money. The expat QS engineers don't realize their role in value management and rarely took a lead role on saving the public money as they are not the nationals. The private infrastructure companies seldom find quality locals for their QS position. There are many reasons for this unavailability of human resources. The problem has roots in many areas however, the awareness about the profession, the motivation towards the profession and, the availability educational institutions to produce the quality human resources play a major role in this issue. This study has taken preliminary steps to

further validate these factors and give recommendations for the improvement. The methodology of the present study is discussed in the next section.

4 Methodology

The study method starts with the literature review on the localization in Middle East region and its related factors. This step helps to understand the big picture of the localization process in this part of the world. This is followed by the study on the status of current Omanisation process through literature review and interview with the respective ministries (random sampling). Then factors which affects the localization of QS profession is obtained through interview (random sampling) with five construction companies. The identified factors are further validated through the questionnaire interview with three targeted groups such as the foundation students, engineering students and the educational institutions. Figure 2 shows the study methodology as the first three steps have been already discussed in the above sections. The following section discusses about the factors affecting the localization of QS profession in detail through interview with the infrastructure industries.

5 The Experiment – Interview and Questionnaire Results and Discussions

The factors affecting the localization in QS profession are identified through interview with the five private construction companies. The interview was focused on the six categorized factors as mentioned in Figure 1. Ten persons have been interviewed and all the persons interviewed were having enough knowledge and background on the profession mainly at the middle and senior management level. The interview data is carefully analysed, the companies common response on addressing the availability of Omani QS applicants are very minimal and most of the time their demand is not been met. The results obtained from the private construction companies interview regarding their implementation of Omanisation policy is presented in figure 3. It is evident from the results that there is a scarcity of the competent local labour force in most of the companies.

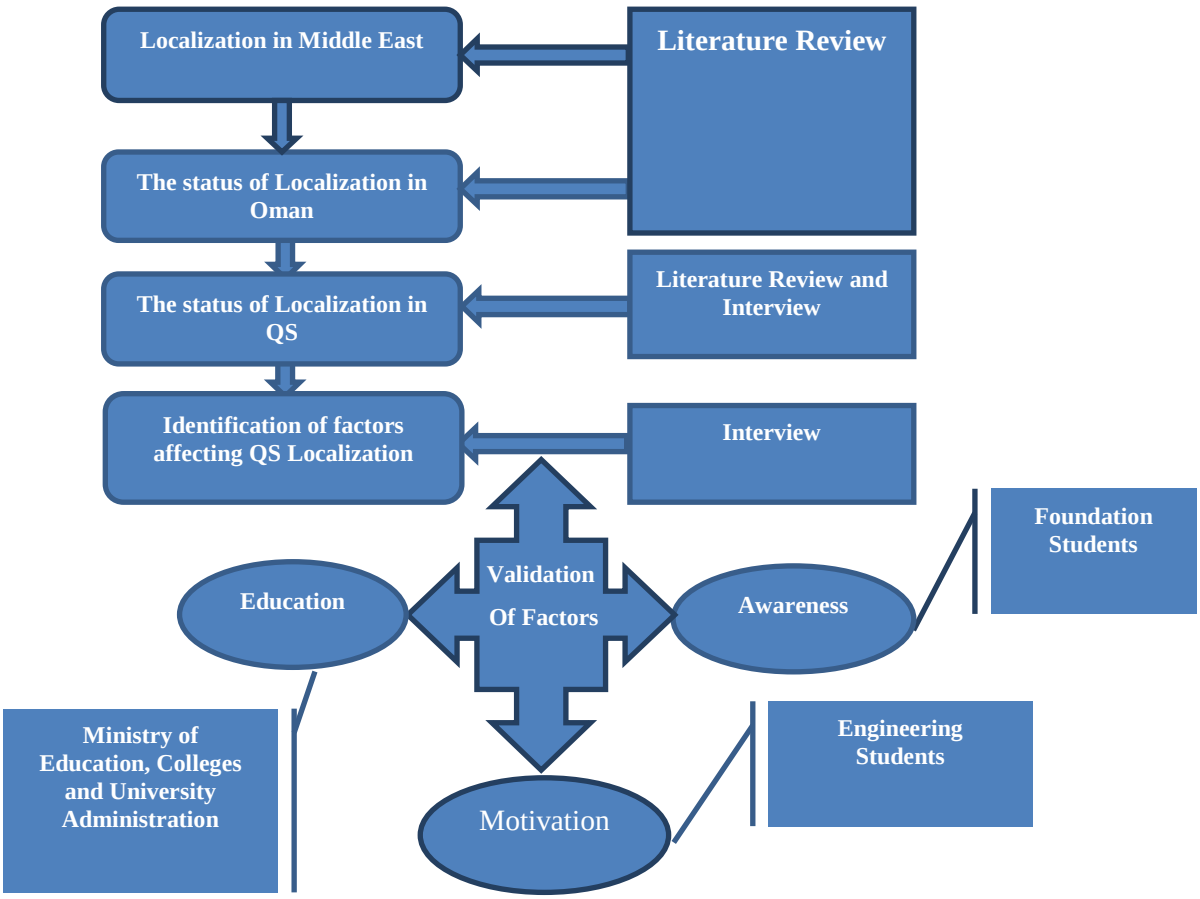

Figure 2. The Study Methodology

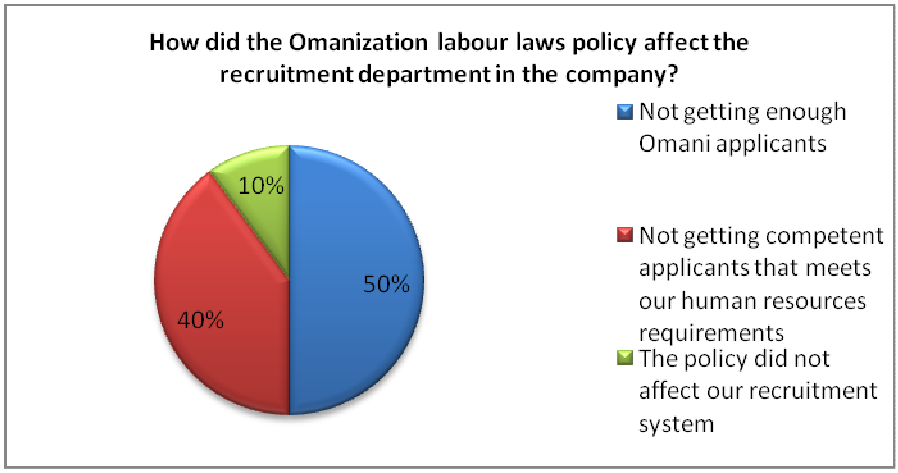

Figure 3. Scarcity of local labour force in construction

At present the construction work force contributes around 43 % of the total expatriate's strength of 985,716 according to Ministry of manpower data. This necessitates the private sector needs around 125,000 local construction workers to meet the government's Omanisation target of approximately 30% in construction sectors. From the interview it is observed that any construction firm requires at least 3% of QS workers in their total workforce in order to manage the QS related activities in their business. It creates the demand of around 3800 qualified QS Omani professionals in total. However, at present this much of their required capacity is not been met. This can be supported with the country's existing educational institutions statistics, the country has 13 higher education institutions (both public and private) among which only 4 institutions offering QS programs among which only one institution offers a 4 year

bachelor degree and others offer 2 yrs. diploma in QS. Further, only 6 institutions offer civil engineering programs. Hence the total QS workforce capacity preparation is not meeting the country's demand. In addition, the private owners says that there are institutions and training organizations which offers the QS programs in diploma and bachelor level degrees, but the motivation of the graduates to become a lower level QS engineer is very minimal. All the local applicants want to secure a managerial position which mainly focuses on the construction management related issues. While addressing about their competences, the theoretical knowledge they acquired during their formal qualification is not meeting the standards at par with the expat workers. Many local QS personals are not aware of the responsibilities and duties of a QS engineer in terms of their project economical management.

From the interview with 10 project managers of various private construction companies of large, medium and small nature, it is concluded that the existing education system of lower capacity, lack of motivation to become a QS personal and the missing awareness about the QS professions are the main reasons to restrict Omanisation process. Since the scarcity of the QS educational capacity building is very much obvious with the data presented in the above paragraph, this has not been taken for further validation process. The facts about the motivation and the awareness factors are further substantiated with the questionnaire survey administered with the foundation students(foundation is the pre degree/ diploma course where the student is prepared ready to take up any of his interested engineering specialisation) and the QS diploma and degree students studying in various technical institutions. The general willingness of the students to take up civil engineering and especially their interest on preparing themselves on site related initial profession is very minimal. 60 questionnaire were circulated to the foundations students (foundation course is a preparatory course before the engineering enrolment) of the various technical institutions reveal that 27 % showed interest to study civil engineering profession which includes all the specialization viz. construction engineering, structural engineering, environmental engineering, Quantity Surveying etc.

Though the selection of civil engineering profession is high, it is not meeting the current demand created by the private construction companies which contributes around 43% requirement of total private workforce in all the sectors. The above results indicates that 27% of students were interested to continue their undergraduate in civil engineering, were 73% of students were interested to study other engineering programs. The minimal interest of students to study civil engineering could be due its site related (non-white collar job) factors. Amongst the 27% students who selected for the civil engineering have been asked about their awareness on QS profession, 37% responded yes, 36% No and 28% replied with I don't know. Further, the students who said that they knew about QS profession were asked the roles and responsibilities of a QS professional. None of the foundations students replied with the other answers except the quantity take off.

Further, 30 students, who are studying the QS course (diploma and degree) has asked question related to the role of QS in construction projects. All the 15 competencies discussed earlier in the paper were introduced to them. Surprisingly many of the competencies were not been identified by the students. This shows their lack of understanding on the subjects and their awareness of their role as a QS professional in future. The following chart in figure 4 depicts the results of the questionnaire. From the survey, it is evident that most of the students studying in QS program can't identify the competencies and their roles in the infrastructure projects. According to their knowledge, the QS profession is meant for Valuation, Measurement, and Project management.

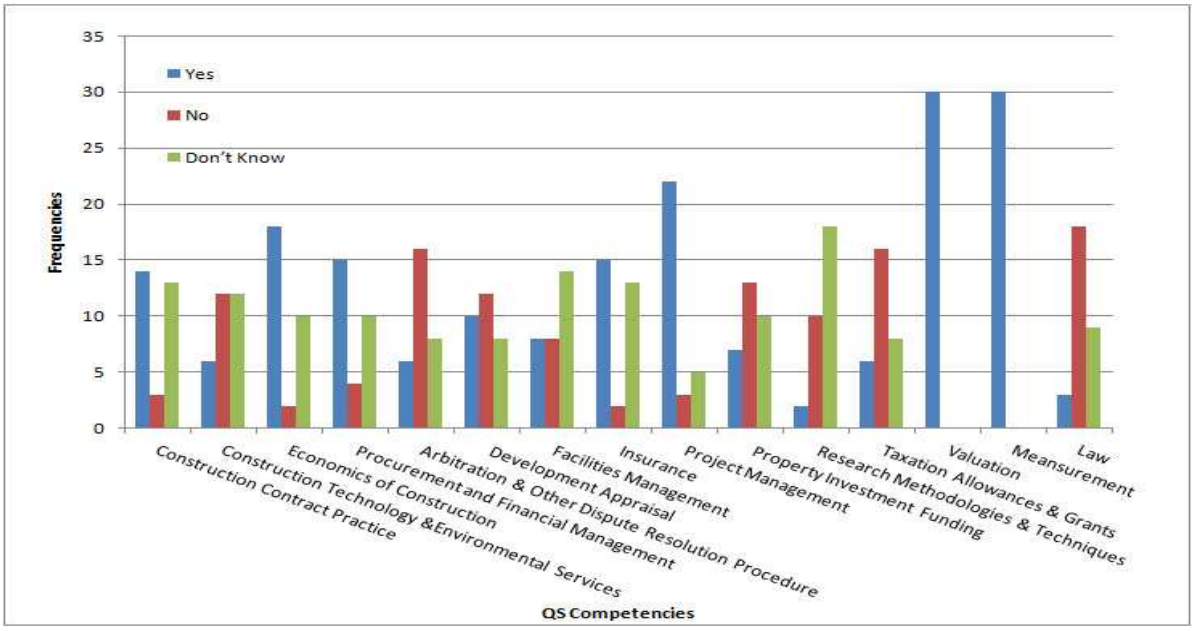

Figure 4 Student's awareness about the role of QS competencies

From the present study, it is evident that the three factors; the availability of educational capacity of QS profession, the awareness about the QS profession and the motivation towards the QS profession are the main obstacles to achieve the localisation process in Oman. Apart from these factors there are typical other factors which exhibits the negative opinion about the private sector's wage, benefits, work culture, job security etc. with the employees and the opinion about the local work force such as lack of motivation, competency, English, absenteeism etc. with the private employers also have stake on this issue. However, proper planning on the educational capacity building based on the country's sector wise labour workforce demand may resolve the problem. There are examples for the success of this solution. For example banking and travel sectors in private companies have almost reached to the full Omanisation targets sometime exceeded the targets. This has been achieved due to the sufficiency in the capacity building together with the awareness and motivation of the local work force (Ministry of Information, 2002). Of course the government's policy rules have a major stake as a driving force, there are other factors which may specific to some sectors which needs to be strategically planned and managed to achieve the self-sufficiency in the localisation process.

6 Conclusion and further research

The political and social and economic conditions of Oman had an effect to its quality educational systems before 1970. The country has developed a lot from its initial renaissance in 1970, the government's economic status have been successful in the initial period with the help of expatriates. However, to sustain the same required self sustainment with the country's own work force in order to ensure the economic status as well as to ensure the employment to the nationals. The major obstacles during the process of localization in Oman were the training and development of nationals to enable them to be competitive against the global work force. The government has taken various efforts to ensure the same through ministry of higher education, ministry of manpower and ministry of economics. A significant amount of budget has been allotted to encourage the training and development of the local workforce. However, the competencies of the locals are inferior when compared to the global work force along with other behavioral aspects.

The realization of the main components of the future development and planning for the localization implementation strategy is much important. Fixing up the target without making the resources ready is the symptomatic cure than the cure for the cause. From the present study, it is evident that the QS profession is lacking in terms of getting qualified locals. The capacity of the available educational resources, the lack of awareness and missing motivations are the main factors which restricting the localization process of this profession. Hence the planning based on the need for the local infrastructure work force is paramount important at this point. Starting educational institutions and increasing the existing intake levels of the educational institutions may in future solve the problem. Many programs can be arranged for creating the awareness about a profession with the school children, the input towards them during their post secondary period has a greater impact on their career selection. The private authorities have to identify future motivational factors such as increase in basic wage levels, facilities etc. in order to motivate the local to select the QS as their profession. Increasing the capacity of the existing educational resources along with creating awareness and motivation about the profession with the locals may solve the problem under study. The current study is a preliminary study hence, limited data have been presented. The future study will be done and will focus on reinforcing the identified factors and necessary strategic planning to the success of localization process in Sultanate of Oman.

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Environmental Law

Improving Environmental Performance through Innovative Commercial Leasing

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Abstract:
The environmental impact of tenanted commercial office buildings can be reduced substantially while at the same time enhancing the productivity and wellbeing of their occupants. Given that relationships between office building owners, occupants and operators are largely defined by leases, it is crucial that the structure and content of those leases facilitate innovation and encourage the most responsible operating practices. Policy measures recently introduced in the UK and Australia provide incentives to improve the environmental performance of office buildings and new ways of easing the financial burden of environmental upgrades. Coupled with market drivers, these are likely to impact on commercial lease practices. However landlord-tenant relationships are still presented as barriers to improving environmental performance. More fundamental changes that align and reward owners and tenants for working together for mutual benefit are required. This paper explores the interplay between the content and structure of commercial leases and the behaviour of building owners, managers, tenants and occupants, illustrated through the experiences of a large Australian-based commercial office building owner/operator. With reference to practical examples it shows how conventional leases stifle innovation and illustrates the difficulties in drafting leases that enable a responsive approach to building management to be adopted. It tentatively presents a number of 'model clauses' for encouraging best environmental practices and concludes with a suite of recommendations.

Keywords:
commercial leases, environmental performance, leasehold innovation, energy efficiency, thermal comfort.

1 Introduction

This paper illustrates some of the opportunities and challenges involved in adapting tenanted commercial space to improve environmental performance and reduce energy consumption. Through a focus on the experience of a large Australian-based commercial office building owner and operator, Investa Property Group, we illustrate the complexities of improving the environmental performance of tenanted space. Given the scale of the impact that commercial property has on the environment, and its contribution to greenhouse gas emissions, it is crucial that a better understanding is

developed of the interplay between the technical possibilities of the building itself, the content and structure of leases, and the behaviour of the various actors involved in letting and using that space (owners, managers, lawyers, landlord and tenant agents, occupiers, and customers). Although in recent years there has been much talk, internationally, around the topic of 'green leasing' there is little evidence as to what is happening in the marketplace, what the process of negotiating green leases is like and the extent to which green leases are able to make a difference. With some rare exceptions, letting practices—in the UK, the USA and Australia—have remained largely untouched by the green agenda and both landlords and tenants are resistant to entering into commitments to work together to improve the environmental performance of the rented space.

A green lease has no fixed form, it is simply one that provides a leasehold structure that will facilitate and support the property being used in an environmentally efficient way. This can relate to any or all of energy use, water management, waste disposal, travel plans and the use of sustainable materials. It can flavour the whole leasehold relationship and include binding environmental performance targets, or can adjust usual provisions to encourage environmentally sensitive behaviour (For further discussion see Bright, 2008). It is clear that 'green transformation' of the letting market is not going to happen easily, but by telling the story of Investa's experience and drawing on other models available, we demonstrate the role leases can play in facilitating innovation within commercial office buildings and encouraging responsible operating practices.

Investa's experience is of value beyond Australia. Although there are detailed differences in the policy and regulatory environments of the major developed nations, and in the content of commercial leases, the essential issues faced are the same in the UK and in the USA. The central challenge is the 'split incentive', referred to extensively in legal and policy literature in each of these nations as a major barrier. The majority of investment grade property in these countries is let on a 'net rent' basis, which means that the tenant pays for the energy costs. As the landlord has responsibility for the building structure and equipment there is little financial incentive for the landlord to improve the energy efficiency of plant and equipment. The disincentive effect is compounded by the fact that the cost of any equipment upgrades will usually fall to the landlord who may be unable to pass the capital costs through the service charge. But there are other common features of leases, which likewise inhibit change; such as the length of leases, the rigidity of leasehold language, and the approach to 'fit out'. The problem is not confined to the wording of the lease itself. It extends beyond this to the whole process of letting – the role that agents play in agreeing 'heads of terms', how the occupied space is managed, and the way that the space is used.

It is unlikely that there will be a standardised response to the challenge as the nature of the issues is so complex, that no template or standard will ever be able to adequately do the job being called on. Rather, innovation is required in the way parties approach negotiations, define their self-interests and deal with each other throughout the lease term and at expiry. These principles can apply to all commercial lease arrangements and, importantly, can be addressed not only at the time of initial let but also through amendments to lease arrangements where a building's environmental performance or services to occupants is falling short of what might be defined as 'best practice'.

2 The lease relationship and its limitations

The relationships between the owners (/landlords), occupiers (/tenants) and operators of tenanted commercial office buildings are largely defined by leases. A typical office building lease protects the interests of the landlord and tenant without expressly dealing with matters of broader community concern, such as greenhouse gas emissions from operating the premises, waste recycling, water use, etc. Despite a growing awareness of the need to reduce environmental impacts from the operation of commercial office buildings—expressed in community concern, emerging rating schemes, tenant requirements, staff expectations, and emerging regulations, including disclosure regulations—the structure and content of commercial leases can impose significant constraints on the ability of buildings to be adjusted/updated.

In addition to the problem of the split incentive outlined above, there is the fact that leases tend to be very rigidly drafted and do not allow flexible responses to new situations. The length of leases means that these problems can persist over considerable time frames. In the UK, although two-thirds of new leases entered into in 2008/09 were for five years or less these short leases were more common on units with lower rental values. For the higher value properties, the proportion of leases less than 5 years in length is notably smaller, at 38 percent, and the proportion of leases longer than 16 years is 9 percent. Tenants who occupy larger units tend to sign longer leases (IPD, 2009). Leases may also contain extension options exercisable upon expiry, and in the UK there may be a statutory right to renew which will make it difficult to change leasehold terms even when the contractual term expires.[1] There is no public data on lease length in Australia but Investa's experience and (slightly dated, and limited) research suggests that the pattern is similar (Crosby, 2006).

The quickening pace of policy, regulatory and technical change in relation to environmental understandings of commercial space means that leases need to allow greater flexibility in order to maximise the opportunities available. The story of the implementation of the CRC Energy Efficiency Scheme (CRC) in the UK provides an illustration of the difficulties of lease language. The CRC is intended to encourage carbon savings within large organisations by requiring those who receive supplies of energy to purchase permits (CRC allowances) to emit the resulting carbon dioxide. Many landlords are required to be participants in the scheme. This increases the cost of supplying energy to tenanted space and, in tune with the idea of the net rent, several landlords intend to pass the cost of CRC participation onto tenants. The difficulty is that leases have not built the language of CRC into the service charge and general outgoings clauses so it is doubtful in many cases as to whether landlords can legitimately pass on the costs. Furthermore, there is a real risk that leases will not be 'future proof'. The property industry invested much time and debate into consideration of how to accommodate CRC into new lease drafting throughout 2009 and 2010, only to find that the new UK Coalition Government moved the goalposts significantly in its Comprehensive Spending Review of Autumn 2010, leaving the details of the scheme in a state of flux for some time thereafter. (For fuller discussion see Bright & Highmore, 2010).

In Australia, leases often set detailed specifications about management issues, often with reference to standards in the Property Council of Australia's Guide to Office Building Quality (PCA, 2006). This level of detail would be highly unusual in the UK.

[1] Landlord and Tenant Act 1954, Part II; *O'May v City of London Real Property Co Ltd* [1983] 2 AC 726 (HL).

In Australia the rigidity of this approach makes innovation difficult. A practical illustration is the standard provision for thermal comfort which provides for a fixed temperature range – this prevents building operators from making adjustments outside of this range even where that may promote greater comfort for the occupiers and be less energy intensive. Investa has been exploring how thermal comfort can be achieved with less energy use, but doing this has often involved breach of lease terms. This experience is explained in section 4 below, but for now the point to draw from this is that it shows how conventional leases stifle innovation.

3 Crucial relationships function outside the lease

'Green' provisions must be built into the expectations of the parties at the start of negotiations. In late 2010, the Northwest Energy Efficiency Alliance (NEEA) moved into a building in Portland, USA, on the basis of a green lease. NEEA explains how important it was to the leasing process that its brokers continually communicated NEEA's environmental goals to the landlord and, indeed, only introduced NEEA to landlords that shared its sustainability vision (NEEA, 2011). In practice, most negotiations are conducted through landlords' and tenants' agents (figure 1) who are focussed primarily on getting a deal done, and if environmental goals are not introduced early on it will be difficult to build them into the lease itself. Research conducted in the UK by Crosby *et al*., shows that the heads of terms agreed have a significant impact on the resulting lease (Crosby, Hughes, & Murdoch, 2005, pp. 167, 172). This has also been the experience of Investa; unless key 'green lease terms' are discussed as part of the initial heads of terms, there is considerable resistance to their inclusion in the resultant lease.

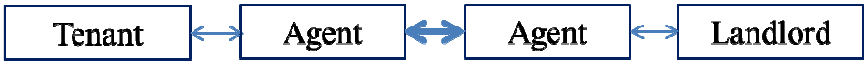

Figure 1: Lease negotiations are largely conducted through intermediaries

Various actors who play important roles in relation to how the space is used are not in fact party to the lease itself (figure 2). Property management is often outsourced to building operators who do not have a direct contractual obligation to the occupants / tenants even though they are crucial to the delivery of services described in leases and have a pivotal role in achieving environmental objectives.

The building manager may in turn subcontract elements of the building's operations (mechanical services maintenance, lift maintenance, cleaning, security, etc.) to specialist providers, or act as agent for the landlord who contracts their services directly. Regardless of the contractual structure, the landlord is unlikely to maintain a close or direct working relationship with the service providers. Even in the case of landlords that internally manage their buildings,[1] the majority of specialist functions will be performed by people who have no direct connection to the lease. Furthermore, employees of the landlord with responsibility for operating a building will not usually have been involved in negotiating a lease and may not even have access to it.

The situation is similar for tenants. Negotiations between landlords and tenants take place at a corporate level, generally before the tenant occupies the demised premises. Individual building occupants may be employed by tenants, but they are not themselves

[1] Investa Property Group operates an internal model. A directly employed 'property supervisor' is based at each building and oversees the work of contract service providers.

tenants. Most occupants have neither access to a copy of the lease, nor awareness of the obligations of landlord or tenant.

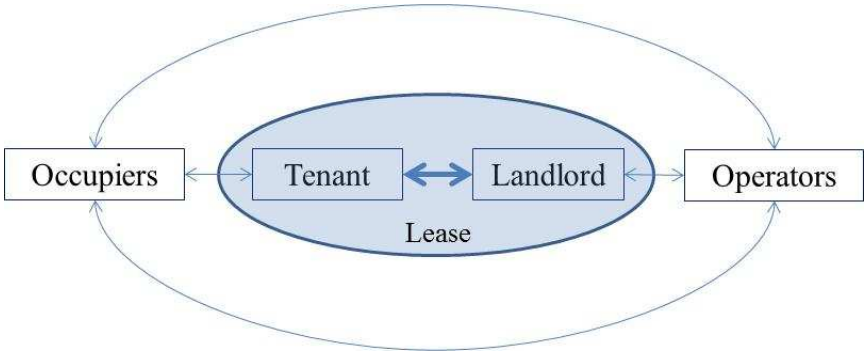

Figure 2: Once signed, the lease is the central relationship, yet it doesn't define or encourage broader engagement

Given that operators and occupiers of commercial office buildings are in most cases not familiar with the contents of leases between landlords and tenants, it begs the question: can commercial office building leases effectively facilitate innovation and encourage responsible operating practices? Put another way, does it matter whether leases prohibit or promote improved environmental performance if the people on the ground do not know what the leases say? This identifies a broader challenge. It is simply not possible to address environmental performance in the commercial built environment without understanding how the various communities using the building engage – with the space, with legal documentation, and practice manuals, and with other owners, occupiers, building managers, customers, employees and so on.

Clearly these questions are fundamental to determining whether leases can provide a basis for improving the environmental performance of commercial buildings.

We believe they can and they should. However it is clear that fundamental changes that align and reward owners and tenants for working together for mutual (and community) benefit are required. It will be necessary for innovative approaches to be adopted within leasing practices that take account of how occupiers behave and what occupiers want out of buildings. Operators need to be free to innovate in the way they run buildings, to be incentivised to do so, and to engage meaningfully with occupants regarding these kinds of issues. Furthermore, the content and structure of agreements between landlords and tenants will need to be understood by this wider group of stakeholders.

4 Some challenges illustrated through practice

The limitations and challenges mentioned above have profound implications for the operation of buildings and the wellbeing of their occupants in practice. Often landlords are compelled to instruct building operators to meet requirements that are not in the best interests of occupants and in doing so they waste energy and resources that could be put to better use. In other situations landlords must sit by as tenants make poor fit out decisions which impact their staff wellbeing and productivity. Some illustrations follow.

4.1 Thermal comfort

Office buildings exist to provide productive workplaces for their occupants. Insofar as it affects productivity, comfort is obviously important; however, there is no absolute standard for human 'thermal comfort'. The internationally-accepted definition states

that "*thermal comfort is that condition of mind which expresses satisfaction with the thermal environment*" (ISO, 1994). Everyday experience of office environments tells us that different people have different perceptions of thermal comfort at different times. Furthermore, those perceptions are impacted by a range of environmental and human variables (Fanger, 1970).

With the increasing prevalence of air conditioning in commercial offices, there has been a trend to codify in leases what constitutes acceptable thermal conditions. In Australia, where air-conditioning is universal, this has led to the prescribing of internal air temperatures of 20-24°C (21.5±1.5°C in winter and 22.5±1.5°C in summer) in typical commercial leases. For reasons yet to be understood, these prescriptions are significantly cooler than the 23-26°C recommended by leading international authorities on the subject (ASHRAE, 2010; ISO, 1994). Furthermore, these specifications take no account of other influences on human thermal comfort such as air velocity and the temperature radiating from windows. This inconsistency between leases and established comfort benchmarks is significant because energy use is directly proportional to the differential between internal and external temperatures (Ward & White, 2007). Also, because people adjust clothing to dress for the weather, so is occupant comfort weather and seasonally dependent (Morgan & de Dear, 2003; Ove Arup & Partners Ltd, 2008).

Landlords in Australia who attempt to provide air temperatures above 24°C during summer run the risk of breaching leases and incurring penalties, even though the conditions are likely to be more comfortable for occupants than those prescribed by the leases. A study by Investa during the Australian summer 2009/10 (where such lease boundaries were pushed on the basis of scientific rather than contractual advice!), found that a 1°C increase in thermostat settings was associated with a 6 percent reduction in daily air conditioning energy use (Roussac, Steinfeld, & de Dear, 2011). Furthermore, an analysis of data recorded via the company's tenant "helpdesk" for a follow up trial (2010/11) found a 16 percent reduction in the frequency of "complaints" related to air conditioning relative to other building issues (Roussac, Steinfeld, & de Dear, Forthcoming). These results demonstrate significant potential for greenhouse gas emission reductions and comfort improvements, if only the leases would not preclude it!

4.2 Fit out churn

Fit outs and refurbishments consume large volumes of resources, much of it associated with "churn". Churn refers to the replacement of building elements throughout the life of a facility. Using Investa's portfolio as a guide (Investa's is the largest portfolio of office buildings in Australia), it is estimated that each year between 10 and 15 percent of commercial office leases expire. At expiry tenants generally have the choice of whether to stay or go. It is common for landlords to offer incentives to stay and these are normally in the form of fit out contributions or cash. While Investa does not keep precise statistics, prior to the global financial crisis they estimated that 75% of expiries led to fit out contributions (to both renewing and new tenants) and the other 25% took cash and retained their fit out. So, from Investa's experience, the annual churn range is probably between 7.5 and 11.5 percent and the average life of a typical office fit out is just over 10 years (Terry & Moore, 2008)[1].

[1] Investa's data for disposal of construction and demolition waste indicates a 56 percent reduction in fit out churn between 2008 and 2010, the period corresponding with the global financial crisis (Investa Property Group. (2011). Sustainability Report 2010 Retrieved 26 May, 2011, from http://www.investa.com.au/sustainability/2010). Tenants were choosing to retain fit out and stay in premises as a means of conserving capital during the economic downturn.

Fixtures, fittings and furniture are replaced even more frequently and have larger impact. Treloar *et al*. estimated that the total life cycle energy consumption of fixtures, fittings and furniture at a churn rate of 5.6 times over 40 years (i.e. a life of just over seven years) was close to, if not more than, the operational energy use for the case study building (Treloar, McCoubrie, Love, & Iyer-Raniga, 1999).

The implications of these figures are significant. It is clear that fit outs are more likely to be replaced because they become unsuitable than because they 'wear out'. In many cases, fit out decisions at the commencement of lease impact negatively on indoor environment quality (IEQ) and occupant wellbeing by reducing the penetration of daylight and limiting the circulation of air, as found in a study by a team working at Cardiff University (CRiBE, 2007, p. 9). Landlords are often powerless to intervene in these decisions. Alterations clauses in leases commonly permit the tenant to install demountable partitioning and carry out non-structural work (subject to the landlord's consent, not to be withheld unreasonably), again without reference to the environmental impact. It has also become standard for leases to require departing tenants to 'make good', i.e. remove all of the tenant's property from the premises and repair or reinstate to a condition which is satisfactory to the landlord. Although this (partially) protects landlords from misconceived fit out decisions it increases waste yet further.

4.3 Excessive demand for building services capacity

A commercial office building's quality is measured according to a range of criteria, including its capacity to provide tenants with services such as mechanical and electrical capacity. A high quality building is therefore generally one which boasts significant capacity to handle tenant loads, in addition to providing prestigious accommodation and views. The Property Council of Australia's Guide to Office Building Quality is an example of a document which classifies office building quality, setting out minimum performance criteria which the market then uses to determine a building's status.

Understandably, perhaps, tenants presented with benchmarks will typically seek performance towards the upper end of the scale in each of the categories for any given amount of rent, perceiving that greater service represents better value. This challenge was expressly acknowledged by the PCA in the 2006 version of its Guide, noting that *"higher, bigger, larger is not necessarily better"* and that excessive demands often lead to negative environmental and financial consequences (p. 7).

5 Significant innovations occurring outside leases

Even without effective green lease arrangements there are numerous factors driving the creation of more environmentally and socially responsible office accommodation, both via new construction and refurbishment. Corporate responsibility has become a significant factor in the decision making of large organisations and this desire to project an image of good corporate citizenship is influencing accommodation choices, particularly among larger institutions (Colliers International, 2010). Likewise, major property owners are competing to demonstrate 'sustainability' leadership credentials to their array of stakeholders, notably tenants, investors and staff. These demand and supply side factors are being brought together by growing evidence that environmental performance is associated with asset 'quality' and is contributing to higher investment returns (IPD, 2011).

Governments too are encouraging this change. The City of Melbourne, for example, now offers building owners the opportunity to recover the cost of financing environmental retrofit works from tenants through a charge linked to the City's rates collection (City of Melbourne, 2011). Likewise, the state of NSW has passed legislation—The NSW Local Government Amendment (Environmental Upgrade Agreements) Act 2010— "to allow local councils to enter into environmental upgrade agreements with owners of buildings and finance providers as a way of funding works to improve the energy, water or environmental efficiency of those buildings."(Office of Environment & Heritage (NSW), 2010). The Green Deal in the Energy Bill currently before the UK Parliament adopts a similar approach.[1] Again, the aim is to make it easier to fund energy efficiency measures with no upfront costs, with costs recovered by a charge on utility bills.

The hope is that landlords will voluntarily make use of these funding opportunities. This may be optimistic. The UK government, in a signal that more forceful measures may be required, has made provision for a review to be undertaken of private rented properties (both domestic and non-domestic) by 1 April 2014 to compare the energy efficiency of rented properties with non-rented,[2] and power to make non-domestic energy efficiency regulations which could compel landlords to upgrade properties prior to letting (but this power can be used only if it will not materially decrease the number of properties available for rent).[3] It is early days for the financing arrangements in Melbourne and NSW; however, there are indications that barriers, particularly in relation to the requirement for tenant consent and the accounting treatment of liabilities, are limiting the schemes' effectiveness: there has been no evidence of take-up to-date.

These various approaches all work to provide either an incentive to improve environmental performance or easier access to capital to fund technical improvements. But none of them address the problem of what you do in the face of leases that prevent technical changes being made, nor do they address behavioural issues. Furthermore, in the majority of cases, owners can only take up the opportunities if the building is currently unlet, or if the leases allow flexibility.

6 The case for broader engagement via the lease

Earlier we suggested that relationships between building operators and occupiers are largely defined by leases, and yet those parties tend to be unfamiliar with the contents of the leases that affect them. This is a problem, of course. The benefit of making changes to the structure and content of leases between landlords and tenants will be limited if changes do not focus on improving communication and collaboration with this broader group of stakeholders. What's needed is a broader and more collaborative approach to the defining of objectives, drafting of agreements and administration of duties. As mentioned above, intermediaries involved in the leasehold negotiations have a crucial role in setting the framework.

A further step is to increase the transparency of building performance. The most eco-efficient commercial office buildings exhibit a combination of excellent design and appropriate technology, together with highly competent and committed operators. Yet a building's eco-efficiency is not readily observable to occupants (who themselves also

[1] Energy Bill [HL] 2010-11.
[2] Energy Bill [HL] 2010-11 cl 39, as at 3 June 2011.
[3] Energy Bill [HL] 2010-11 cl 46, as at 3 June 2011.

have an influence on building performance) and other stakeholders in the way that attributes such as views, location and finishes are. The EU's Energy Performance of Buildings Directive requirements for display certificates and the Australian Government's recently enacted Commercial Building Disclosure legislation are both designed to address this information gap. Both schemes, however, only require annual updates.

Raising awareness about buildings' operational performance was a key motivator behind the development of Investa's 2009 Sustainability Report, the first of its kind to incorporate an interactive data visualisation tool (ref. figure 3) (Investa Property Group, 2010). This 'bare all' approach, which provided insights into detailed monthly performance statistics at an individual building level, was expected to be popular with those staff associated with well performing buildings and less so with those operating the others[1]. Feedback from Investa employees was somewhat surprising. In response to the question: "What do you think the consequences of publicly disclosing detailed building-level performance statistics will be for the future performance of Investa-operated buildings," 70 percent (N=52) from a sample of 74 staff (representing approximately 1/3 of Investa's workforce) surveyed upon their first exposure to the online data visualisation prototype rated them as either "very good" or "extremely good." Interestingly, the proportion was higher among those working directly within buildings at the 'property supervisor' level (9 of 12). 55 percent of staff (N=41) rated the public disclosure of detailed building-level performance statistics as being "very good" or "extremely good" for them "personally and/or professionally". Unsurprisingly, property supervisors working on buildings that had demonstrated significant eco-efficiency improvements were found to respond most favourably to that question, whereas those from poorer buildings were more cautious; though all were more than "slightly positive."

[1] Investa wanted to respond to feedback that previously reported aggregated portfolio performance data was of limited use for independent analysis because it masked much of the detail. Concerns about poorer performing buildings being perceived negatively were offset by the fact that most buildings would present well and that the publication of such data would be an 'industry first'.

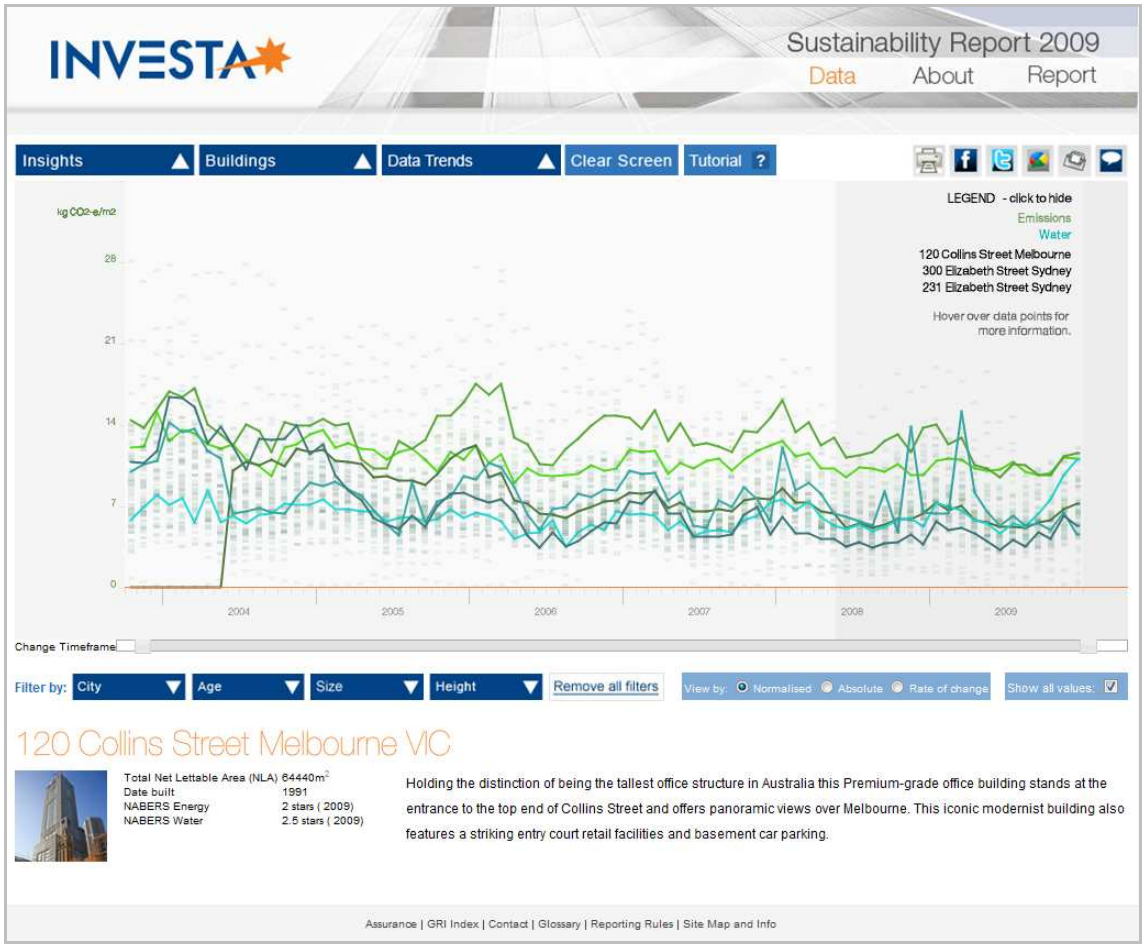

Figure 3. Snapshot of the Investa 2009 Sustainability Report's interactive data visualisation tool showing monthly data trends.

(Source: Investa Property Group, 2010)

Lease obligations that require building operators to disclose detailed performance data in a form where 'good/bad' performance can be easily distinguished by building occupants may therefore be welcomed or resisted, depending on the performance leading up to disclosure. It is widely accepted that people are most productive in an organisational setting when they combine high levels of competence and commitment, where commitment is defined as a combination of an individual's motivation and confidence on a goal or task (Hersey, Blanchard, & Johnson, 2001). Clearly the existence of an 'audience' can help to increase competence and commitment levels and drive better building performance. On the flip side, it has been found that "if either motivation or confidence is considered low or lacking, commitment as a whole will be low" (Hersey, et al., 2001).

Disclosure of poor operational performance without adequate support from a landlord willing to invest in the systems, training and tools to help building operators address that performance may therefore be counter-productive. Furthermore, to a poorly informed audience, more information is unlikely to deliver greater understanding or better behaviour (Janda, 2011). For these reasons it is crucial that initiatives be implemented as a suite that combines education with useful information, technology and a forum that facilitates working together.

7 A suite of examples for how we might do better

This section suggests a variety of ways the structure and content of leases can be improved to encourage better alignment between the stakeholders that influence the environmental performance of commercial office premises.

7.1 Green lease schedule

It is possible to promote environmental performance in a flexible way by agreeing a 'Green Lease Schedule' which can be attached to a standard lease. This can be comprehensive, or sketchy, depending on how much detail the parties wish to put in. Likewise, it can be aspirational (setting non-binding goals) or more prescriptive (setting binding goals and the consequences of breach).

An example of this approach is the Investa precedent lease, extracts from which follow:

16.1 Green Lease Schedule

(a) The Landlord and the Tenant agree that:

(i) the objectives outlined in the Green Lease Schedule are established to positively contribute to the working environment of the occupants of the Building and promote the efficient use of resources in the Building's operation;

(ii) they will each use reasonable endeavours to meet the objectives outlined in the Green Lease Schedule and to use the Premises and operate the Building in the spirit of progressively improving environmental performance as measured against the objectives outlined in the Green Lease Schedule;

(iii) they will consult with each other on issues or circumstances that may enhance environmental performance and will consider undertaking all such opportunities which are expected to have a positive impact on the work environment subject to an analysis of the costs and benefits;

(iv) they will constructively consult with each other on issues or circumstances that may detract from attaining the objectives outlined in the Green Lease Schedule;

(Investa Property Group, 2009)

The landlord commits to annual measurements, and the tenant to providing the landlord with information necessary to enable environmental reporting. The commitments are not binding and breach will not constitute a breach of the lease. Future landlords are not required to adopt the Green Lease Schedule. The problem of fit out churn discussed earlier is reduced by a tenant promise to incorporate energy, water and indoor environmental quality performance criteria into fit out design and equipment selection.

The Green Lease schedule referred to in the Investa lease is a 12 page document containing checklists used to indicate the landlord's and tenant's wide-ranging 'green lease' commitments (Investa Property Group, 2007b). Each of the checklists is reproduced from the Green Lease Guide, a publication developed by Investa in collaboration with the cities of Melbourne and Sydney and the NSW Government to educate the parties about the benefits and costs of various commitments. The Guide is used in conjunction with the lease and schedule and summarises the impact of each

commitment in terms of: financial cost, employee wellbeing, and corporate reputation (Investa Property Group, 2007a). The schedule is attached to every Investa lease.

7.2 Building management plans and committees

The green lease schedule discussed above differs from the Green Lease Schedule developed by the Australian Government under its Energy Efficiency in Government Operations (EEGO) policy. That policy requires, for the majority of office leases the Australian government enters into, a formal commitment to energy efficiency, including an agreement between landlords and tenants to commit to a minimum ongoing operational building energy performance standard, measured by the National Australian Built Environment Rating Scheme (NABERS). The schedule sets out the requirement for the creation of a Building Management Committee (BMC) and how it functions, including the Energy Management Plan the committee is required to develop, how building performance is to be monitored and periodical reporting on the outcomes (Australian Government, 2010).

A key advantage of this approach is the formalisation of the ongoing role of the BMC in developing, monitoring and implementing the EMP. Participants need the necessary skills to "meet the landlord or tenant's needs and obligations", however "they will not need to be accredited building or energy experts or hold specialist qualifications" (Australian Government, 2010).

Under the EEGO model, the BMC must include the landlord's and tenant's 'energy representatives' (Australian Government Solicitor, 2011, p. 21). There is no requirement that the committee include other stakeholders (although they are not excluded). We understand the BMC is a feature of the schedules used for larger tenancies where the government tenant has greater bargaining power (p. 20), however, we have not found evidence that government tenants are widely using the policy to drive "effective operational management" (Australian Government, 2010).

In the UK, there are few publicised examples of green lease provisions in use. The Better Buildings Partnership (BBP, a collaboration of London's leading commercial property owners and allied organisations) produced a 'green lease toolkit' during 2009, but there is little evidence as to what impact it is having. This toolkit also promotes the use of a BMC which is tasked, *inter alia*, to set up and review an environmental management plan for the building, including specific targets (Better Buildings Partnership, 2009, pp. 9, 13, 14, 20, 21).

7.3 Green Improvements

Under a 'net lease' the 'split incentive' means that the landlord has limited financial incentive to install eco-efficient plant and machinery because the cost of servicing the building is borne by its tenants. A survey conducted as part of the New York City Office of Long-Term Planning and Sustainability (OLTPS) PlaNYC initiative found that 60 percent of NYC building owners believed the split incentive was an impediment to their investing in retrofits (PlaNYC, 2011). Approaches that overcome this "significant disconnect between those owning/managing buildings and those paying the energy bills" (All Party Urban Development Group, 2008, p. 25) may be crucial, therefore, in improving the environmental performance of buildings leased on a net basis.

In light of this challenge, Investa amended its precedent lease to permit the recovery of costs associated with capital works directly benefitting the tenants through a special amortisation charge applied to the rent. The concern that the landlord will be able to upgrade its buildings at the tenant's cost (expressed by tenants during the consultation process) is addressed by limiting the application to projects that will reduce outgoings costs to tenants and also reduce the environmental impact of running the property (i.e. energy and water saving projects, and some projects to enhance IEQ). The tenant's outgoings costs are not permitted to increase (due to the improvements charge) above the amortised cost of the project without written approval from the tenant. Subject to the improvement not causing an increase in the tenant's outgoings, the landlord can carry out a green improvement after a consultation period. The tenant must then allow the landlord to do 'all things reasonably required' to this end, even if 'quiet enjoyment' or access to the premises is affected.

Similar approaches have been adopted under the models recently legislated by the Victorian and NSW governments, and also for the model lease language in the PlaNYC "Energy Aligned Lease'. Under the PlaNYC model, a building owner's capital expense pass-through is limited to 80 percent of the predicted savings in any given year. This provides the tenant with a cushion to protect against underperformance and the owner still receives the full reimbursement, however, the payback (recovery) period is extended by 25 percent (PlaNYC, 2011).

Investa's experience negotiating these clauses has been mildly positive, with the provisions making it through the negotiating phase on approximately 50 percent of occasions since they started being introduced in 2009. A large proportion of tenants has been willing to accept the fact that there may be free-riders in buildings where not all tenants have signed up to the new green improvements clauses, noting that their expense is always in proportion to their benefit. In some instances, however, particularly where government tenants are involved, tenants have expressed the view that the capital reimbursement provision is not justified because the landlord has the benefit of the asset improvement and a greater likelihood of retaining tenants at lease expiry. The (landlord's) counter to this argument is that it is invariably cheaper and more effective to conserve capital and offer a substantial tenant incentive payment instead.

7.4 Sustainability incentive (lighting controls)

As mentioned in the earlier section on fit out churn, it is common practice for landlords to offer financial incentives to new and renewing tenants. Depending on the level of demand, this may amount to 20-30 percent of the total rent payable over the term of the lease. Tenants are generally free to use the incentive at their discretion; however, it generally offsets the rent or contributes to the cost of fitting out the premises. Although conventions vary from market to market, it is usual in Australia for the landlord to provide floor and ceiling finishes, air conditioning and fluorescent lights as base provisions and the tenant fits out from there (often removing part of these components and reinstating at expiry). It is a tenant's decision whether or not lighting controls that automatically switch off lights based on occupancy should be installed.

In 2005 Investa introduced an initiative called the Investa Greenhouse Guarantee (Investa Property Group, 2005) designed to give tenants access to quality office lighting systems and expertise, with guaranteed environmental and investment benefits. While some tenants were motivated to take up the offer, it was found that many simply lacked the time and inclination to invest in lighting controls even though they would, in typical

cases, deliver guaranteed returns on investment of 30 percent and better. In response to this inertia, the company decided to introduce a 'sustainability incentive' that can only be used to pay for lighting controls. An arrangement was agreed with the partner company delivering the Greenhouse Guarantee to provide the controls for a fixed rate per square metre equivalent to the incentive being offered. The controls specification and all associated details are described in a schedule to the lease. Under this arrangement, where tenants must introduce automatic lighting controls if they are to receive the incentive, take-up is now in the order of 70 percent.

7.5 Re-work counter-productive clauses

Many clauses designed to protect the parties' interests have unfortunate side-effects. Examples discussed throughout this paper include 'make good' requirements that oblige tenants to return premises to the state that existed prior to their fit out, even when this might involve stripping out still valuable materials, alterations clauses that pay no attention to environmental impact, and temperature control bands that take no account of the weather outside or occupants' clothing choices. These things can be changed by amending standard lease clauses to take account of environmental impact. So, for example, the NEEA green lease specifies that all tenant improvement work must be performed in accordance with sustainability practices and maintain LEED certification for Commercial Interiors certification (LEED, or Leadership in Energy and Environmental Design, is an internationally recognised green building certification system, developed by the US Green Building Council) (NEEA, 2011). Likewise, a model clause in the BBP green lease toolkit provides that if proposed tenant alterations adversely impact on energy and water efficiency the tenant 'will consider, [and, where reasonable, implement],' the landlord's suggestions to minimise this impact (Refer to BBP toolkit, p. 23). The cautious approach advocated by BBP reflects the commercial challenge in agreeing changes to standard leasing practices.

Investa's lease, as well as emphasising the role of the schedule and the broader collaboration that entails, also seeks to eliminate some of the more problematic 'industry standard' clauses.

For rent reviews, the independent valuer must be instructed to take into account the sustainability incentive and the green improvement payments to avoid any erosion of the value of these when making a determination.

The landlord may require the tenant to *not* remove improvements to the premises made by the tenant that, in the landlord's opinion (acting reasonably), improve the environmental performance of the premises. There is a similar provision in the BBP green lease toolkit (Refer to BBP toolkit, pp. 23, 24).

Some of these anomalies can alternatively be addressed by negotiating a green lease schedule. However if the schedule is not binding, as is the case with the Investa example provided above, this may leave an unsatisfactory degree of uncertainty. This was the motivation for the Northwest Energy Efficiency Alliance when it recently negotiated the inclusion of a variety of green aspects into the lease itself for its new premises in Portland's Commonwealth Building (NEEA, 2011). The advantage, as described by NEEA, is that "if the building sells, the next owner will be required to stick to their predecessor's commitments" (p. 6).

8 Concluding remarks

'Green leasing' has become the catchphrase to represent new approaches to leases that aim to promote improved environmental performance. Although we also use this language, it carries the risk of becoming stereotyped. In sum, what we argue for is an approach to leasing and managing let space that enables and encourages innovation, co-operation and collaboration. This involves not simply a re-examination of the structure and content of the lease itself but also the relationships between the landlord and tenant, building operators and users of the space so that practices take account of how occupiers behave and what occupiers want out of buildings. Operators will need to be free to innovate in the way they run buildings, to be incentivised to do so, and to engage meaningfully with occupants regarding these kinds of issues. Furthermore, the content and structure of agreements between landlords and tenants will need to be understood by this wider group of stakeholders. The following recommendations suggest ways of encouraging innovative leasing that put environmental concerns at the core of the relationship:

1. Start the discussions early in the negotiating process, make sure that agents understand the environmental goals, but don't leave it only in the hands of agents.

2. Express clearly what constitutes good environmental design and performance (e.g. in green lease schedules).

3. Consider whether to use language that gives enforceability and will also bind future owners.

4. Commit to transparency and accountability for performance that goes beyond regulatory requirements.

5. Develop processes, such as a BMC, noticeboards, etc., that enable all stakeholders to be actively involved in the pursuit of, and commitment to, environmental goals for the duration of the lease.

6. If it is a net rent lease, use clauses that enable environmental improvements to be made in a way that overcomes the problem of the split incentive.

7. Review standard lease terms to consider their potential impact on environmental performance (particularly the alterations, making good, and rent review clauses).

8. Consider how control and responsibility are aligned within the lease, as in the lighting controls example considered above.

9. Build in adaptability for changes in technology, occupant expectations and legislation.

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Public Participation and Environmental Impact Assessment

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Abstract:
With the adoption of the Aarhus Convention, the question of whether there is a need for public participation in environmental decision-making has replaced the question of possible ways of public participation and a manner of achieving maximum effects from public participation. One of the procedures where the public is a participant in the decision-making is the environmental impact assessment. This paper analyzes the types of public participation in environmental decision-making, the benefits that could be achieved by means of public participation in decision-making in the environmental impact assessment, as well as preconditions for adequate public participation in environmental impact assessment. The paper also explores the development process of impact assessment of environmental legislation in Serbia and the transformation of the public's right to participate in environmental impact assessment. The review is provided on the relevant case law of Serbia, and the Comparative and Case Law are pointed to.

Keywords:
Environmental Impact Assessment, environmental values, Serbian environmental law, public participation

1 Introduction

The concept of the need for public participation in environmental decision-making is found in the Stockholm Declaration on the Environment. As stated in the first Principle of this Declaration: „Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating apartheid, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated”.[1] The importance of public participation in environmental decision-making is also highlighted in Principle 10 of Rio Declaration: „Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information

[1] *Declaration of the United Nations Conference on the Human Environment*, June 16, 1972.

widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided."[1] The basic principles of public participation in environmental decision-making were established by Aarhus Convention.[2] From the moment of Aarhus Convention's adoption, the key question was no longer whether there is a need for public participation in environmental decision-making, but how to achieve optimal public participation in environmental decision-making. The paper analyzes the types of public participation in the environmental impact assessment, requirements to be met for the best results of public participation and effects achieved by involving the public in the environmental impact assessment. This paper presents the current solutions and reviews the development of environmental impact assessment in Serbian legislation. In addition, the paper points to the European Court of Justice.

2 Literature Review

The public is a necessary participant in the process of making environmental decisions in a formal and material sense. In a formal sense, the public, as an entity environmental decisions relate to, should be entitled to participate in making these decisions (Holder and Lee, 2007; Dryzek, 1997; Steele, 2001; Kelman, 1997; Fisher, 2010). In a material sense, the public is an essential participant in the process of making environmental decisions, because it contributes to the quality of decision-making in environmental matters (Holder and Lee, 2007; Bell and McGillivray, 2008; Nadal, 2008).

Environmental impact assessment is a unique procedure in which a decision is made on initiating projects which, based on estimates and taking into account all the information about the possible effects on the environment, could have an impact on the environment (Holder, 2004; Bina, 2007). As there are different forms of public participation in environmental decision-making, the paper discusses the forms that are unique to the process of environmental impact assessment (Morriss and Therivel, 2009). In addition, it is pointed to specific objectives necessary to achieve public participation in environmental impact assessment (Lee and Abbot, 2003), as well as prerequisites for adequate public participation (Bell and McGillivray, 2008; Kysar and Salzman, 2003; Felleman, 1997).

The paper points to the current statutory provisions of public participation in the environmental impact assessment in Serbia and the degree of compliance of Serbian legislation with the Aarhus Convention after the adoption of the Law on Ratification of the Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, May 2009. (Drenovak Ivanovic, 2011a). In addition, paper provides a review of the development of a legal framework governing the procedures for environmental impact assessment and indicates the change in attitude towards public participation (Todic and Durac, 2003a).

3 Types of Public Participation

„Recent decades have seen the emergence of a very widespread consensus that „public participation" is a crutial element of good and democratically legitimate environmental decision-making. Consensus around public participation can be seen at every level,

[1] *Rio Declaration on Environment and Development*, Rio de Janeiro, June 3-14, 1992.

[2] *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters*, Aarhus, Denmark, June 25, 1998.

international, regional, national and local." (Holder and Lee, 2007, pp. 85; Rosener, 1997). In this sense, the key question of modern environmental law is not the existence of need for public participation in environmental decision-making, but the analysis of procedures and ways in which the public can take part in the protection of basic environmental values and assumptions to be met in order to give maximum public participation results (Schrader-Frechette, 1985; Fiorino, 1989).

The notion of public participation in environmental decision-making can be defined in a broad and narrow sense. In a broad sense, public participates in environmental decision-making with every activity that aims at influening the practice of the legislative and executive powers regarding the protection of essential environmental values. Public participation understood in such a manner is present when the public elects representatives of legislative power in parliamentary elections, who will legislate in the field of environmental protection and influence the formulation of environmental policy (Bell and McGillivray 2008). In a narrow sense, public participates in environmental decision-making only when there is a possibility, stipulated by law, of its participation in the decision-making policy, plan or strategy in the field of environmental protection or in the procedures of issuing certain permits that are accompanied by environmental impact assessment.

The basic criterion for distinguishing forms of public participation in the narrow sense may be the moment of making public participation in environmental decision-making possible. We distinguish between cases in which the public has the opportunity to participate as early as when policies, programs and strategies of environmental protection are formulated, and those in which the public can only participate in the final stage of making concrete decisions. In the first case, it is a deliberative participation, which includes public participation in the process of achieving agreement on the grounds of environmental protection (Steele 2001). The public, in this case, is an indispensable party in formulation of environmental policy and has the ability to participate in the formulation of the general environmental policies and strategies that are later applied to environmental protection in a particular case. However, if the public has no opportunity to participate at the early stages of environmental decision-making, but only at the stage where decisions have already been formulated, and the public is given the opportunity to express an opinion on specific decisions, it is a stakeholder participation (Bell and McGillivray, 2008). This form of public participation sees the public as an important factor in achieving the protection of environmental values. However, the public, in this sense, is the party with no role in determining the extent and direction of environmental protection, but the one which, by expressing an opinion on already formulated decisions, contributes to their better quality. An example of this form of public participation is found in the procedures of issuing permits that are accompanied by the environmental impacts assessment, such as permit to use the land, or building and occupancy permits.

The distinction has not only theoretical, but also a practical value. If the model of deliberative participation is accepted and obligation of public authorities to provide the possibility of participation in the formulation of plans, programs and strategies of environmental protection is established, then the public has the ability to protect the right of participating in making these documents. Otherwise, the public can, as an expression of desire to achieve best practice or by informing the public about the activities in the field of environmental protection, invite the public to express their opinion. However, public opinion has no binding force (Arnstein, 1996). Administrative authority may consider an opinion disclosed in such a manner when making plans,

programs or strategies for environmental protection, but is not obliged to. In addition, the administrative authority is not obliged to explain the reasons why public opinion was not taken into account.

Since the public is largely engaged in the process of environmental impact assessment and since the public is guaranteed not only the right to participate in environmental decision-making, but also to the legal protection of this procedural right in the environmental impact assessment, there will be a discussion on public participation in the procedure of environmental impact assessment further on.

4 The Index of Environmental Impact Asessment Procedure

4.1 The Term of Environmental Impact Assessment

In terms of the Convention on Environmental Impact Assessment[1] in a transboundary context, environmental impact assessment represents the assessment of the impact that planned activities may have on the environment, particularly considering alternatives to the proposed activities and measures which, in the case of project approval, are necessary to be applied in order to accomplish comprehensive environmental protection (Lawrence, 1997). Environmental impact assessment may also be defined as a unique procedure in which a decision is made on innitiating projects which can have an impact on the environment, based on estimates and taking into account all the information about the possible effects on the environment (Morriss and Therivel, 2009). It is a procedure that expresses the need to identify and predict the impact of certain legislative proposals, policies, programs and projects on the environment and human health, and to interpret environmental information that are relevant in a particular case (Munn, 1979). If the environmental impact assessment is compared with other instruments of environmental protection, we may see that the dominant feature of impact assessment is prevention.

Environmental impact assessment is applied to projects which could have an impact on the environment and which are in a planning or construction phase, as well as those related to technological change, reconstruction and capacity expansion, termination of work and removal of projects. In addition, the subject of environmental impact assessment are projects that are not approved for construction, or are used without the use permit, and which have been realized without the implementation process of environmental impact assessment.[2]

The procedure of environmental impact assessment in Serbian legislation is carried out in two or three phases. The first phase is deciding on the need to assess the environmental impact. This phase does not apply to projects for which impact assessment is required. The second phase is determining the extent and implications of environmental impact assessment study. This phase applies to projects with demand for environmental impact assessment at the previous phase, as well as to those projects for which the impact assessment is required. The third phase means deciding on the approval of the environmental impact assessment project study.

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[1] *Espoo Convention on Environmental Impact Assessment in a Transboundary Context*, Finland, February 25, 1991, Article 1 paragraph 1 item 6.

[2] *Law on Amendments to Law on Assessment of Environmental Impact*, „Official Gazette of the Republic of Serbia", no. 36/09, Article 2.

If the project in question is the one that requires environmental impact assessment or the one with the identified need for impact assessment, the applicant can not begin with its execution without the consent of the competent authority on the environmental impact assessment study. It further means that these projects can not be accessed without a prior procedure of environmental impact assessment and adequate public participation in making the study. In this sense, the environmental impact assessment represents the realization of idea of participatory democracy in environmental decision-making, i.e. ideas of the necessity of consultation and public participation in decision-making in cases of possibilities for certain projects, plans, legislative proposals and measures to have an impact on the environment (Holder and Lee, 2007).

Procedure of environmental impact assessment encompasses the right to access environmental information in a broad sense, as part of the right to access public information, the right to access environmental information in the narrow sense, as a right to access those environmental information that are related to the particular stage of the environmental impact assessment procedure, the public's right to participate in decision-making on the environmental impact assessment, and the right to legal protection of access to environmental information in the narrow and broad sense, or, in other words, the protection of the public's right to participate in the stages of environmental impact assessment (Drenovak Ivanovic, 2011b). An illustrative example that indicates the necessary connection of these elements is the case of the European Court of Justice *Djurgarden-Lilla Vartans Miljoskyddsforening*.[1] The Court, among other things, expressed the following opinion: „Thus, the fact relied on by the Kingdom of Sweden, that the national rules offer extensive opportunities to participate at an early stage in the procedure in drawing up the decision relating to a project is no justification for the fact that judicial remedies against the decision adopted at the end of that procedure are available only under very restrictive conditions.“[2] (Ryall, 2010).

4.2 Environmental Impact Assessment in Serbia

Procedure of environmental impact assessment in Serbia is applied according to the Law on Environmental Impact Assessment. Facilities, or activities that are subject to environmental impact assessment are determined by the List of projects under EU Directive 85/337/EEC as amended by the 97/11/EC.

The legal framework of implementation of environmental impact assessment in Serbia are: Law on Environmental Impact Assessment (Official Gazette of the Republic of Serbia, no. 135/04 and 36/09), Law on Strategic Environmental Impact Assessment (Official Gazette of the Republic of Serbia, no. 88/10), Decree on the List of projects for which EIA is mandatory and Lists of projects that may require environmental impact assessment (Official Gazette of the Republic of Serbia, no. 114/08), Regulation on the contents of requests for deciding on the need for impact studies and content requirements for determining the scope and content of the environmental impact assessment study (Official Gazette of the Republic of Serbia, no. 69/05), Regulations on the contents of the environmental impact assessment study (Official Gazette of the Republic of Serbia, no. 69/05), Regulations on the content, appearance and manner of keeping public records on executed actions and decisions of the environmental impact assessment (Official Gazette of the Republic of Serbia, no. 69/05), Regulations on the work of the technical committee for the environmental impact assessment study

[1] *Djurgarden-Lilla Vartans Miljoskyddsforening* (2009) EUECJ C-263/08

[2] *Djurgarden-Lilla Vartans Miljoskyddsforening* (2009) EUECJ C-263/08, Para. 49.

evaluation (Official Gazette of the Republic of Serbia, no. 69/05), Regulations on public release, presentation and public discussion of the environmental impact assessment (Official Gazette of the Republic of Serbia, no. 69/05). The legal framework governing the rights of public participation in decision-making in environmental matters in Serbia complies with the Aarhus Convention (Article 6-8). Aarhus Convention has become a part of Serbian legal system by adopting the Law on Ratification of the Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters in May, 2009. [1]

The adoption of the Environmental Impact Assessment Law and the Law on Environmental Protection in 2004 made significant progress towards the promotion of public participation in the environmental impact assessment. Previous legislation did not recognize the public's right to participate in decision-making in the process of environmental impact assessment. Under article 16 of the Law on Environmental Protection of the Republic of Serbia (Official Gazette of the Republic of Serbia Nos. 66/91, 83/92, 53/93, 67/93, 48/94, 44/95 and 53/95), an analysis of the environmental impact had to be made with respect to all facilities and works that may put the environment at serious risk. This analysis had to be approved by the ministry in charge of environmental affairs and such an approval forms part of the urban planning and technical documentation. The law did not provide for public participation in the decision-making process. In practice, the absence of legally established opportunity for the public to participate in the environmental impact assessment has led to serious difficulties. An illustrative example is the case from 1998 where plaintiffs appealed against the approval of an environmental assessment, seeking review of wrongly established facts in the first detailed analysis, including area of land involved, the level of dust in the air and on the ground, noise produced by the quarry, and the safety of citizens around the quarry. In this case, “there was no public participation in the development of the detailed analysis. Regulations of the Federal Republic of Yugoslavia and of the Republic of Serbia did not address public participation in decision-making regarding the preparation of environmental assessments. Consequently, there was no basis for the local residents to claim that their participation rights had been violated. The only opportunity for residents to challenge the conclusions, therefore, was to appeal against the decision approving the detailed analysis on the basis of legal insufficiency.” (Todic and Durac, 2003a, pp. 190)

In the existing legislation in Serbia, public's right to participate in environmental impact assessment is standardized. After the competent authority has notified the public of application filed for environmental impact assessment and the application filed for determining the scope and content of the environmental impact assessment study, interested agencies, organizations and the public can submit their opinion within 10 days. It is a possibility for the public concerned to take part in the first phase (or in the second phase in the event of required environmental impact assessment), i.e. before making decisions on approval of a study on the environmental impact assessment when interested public can give an opinion about the need to perform impact assessment, and on the scope and content of the study. In addition, the public concerned has a right to participate in decision-making in the second phase of environmental impact assessment. This means that the public has a right to be informed on filed application for determining the scope and content of a study, within 10 days of receipt of the

[1] *Law on Ratification of the Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters,* “Official Gazette of the Republic of Serbia”, no. 38/09.

application to determine the scope and content, and the public concerned has the opportunity to express an opinion on the application within a specified period of time. In order to prepare for a public hearing on the environmental impact assessment study, the competent authority is obliged to inform the project sponsor, interested bodies and organizations and the public about the place and time of public access, public presentation and public discussion on the impact assessment study within 7 days of receipt of the application for approval of impact assessment study. In order for the public to prepare in the best possible way for a public hearing, it is normalized by Environmental Impact Assessment Law that a public hearing may be held at earliest 20 days from the date of notifying the public.[1]

4.3 What is the Purpose of the Environmental Impact Assessment Procedure?

Involving the public in environmental impact assessment leads to an adequate and effective protection of the right to a healthy environment and to establishing a balance between the needs of present and future generations in distinguishing between environmental goods and environmental "evils." The question that arises is whether the goal of environmental impact assessment is the decision making, which is a product of compromise of administrative bodies, industry and the public, in a particular case, as a participant in the process, or the goal is absolute protection of the environment which includes compliance of proposed activities with the development policy? Study on the environmental assessment is a document in which the analysis and professional assessment of environmental factors' quality are presented, as well as their sensitivity to the area of planned activity, for which the environmental impact assessment procedure is carried out. The study analyzes the interplay of existing and planned activities. In addition, the study contains an element that refers to the prediction of direct and indirect harmful effects of specific project on environmental factors. This element brings the environmental impact assessment closer, as well as the process of formulating environmental policy. The answer to the question what is the difference between these two procedures depends on the answer to the question what is the objective of environmental impact assessment.

The environmental impact assessment is the preventive measure of environmental protection during which all data, necessary for determining the potential adverse impact of a specific project on the environment, are collected. If potential harmful effects are determined, it is necessary to compare the proposed activity with alternative measures. If the proposed activity is the best solution in a particular case, measures are established and proposed in the process of environmental impact assessment, by which, in a particular case, adverse effects can be prevented, reduced or eliminated. This means that the impact assessment procedure considers both positive and negative effects of the implementation of specific, concrete activity and impact of these effects on the environment. Environmental impact assessment study should not contain an analysis of impact of specific project on the implementation of development policies. This is because a study on the environmental impact assessment is produced by legal person or entrepreneur, if he/she is registered in the appropriate register for activities of design, engineering and making studies and analyses, and multi-disciplinary team consisting of persons qualified to analyze each of the factors of the environment. These persons are not competent to define the environmental and development policy, plan or program, but to determine the environmental impact of a specific project in a specific case.

[1] *Law on Environmental Impact Assessment*, Article 20 paragraph 3.

The objective of environmental impact assessment is establishing the impact of the proposed project or activity on the environment, rather than analysis of compliance of implementation with developmental or environmental policy of the state (Weston, 2002). If it were allowed for environmental impact assessment study to contain this analysis, the public could be mislead about the real strengths and weaknesses of a particular project. In Comparative Law, an illustrative example is found in the case of *West Coast Wind Farms Ltd. v. Secretary of State and North Devon DC*[1] (Leitch, 2010). In this case, the opinion was expressed that the aim of determining the development state policy is achieving comprehensive protection of environmental values. This procedure requires identifying interests that influence its formulation and, by means of balancing these interests determining a unique development policy. The "balancing" of competing interests should take place when it is being decided whether or not to authorize the development - a decision which should be taken by elected and accountable representatives, as part of a political process." (Holder and Lee, 2007, pp. 565)

5 What is Achieved with Public Participation in the Process of Environmental Impact Assessment?

Response to a question about the goals that can be achieved by introducing the public in environmental decision-making can be approached from a philosophical standpoint and the standpoint of positive environmental rights. However, analysis of the goals to be achieved by public participation would be incomplete if we access it only from one or another point of view (Steele, 2001). In a further analysis, the basis is a Positive Environmental Law, and the additional elements are philosophical points of view on public participation.

Starting from the standpoint of Positive Law, the role of the public in environmental decision-making depends on whether this right, in the case of environmental protection, is stipulated by law. If so, public participation in environmental decision-making process is a condition for its legitimacy and viability. „As well as potentially improving results, public participation might be used to improve procedural legitimacy, tempering unease with the democratic condition of environmental decision-making.“ (Lee and Abot, 2003). In addition, if the law stipulates the obligation of government to allow the public expression of opinions in the process of environmental impact assessment, this means that the legislator had in mind the fact that public participation contributes to the quality of their decisions when regulating such a provision. Improving the quality of decisions in the process of environmental impact assessment is *ratio legis* for the standardization of mandatory public participation. Thus is realized an idea expressed in the Preamble to the Aarhus Convention: „improved access and public participation in decision-making enhance the quality and the implementation of decision“.[2]

If the Law on Environmental Impact Assessment did not standardize public's right to participate in decision-making, the public has a completely different role. First of all, by participating in a legally non-binding discussions, the public can express the views on certain activities that are subject to environmental impact assessment. In this way, the administration authority will be acquainted with the role that certain values have to the

[1] *West Coast Wind Farms Ltd. v. Secretary of State and North Devon DC* (1996) JPL 767.

[2] *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*, Aarhus, Denmark, June 25, 1998.

public in environmental decision-making (Steele, 2001; Lee and Abbot 2003). Consequently, although not legally binding, public opinion expressed in this way can influence the decisions of administrative bodies.

6 Theses of Adequate Public Participation in Environmental Impact Assessment

„Technological risk disputes are not just discrete technical or ethical disagreements. They concern how collective institutions should identify, understand and take action in relation to such risk.“ (Fisher, 2010, pp. 11). In that sense, it is necessary to take account of all aspects of public participation in the environmental impact assessment as a collective that identifies environmental risk and takes it into account when forming an opinion on its acceptability.

Public participation in the process of environmental impact assessment has a quantitative and qualitative dimension (Macnaghten and Jacobs, 1997; Duram and Brown, 1999). Quantitative dimension is reflected in the fact that the introduction of public participation in environmental impact assessment brings an additional element to this process that may influence the decision of the administration. In this sense, the administrative authority is obliged to consult and / or include disclosed public opinion in the moment when, using the delegated discretionary power, decides on the impact that the proposed activity may have on the environment. Public participation in qualitative sense means that the public, by expressing opinions in the process of environmental impact assessment, can contribute to perception of those aspects of proposed activities which administrative body would not have had in mind when making decisions, which are necessary for making lawful and appropriate decisions. In this sense, public participation is not an element that further burdens the environmental impact assessment, but an element without which this procedure does not lead to achieving environmental justice in terms of substance. The environmental impact assessment is a procedure in which it is necessary to consider alternatives of the proposed activity. The role of the public in qualitative sense is particularly pronounced in this matter. The public, in this case, has an opportunity to present not only an opinion in terms of the proposed activity, but to point out whether the existing alternatives lead to more adequate environment protection.

6.1 Informing the Public

In order for public to make a contribution in qualitative and quantitative sense to realization of environmental impact assessment, it is necessary to meet several conditions. First of all, it is the proper informing of public, i.e. allowing public assess to environmental information in broad and narrow sense (Kysar and Salzman, 2008).

In the legislation of Serbia, in the process of environmental impact assessment, the public has a right of access to environmental information in the broad and narrow sense (Drenovak Ivanovic, 2011b). The right of access to environmental information in the narrow sense refers to access to any information relating to the procedure of impact assessment. It is the data about the holder of the project, name, type and location of the project whose implementation is planned; time and location of potential access to the data; information and documentation from the requirements of the project holder; the nature of decision to be made on the basis of an application; the name and address of the competent organs. The competent authority has a duty to inform the public of these data within ten days of receipt of proper application on the need to assess the environmental

impact.[1] In addition, it is essential that the public has a right of access to environmental information in the narrow sense in the procedures of environmental impact assessment, established by law. An illustrative example in the comparative practice is found in the case *R (on the application of Edwards and another) v Environment Agency and others*. On 16 April 2008, the House of Lords handed down judgment in this case and Lord Hoffmann stated „when the whole question of public involvement has been considered and dealt with in detail by the legislature, I do not think it is for the courts to impose a broader duty.“ [2]

The right of access to environmental information in a broad sense is the public's right of access not only to information relating to the specific procedures for environmental impact assessment and are part of the request on the need to assess the environmental impact, but also to access all the information which the public can access, and are in connection with the protection of essential environmental values. Since forming attitudes on environmental values is a key element in (non)acceptance of environmental risk on the public's side, the right of access to environmental information in a broad sense is the basis for proper public participation in the process of environmental impact assessment (Kelman, 1987; Dryzek, 1997; Flournoy, 2003). The right of access to environmental information in a broad sense is of particular importance for the process of environmental impact assessment, because it allows public access to a variety of environmental information, which enables educating the public about the state of the environment and awareness about the environment as a whole, whose certain aspects may be exposed to project influence, for which the environmental impact assessment is done (Felleman, 1997). This is the type of information held by public authorities, related to the threat or the protection of public health and the environment. The applicant is not obliged to give reasons for access, in the request for access to this information, but the law regulates the assumption that the justified public interest to know is always present when it comes to environmental information held by government.[3]

The right of access to environmental information in the narrow and broad sense is the basis for public’s qualitative participation in the environmental impact assessment.

6.2 Entrusting the Public with Possibility to Participate in the Environmental Impact Assessment

The second condition that must be met in order to achieve maximum results of public participation is entrusting the public with an opportunity to participate in a form that is optimal in a particular case. In the earlier legislation of Serbia, before introducing the Law on Environmental Protection and the Law on Environmental Impact Assessment in 2004, there has been no right of public to participate in decision-making in the process of environmental impact assessment. It was planned for environmental impact assessment to be initiated with an investor's request for approval of the analysis of the object impact. In doing so, the citizens, as well as public, were aware of the existence of decision of giving consent to the environmental impact assessment only when the decision was final, or when the investor has already begun implementation of the activities for which the permit was issued. In such circumstances, the public had the opportunity to challenge the legality and appropriateness of the authority's consent on

[1] *Law on Environmental Impact Assessment*, Article 10.

[2] *R (on the application of Edwards and another) v Environment Agency and others*, (2008) UKHL 22.

[3] *Law on Free Access to Information of Public Importance*, „Official Gazette of the Republic of Serbia”, no. 120/04, Article 15 paragraph 4.

the analysis of environmental impact, primarily by filing complaints and petitions (Todic and Durac, 2003b). For filing the appeal, as a regular legal remedy or any of the extraordinary legal remedies, it was necessary that the public is recognized as a party to the proceedings. Only in those cases where the public was recognized as a party to the proceedings, the public had an insight into the decision, and environmental information in the narrow sense, i.e. information regarding the process of environmental impact assessment. In practice, this led to reduced opportunities for the public, even after the decision on the environmental impact assessment, to challenge its regularity, because it was impossible to access not only environmental information in the broad and narrow sense, but the challenged decision itself. Requirements of the public concerned, in accordance with the previously applicable legislation, were considered as an appeal, if the appeal had been lodged in time. Requirements that were not made in the appeal period have been considered as a proposal to reopen the administrative proceedings, the demand for the abolition of emergency executive orders, or request for cancellation or abolition of final decision on the basis of official control (Todic and Durac, 2003b). Bearing in mind the above example, we conclude that the effect of public participation is largely dependent on the way the public is allowed to participate in the environmental impact assessment. If the public is not identified as a participant, and is not provided adequate information, despite the finding of alternative ways to participate in the environmental impact assessment, the public will not be able to contribute to decision-making.

To achieve maximum results of public participation, it is not enough to stipulate such possibility by law. It is also necessary to distinguish cases in which the public participates in the environmental impact assessment, i.e. impact assessment of specific activities on the environment, from those in which the public participates in the strategic environmental impact assessment, i.e. in the preparation of policies relating to the environment.

Proper public involvement in these activities can not be achieved in the same way. Namely, in case of public participation in the environmental impact assessment, the question of informing the public concerned, which has a significant role in relation to the public, is getting more attention. In fact, environmental information about the particular impact assessment procedure must be made public, but only the public concerned has an opportunity to present an opinion which the appropriate authority must take into account when deciding on the request to assess the impact on the environment, the request for determining the scope and content of impact assessment study, or a decision on approval of the environmental impact assessment study. In this sense, it is necessary to carefully identify who makes the public concerned, how to achieve timely and complete informing of public identified in such manner and how to include it in the assessment process from the initial phase.

When it comes to public participation in the strategic environmental impact assessment, the key question is at what stage the public should be involved. In a environmental impact strategic assessment, it is not necessary to identify the public concerned. Consequently, access to public informing in this case is different. The strategic environmental impact assessment procedure in Serbia is divided into three phases: a) preparation, which aims at decision-making on a strategic impact assessment, b) drafting stage of the environmental impact assessment report, and c) phase of consent, ie. adoption of the report. In preparation of the decision on strategic assessment elaboration, or the decision on non-elaboration of the strategic assessment, the competent planning authority shall request from the competent environmental

protection authority and other authorities and organisations concerned to submit their opinions, but not from public concerned or public.[1] In a report on strategic assessment, as the second phase, the starting point of strategic assessment, among other things includes the results of previous consultations with authorities and organisations concerned that are relevant from the aspect of objectives and evaluation of potential impact of the strategic assessment.[2] Public participation is provided only at the stage of deciding on the strategic impact assessment, i.e. in the third and final phase. The authority responsible for the preparation of plans and programs have an obligation to ensure public participation in the review report on strategic assessment before filing the application for approval of the strategic assessment report. „By favoring the participation of authorities and organizations to the public, and not including the public concerned in the process of making strategic assessment from the first phase, the level of public involvement in the process of preparing reports on the impact assessment is reduced." (Drenovak Ivanovic, 2011a, pp. 67).

One of the serious obstacles to implementation of the Aarhus Convention and Serbian legislation harmonized with it is little interest of citizens to participate in the procedures of impact assessment on environmental projects at the provincial level.[3] In order to stimulate public interest in participation in decision-making on matters of mutual interest, primarily those relating to environmental protection, the Serbian government adopted the Decree on the Office for Cooperation with Civil Society in 2010. It was envisaged that the Office carries out tasks for the Government relating to the coordination of public administration bodies and encouragement of cooperation between public administration bodies with associations and other civil society organizations for the purpose of their participation in the preparation and monitoring of strategic documents and initiation of the adoption of regulations and other by-laws. Public education in environmental protection and rights and the establishment of coordinated cooperation between government and civil society should contribute to the greater interest of the public to participate in decision-making in environmental matters.

7 Conclusion

Environmental impact assessment is a complex process that includes several basic rights: the right of public to access environmental information in the broad and narrow sense, the right of public (concerned) to participate in decision-making and the right to protection of rights of access to environmental information and public participation. The paper analyzed the public's right to participate in decision-making in the environmental impact assessment.

In the modern environmental law, it is accented that the need for involving public in environmental decision making is indisputable. The paper analyzed the types of public participation in environmental decision-making, the benefits that can be achieved by public participation in decision-making in the environmental impact assessment, as well as prerequisites for public participation in the environmental impact assessment that lead to achieving maximum results. In this sense, it was established that the public, by

[1] *Law on Strategic Environmental Impact Assessment*, Aticle 11, paragaph 1.

[2] *Law on Strategic Environmental Impact Assessment*, Aticle 13, paragraph 1, item 6

[3] *The First National Report on the Implementation of the Aarhus Convention*, pp. 48, http://www.unece.org/env/pp/reporting/NIRs%202011/Serbia_NIR_2011_e.pdf , viewed: 26/05/2011.

participating in decision-making in the process of environmental impact assessment, contributes not only quantitatively but also qualitatively to impact assessment procedure. Quantitatively, because it introduces another element in the process of impact assessment that has an impact on the formulation of the decision, and qualitative, because the public contributes to the substantiality of concrete decisions by expressing their opinion. In addition, by means of expressing opinions in the environmental impact assessment, the public can contribute to the quality of concrete decisions, even though the law has not stipulated the right for participation in a particular stage. When the administrative body consults the public on certain activities which induced environmental impact assessment, it is under no obligation to present reasons for the decision and the reasons for accepting or not accepting the arguments put forward by the public. However, in this way, the administrative body gets important information about public attitudes on environmental values and the manner public accepts environmental risks.

In order for the public to have ability to competently participate in the environmental impact assessment, two conditions must be fulfilled. Firstly, the public must be provided with timely access to information regarding the environmental impact assessment, as well as information about the state of the environment. In addition, it is necessary to stipulate the public's right to participate in the environmental impact assessment. This results in public interest to assess the impact on the environment and the state of the environment, public's sense that it has an obligation to make decisions on environmental issues of which he is a part of, as well as better public understanding of issues relating to environmental risks and environmental impact assessment.

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Making Incentives for Renewable Energy in China Work: Case Study on Shanghai Green Electricity Scheme

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Abstract:
Being passed in 2005 and coming into effect on January 1st 2006, the Renewable Energy Law is the first comprehensive policy document that directly aims to promote renewable energy in China. It also acts as the legal basis for country-wide activity to drive renewable energy and to increase the share of electricity generated from renewable energy. During the past 5 years since the Renewable Energy Law's announcement, however, little research has been done to give a close look at how the law really works in practice, which accordingly becomes the focus of this article. By making a case study on Shanghai Green Electricity Scheme (Scheme) which creates incentives to drive renewable energy by local government in strict compliance with the Renewable Energy Law, the article explores the existing problems and barriers of this Scheme and discusses whether the Renewable Energy Law has addressed them and provided possibility to solve them in the long run, hoping to benefit the future law making and enforcement regarding renewable energy in China.

Keywords:
green electricity scheme, incentives, renewable energy law

1 Introduction

After 30 years' economic growth, China has become a divided society with remarkable growth rate on one hand, but also with deteriorating environmental conditions and astonishing resource scarcities on the other hand (Hallding, Han and Olsson, 2009). When the Hu Jintao-Wen Jiabao (Hu-Wen) administration took office in late 2002, they took a decisive shift in focus from the single-minded growth policies of the Jiang Zemin era to a broader notion of social development—in particular the search for an alternative path to industrialization "featuring high technology, good economic returns, low resource-consumption, low environment pollution and the full use of human resources" (Xinhua, 2006) under "the new guiding principles of *Scientific Development Concept* and the building of a *Harmonious Society*" (Halling, Hand and Olsson, 2009). The Hu-Wen leadership's development strategy has provided a historical opportunity for China to develop renewable energy and go green.

Against this backdrop, China has done a lot of right things to promote the development of renewable energy, including but not limited to developing an extensive set of laws, policies and programs in the pursuit of renewable and low carbon energy, setting a series of renewable energy related targets, making tremendous investment in renewable

energy field and participating in global efforts to facilitate renewable energy technology transfer and cooperation.

Among these policy measures, the announcement of Renewable Energy Law has been regarded as the most effective one and attracted the most attention. Coming into effect on January 1st 2006, the Renewable Energy Law is the first comprehensive policy document that directly aims to promote renewable energy in China. A lot of literatures talk about the significant role Renewable Energy Law has played in stimulating renewable energy and helping China to win a leading position in this field.

However, as Elizabeth mentioned, "even when you are looking at these big numbers that are coming out of China today, I think it really pays to give a close look at what is really happening on the ground" (Larson, 2010). Although 5 years have passed already since the announcement of the Renewable Energy Law, few people have tried to examine or evaluate its real effect, particularly in the following aspects: In what way the law has been enforced by local governments? To what extent the law has contributed to the generation and demand of renewable energy? What have been the pros and cons of the law?

Bearing these questions in mind, this article makes a case study on Shanghai Green Electricity Scheme, a scheme creating incentives to drive renewable energy by local government in strict compliance with the Renewable Energy Law. Specifically, the article examines the existing problems and barriers of this Scheme and discusses whether the Renewable Energy Law has addressed them and provided possibility to solve them in the long run, hoping to benefit the future law making and enforcement regarding renewable energy in China.

2 Overview of Shanghai Green Electricity Scheme

2.1 The Scheme in a Nutshell

The Shanghai Green Electricity Scheme offers electricity consumers in Shanghai the opportunity to "green" their electricity consumption by buying some amount of green electricity for which a premium needs to be paid. Through participation, Shanghai electricity consumers including both enterprise consumers and individual consumers can directly contribute to CO2 reduction and environmental protection. The Shanghai Municipal Government guarantees that the additional payment for Green Electricity will be used to develop additional renewable electricity generating capacity such as wind farms. An independent supervising body is responsible for auditing the green electricity accounts and publishing the audit results to ensure that no more green electricity is sold than produced and that the consumers' additional payment is used exclusively for developing renewable electricity generation capacity (Shanghai Green Power, 2005).

2.2 Guiding Principles

2.2.1 Voluntary Purchase

Consumers purchase green electricity on a voluntary basis.

2.2.2 Government Pricing

At present, the green electricity shall temporally not participate in the price competition on the electricity market for going onto the grid. Its price shall be set by the government

according to the principles of "Being beneficial to the development and utilization of renewable resources, being economic and reasonable, being able to reasonably compensate for the cost and put apart room for profits".[1]

2.2.3 Incentivizing Purchase

The government of Shanghai Municipality encourages the development of green electricity and vigorously encourages consumers to voluntarily subscribe to green electricity by adopting the following measures:[2]

- ✧ The Shanghai Municipal Energy Conservation Supervision Center (SMECSC) shall regularly make public the list of users of green electricity, and award the honorary certificates to the users who have subscribed to green electricity.

- ✧ For the users who have signed with the electricity company a contract for a term of at least two years and annually subscribed to green electricity in the quantity of more than one million kilowatt hours, and whose purchasing capacity of green electricity accounts for no less than 10% of the previous year's electricity quantity used for manufacturing main products, the Shanghai Municipal Development and Reform Commission (SMDRC) and Shanghai Municipal Economic Commission (SMEC) shall authorize the SMECSC to grant them the Emblem of Green Electricity. The users who have obtained the Emblem may use it within the period of purchase.

- ✧ For the users making outstanding achievements in subscribing to green electricity, the SMDRC and SMEC shall jointly award medals to them.

2.3 Significance

2.3.1 Initiative Spirit

Shanghai has become the first developing country city in the world to offer green electricity.

2.3.2 Environmental Friendly

Given green electricity is produced from renewable resources such as wind, solar and biomass, the generation of green electricity produces little or no pollutants to air, water and land, therefore helping to reduce CO2 emissions and improve air quality in Shanghai. In addition, green electricity does not consume fossil fuel, so it is beneficial to sustainable utilization of energy. Finally, developing the renewable energy industry promotes Shanghai's image as an environmentally conscientious and responsible city while improves local economy and employment (Shanghai Green Power, 2005).

2.3.3 Driving End-Users' Demand

This Scheme represents Shanghai government's efforts to enforce the newly issued Law of the People's Republic of China on Renewable Energies (Renewable Energy Law). In particular, different from the commonly-used measures of promoting renewable energies through encouraging the generation of green electricity, this Scheme aims to advance the development of renewable energies by increasing the end-users' demand for green electricity.

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[1] Shanghai Green Electricity Marketing Promotion Regulation 2005, s 3(12).
[2] *Ibid*., s 4(16, 17 and 18).

3 Working Mechanism and Existing Problems

3.1 Working Mechanism

The Shanghai Green Electricity Scheme was developed over 2004, formally launched in 2005, and was formally called and branded "Jade Electricity". In June 2005, the Shanghai government issued *Shanghai Green Electricity Promotion Regulation* (*Regulation*). The *Regulation* establishes legal framework and provides specific guidance for implementing the Scheme. It states that the aims are pushing forward the development and utilization of green electricity in this Municipality, improving the energy source composition, promoting the protection of environment and the sustainable development, and creating a good atmosphere of the whole society showing concern about the development of green electricity.[1] The *Regulation* was formulated in accordance with the newly issued *Renewable Energy Law* at that time and turned out to be an important measure of the Shanghai government to implement *Renewable Energy Law* and promote renewable energy in Shanghai.

The Scheme will initially support wind and PV electricity only. The approach adopted by the Shanghai government was "to start small and to let the Scheme develop and grow with increasing demand and increasing availability of renewable electricity" (ASTAE, 2006). To qualify as a Green Electricity user, customers must buy by yearly a certain amount of green electricity. For example, the minimum annual subscription shares for the residential household are ten quotas, with one quota defined as 12 KWh; the one quota for the enterprise (unity) user is set at 6000 KWh, and the minimum annual subscription shares are varied in accordance with the electricity volume consumed by that user in the preceding year.[2]

The green electricity subscription fees are counted according to the unit price of green electricity and the green electricity capacity subscribed to. The unit price of green electricity is determined by the difference between the average on-grid price of green electricity and the on-grid price of electricity produced by Shanghai coal-fired new generator as examined and verified by the State. The unit price, namely the incremental cost of green electricity, has initially been set at 0.53 Yuan/KWh. The green electricity capacity is purchased through customers' voluntary registration in compliance with the above mentioned minimum annual subscription shares. The term for the subscription to green electricity shall be one year, two years, or three years respectively. The subscription fees for green electricity shall be paid monthly through the current channel and method of paying electricity fees.[3] For example, if a household has subscribed to 10 quotas of green electricity, i.e. 120 KWh, for one year, then the household needs to pay an additional 63.6 Yuan for purchasing one years' green electricity apart from the normal electricity bill. Given this total 63.6 Yuan will be distributed to 12 months, this household needs to pay an additional 5.3 Yuan when paying their monthly electricity fees.

3.2 Existing Problems

The biggest problem encountered by the Scheme is that the actual quantity of green electricity purchased is much smaller than expected.

[1] *Ibid*., s 1(1).
[2] *Ibid*., s 2(9).
[3] *Ibid*., s 2(10).

In June 2005, the Shanghai government held the Ceremony of Signing Contracts to Purchase Green Electricity. During this ceremony 15 industries and institutions signed contracts with Shanghai Municipal Electric Power Company (SMEPC) for a duration of 1-3 years and became the first consumers to purchase green electricity.

However, after that the process of subscribing to green electricity became very slow. Over one year later, i.e., by the end of 2006, only 22 industries and 6842 households purchased green electricity amounting to a total of 15.82 GWh. Particularly, around 2/3 of the 22 industries are foreign funded enterprises (Chen, You and Zhou).

In addition, among Shanghai's top 10 electricity-consuming enterprises, only Baosteel Corporation subscribed to 3 years' green electricity amounting to a total of 1.2 GWh. To make it more clear, the single year of 2006 will be taken as an example to demonstrate the insufficient purchase of green electricity. In 2006, the total amount of green electricity purchased was around 8.5 GWh while the amount of green electricity generated that year was more than 20 GWh. Notably, the green electricity purchased was less than half of green electricity generated in 2006. For the surplus green electricity, the SMEPC had to temporarily pay for the price differential between green electricity and electricity generated by conventional energy.

Instead of rising, the public's enthusiasm for purchasing green electricity even falls a little bit as time goes on. At the end of 2008, the green electricity's purchase amount only accounted for 13.5% of its' total supply amount in Shanghai (World Wind Power, 2009). Until recently, the green electricity scheme is not very popular with Shanghai citizens.

4 Barriers and the Way Forward

Given Shanghai's abundant renewable energy resources, advanced production capacity of equipments relevant to green electricity, and relatively high level of economic development and people's living standard, Shanghai has great potential to develop green electricity.

However, the Scheme has not been as successful as expected. According to a survey (Chen, You and Zhou, 2008) conducted by South-North Institute for Sustainable Development in 2006, the main reasons for customers' unwillingness to purchase green electricity are as follows: lack of sufficient understanding about green electricity (36%); unacceptable high price of green electricity (27%); no substantive benefits or returns to green electricity users (25%); lack of knowledge of how to purchase green electricity (10%).

4.1 Publicize the Scheme and Increase Public Awareness of Environmental Protection

To solve the problem of customers' lacking understanding about green electricity and lacking knowledge of how to purchase green electricity, the Shanghai government should take more effective measures to publicize the Scheme and gradually increase public awareness of environmental protection.

4.1.1 Specific Measures

Fist of all, to make the Scheme widely known by Shanghai citizens and enterprises, the Shanghai government should make full use of various media to introduce the Scheme

such as newspaper, books, magazines, TV programs (including mobile TV programs), websites, booklets, posters and public service advertisements. Secondly, the Shanghai government may cooperate with NGOs and the producers and investors of green electricity to better publicize the Scheme. Thirdly, "Better city, better life" is the Shanghai municipality slogan to promote its image as an environmentally conscientious and responsible city. Development of green electricity is an important measure for Shanghai to realize its commitment. If the Shanghai government can combine the Scheme with Shanghai's city planning and development, the Scheme will attract more attention and gain more support. In addition, the Shanghai government needs to pay more attention to the large electricity users and encourage them to use green electricity. In the US, it is estimated that the total amount of green electricity purchased by the top 50 institution users surpassed 13.7 billion KWh annually, representing more than 70 percent of the green electricity commitments made by all the US green power subscribers (U.S. EPA, 2011). This has shown the significant role large electricity users may play and set a role model for the Shanghai government to emulate. Finally, the Shanghai government and SMEPC should provide better service and guidance to facilitate the purchase of green electricity.

4.1.2 Special Point

Given that green electricity is still quite new in China, most people have not fully realized the benefits of using green electricity. As we know, green electricity contributes to CO2 reduction and pollution control mainly through its use of renewable energy and its clean production process. However, to end users, green electricity looks the same with conventional electricity. No matter green electricity or conventional electricity, they are transmitted through the same grid and users can hardly distinguish between them (Zhang and Gao, 2006). Therefore, during the publicity of green electricity, the Shanghai government should highlight green electricity's substantial benefits to environmental protection, create culture of "using green and being environmental friendly", and make the purchase of green electricity a kind of fashion.

4.2 Reduce the Cost of Green Electricity

The price of green electricity set by the Shanghai government is 1.14 Yuan/KWh and the price for conventional electricity is 0.61 Yuan/KWh. There exists an incremental cost of 0.53 Yuan/KWh between the two. The high price of green electricity has deterred many consumers to use it and become the biggest barrier to the development of green electricity. Actually, this issue of price differential is quite common in China. There is a difference between power purchase price for coal-fired and for renewable energy generation in a number of provinces. Coal prices are always considerably lower. For example, in the provinces of Xinjiang, Liaoning and Inner Mongolia the wind power prices are even more than double the ones from coal.

4.2.1 Reasons for Green Power's High Price

Notably, such a price differential lies with the fact that the cost of electricity from renewable energy generation is higher than from coal. One reason for the relatively high cost of green electricity has been the weak domestic manufacturing industry in China. Specifically, renewable energy technologies are relatively nascent within the power sector and unlike conventional energy technologies do not benefit from the economy of scale. For example, in the wind industry, only a very small number of Chinese owned manufacturers have been established and they are significantly limited in the size and quality of the turbine they are able to produce. The small size and poor quality of

domestic manufacturing industry forces renewable energy developers to import costly equipment from overseas, which increases the cost of electricity from renewable energy and inhibits the growth of the local manufacturing industry.

Another reason for the relatively high cost of green electricity has been the lack of competition and the relatively small scale of market.

Last but not the least, a more significant contributory factor to the high cost of green electricity has been the low-cost of coal-fired electricity generation in China. The full cost of coal-fired electricity has not been fully reflected in its price (Zhang, 2009). For example, the costs of transmission and distribution are not accurately reflected in the coal-fired electricity price. As coal resources are primarily located in the north of China, far from demand centres in eastern and south-eastern coastal areas, true transmission costs are likely to be high by comparison with renewable energy given that the southeast coast of China is rich in wind resources. More importantly, the environmental externalities associated with coal-fired generation have not been reflected in the price of conventional electricity because of weak pollution control. Thus, internalization of the environmental damage within the cost of coal may help to decrease the incremental cost between green electricity and coal-fired electricity.

4.2.2 Current Solution to the Issue of High Price

Due to the relatively high cost, green electricity is currently unable to compete with coal-fired electricity. Under the Shanghai Green Electricity Scheme, the grid price of green electricity is set by the Shanghai government according to the principle of "Being beneficial to the development and utilization of renewable resources, being economic and reasonable, being able to reasonably compensate for the cost and put apart room for profits"[1] or through public bidding with prices no higher than those set by the government for similar projects. The difference between the on-grid price of green electricity and conventional electricity is absorbed through the voluntary purchase of green electricity by the public, or is to be passed on in the selling price of electricity in case some remaining unsold green electricity exists.

Clearly, the Shanghai government takes pricing as an incentive to promote the generation of green electricity and to increase its market scale. However, such a fixed price guarantee can only be temporary because it is anti-competitive and can not reflect the real cost of green electricity. From the long run, to reduce the cost of green electricity is the key to the success of the Scheme and the development of renewable energy. The Shanghai government states that with the deepening of reform in electricity system afterwards, Shanghai shall establish and perfect competitive market of renewable energy. In addition, the Shanghai government determines to gradually reduce the cost of generation of green electricity through reducing revenue and providing allowance in order to reduce the selling price of green electricity. Thus, we have reasons to believe that although the Scheme is currently small and confronted with some difficulties, it will grow with the increasing demand and increasing availability of green electricity and with the decreasing cost and decreasing price of green electricity.

4.2.3 Renewable Energy Law's Constructive Role and Possible Drawbacks

Notably, the Shanghai government establishes and implements the Scheme in strict compliance with the relevant State provisions and in particular, the Renewable Energy

[1] *Ibid*., s 3(12).

Law. In China, the central government sets the policy and legal framework to guide the development of renewable energy and the local governments are responsible to specify and implement the relevant provisions. Thus, the State-level laws and policies will also have a significant impact on the future development of the Scheme. As we know, the Chinese central government has long been concerned with the development of renewable energy and has made a strong commitment to growing the renewable energy industry. There have been a lot of national and provincial policy initiatives to foster the development of renewable energy. The Renewable Energy Law, which was passed in 2005 and came into effect on January 1st 2006, is the first comprehensive policy document that directly aims to promote renewable energy in China. It acts as the legal basis for country-wide activity to stimulate renewable energy and to increase the share of electricity generated from renewable energy. Hence, the Renewable Energy Law will be briefly examined here to see whether it addresses the four previously-discussed factors for green electricity's relatively high cost and provides the possibility of reducing the cost in the long term.

As previously mentioned, one reason for the relatively high cost of green electricity is the weak domestic manufacturing industry in China. To improve the quality and capacity of domestic renewable energy manufacturing industry, the fundamental way lies in the promotion of domestic technological innovation. The Renewable Energy Law stimulates domestic technological innovation mainly through encouraging investment in the research and development (R&D) of renewable energy, setting up a renewable energy development fund and establishing a feed-in tariff (FIT) system. Specifically, the Renewable Energy Law makes investment in renewable energy R&D a priority and provides that the government allocates funding for the scientific and technical research, application demonstration and industrialized development of the development and utilization of renewable energy so as to promote technical advancement in the development and utilization of renewable energy, reduce the production cost of renewable energy products and improve the quality of products.[1] The law also establishes a renewable energy development fund to support scientific and technological research, standard setting and pilot projects for the development and utilization of renewable energy, and to foster the localized production of the equipment for the development and utilization of renewable energy.[2] In addition, the Renewable Energy Law stipulates that grid utilities shall enter into agreements with licensed power generators to purchase all the renewable energy that they produce within the area of the grid,[3] and the grid price of renewable energy shall be set by price authorities of the State Council.[4] This implies establishment of a FIT system, an obligation on electricity suppliers to accept all power from renewable energy generators at a guaranteed fixed price set by the State. Given that the FIT system enables renewable power generators to capture the surplus created by technical change, it will stimulate them to invest in R&D to reduce costs and increase profits, thus providing a stimulus for technological innovation in China. Notably, the Renewable Energy Law promotes an innovative system for renewable energy technologies, which is likely to strengthen China's domestic manufacturing industry and hence to reduce the high cost of electricity from renewable energy.

However, room for improvement still exists. For example, the provision of renewable energy development fund does not specify the value of the increase in funding or the

[1] Renewable Energy Law of People's Republic of China 2005, s 3(12).
[2] *Ibid*., s 6(24).
[3] *Ibid*., s 4(14).
[4] *Ibid*., s 5(19).

likely distribution of funding, so there is a risk that compliance could be satisfied with a very small increase or inappropriately targeted funding, contrary to the intention of the law. In addition, there contains no suggestion of tariff reductions overtime which could provide a further incentive for R&D investment in technological innovation among market participants. Finally, the Renewable Energy Law provides that middle and long-term targets for the total volume of renewable energy at the national level are to be set by the Energy authorities of the State Council subject to approval by the State Council,[1] and based on the national targets, provincial, regional and municipal energy authorities will prepare renewable energy development and utilization plans for their own administrative regions to be implemented subject to approval by governments at their own level.[2] This provides the basis for implementation of a mandatory market share policy (MMS), an obligation on electricity suppliers to source a proportion of their power from renewable energy generation. Given that MMS policy does not allow producers to capture the surplus from technological change, and universal pressure to reduce costs under MMS schemes can discourage R&D investments in favour of sourcing technology from abroad. This may prejudice technological innovation and hinder the development of domestic manufacturing industry. While experience in other countries has shown that the MMS is usually combined with tradable renewable energy certificates to ensure greater equity, efficiency and innovation that will deliver renewable energy at the lowest possible cost, there is currently an absence of such a mechanism to foster innovation and drive cost reductions in China.

To address the issue of insufficient competition, the Renewable Energy Law introduces the tender system, i.e., where there is more than one applicant, licenses for construction of renewable power generation projects will be determined through a tender system (Concession Programme).[3] The Concession Programme may effectively stimulate competition and encourages a systematic effort to reduce costs through economy of scale and use of the very best available sites. The MMS mechanism can also provide pervasive competitive pressures, giving an incentive for cost reductions and project quality improvements.

As for the scale of market, the FIT and MMS can be used to stimulate an increase in market scale. The FIT helps to overcome the cost disadvantages of renewable energy sources and thus boost adoption of renewable energy technologies. Experience in other countries has shown a rapid increase in capacity following implementation of a FIT. For example, the FIT has been associated with a large growth in solar power in Spain, Germany and wind power in Denmark. The MMS may also be taken to scale up markets for renewable energy, but in a more steady way compared with the rapid increase led by the FIT. The US has been very successful in stimulating new renewable energy capacity through MMS policies. Increased market scale can reduce costs of renewable energy technology and bring economy of scale, which accordingly encourages further scale increases.

The Renewable Energy Law makes no reference to the low cost of coal-fired electricity generation in China. Compared with the relatively nascent renewable power industry, the conventional electricity sector enjoys more benefits during the decades of institutional and organizational adaptation. Particularly, the Chinese central government keeps electricity prices low in support of GDP growth for a long time and the

[1] *Ibid*., s 2(7).
[2] *Ibid*., s 2(8).
[3] *Ibid*., s 4(13).

environmental externalities associated with coal-fired generation have not been reflected in the price of conventional electricity. Now changes and improvements need to be made to pollution control policies so as to redress the economic balance between coal and renewable energy.

In short, the Renewable Energy Law helps to reduce the cost of green electricity and foster the development of renewable energy mainly through making provisions for implementing the three policy mechanisms, the FIT, the MMS and the Concession Programme. Actually, these are the most commonly used promotion policies in renewable energy field. However, the law does not specify the manner in which these three mechanisms will be combined. Given that these policies serve different purposes and have differing advantages and disadvantages, they need to be differentiated over time taking into account China's specific policy objectives, socio-economic conditions and the capacity to expand renewable energy production. In addition, the law would have been more effective and easy to be implemented had it paid more attention to details and included more specific provisions.

4.3 Incentivize Customers to Purchase Green Electricity

As mentioned above, the Shanghai government encourages customers to purchase green electricity mainly through increasing their sense of honour and promoting their public image. The primary encouragement methods include making public the list of users of green electricity and awarding them honorary certificates, Emblem of Green Electricity or medals. However, such methods have proven to be ineffective in providing proper incentives, and more initiatives should be taken to better incentivize customers to use green electricity.

4.3.1 Introducing Fiscal Incentives

Apart from giving commendation and honour, the Shanghai government may think about providing more attractive rewards for the users of green electricity. According to the survey in 2006, a quarter of respondents chose not to purchase green electricity because they were not satisfied with the relevant rewards and returns (Chen, You and Zhou, 2008). For example, some enterprises proposed that as a reward large users of green electricity should be allowed to emit more pollutants. Of course, this has been denied by the government (Yu, 2006). To encourage the wide use of green electricity, some measures involving substantive benefits such as preferential loans, direct subsidy to the users and tax reduction or exemption might be adopted as possible incentives.

For instance, experience in the Netherlands has shown a rapid increase in the demand for green electricity due to the adoption of tax incentive. Aiming at stimulating energy saving attitudes by consumers, the Dutch government started to collect the Regulatory Energy Tax (REB) on electricity consumption of all types since October 1996, irrespective of whether the energy resources used for generating electricity are renewable or not. Based on this tax policy, the Consumer-driven Strategy, a scheme encouraging the customers' voluntary purchase of green electricity promoted by the Dutch government from 1995, attracted little attention and consumer participation was quite modest. Later on, specifically beginning with 1 January 1998, the Dutch government introduced the "nil tariff" policy which exempts "domestic renewable generators and the selling of imported green electricity from the REB tax", thus allowing consumers subscribing to the green electricity not to pay the REB tax anymore (Dinica and Arentsen, 2001). This has led to dramatic expanding of customers' demanding for green electricity and now more than 20% of Dutch residents have chosen

to use green electricity. Also deserving mention is the fact that "the higher the REB tax goes, the more attractive it will be for consumers to subscribe to a voluntary green electricity scheme" (Dinica and Arentsen, 2001). Apart from stimulating green demand, given that green electricity users are exempted from the REB tax and given the high level of the REB tax in the Netherlands, this tax policy helps renewable energy companies to lower cost so as to provide green electricity products at almost the same price as conventional electricity products. Therefore, the REB scheme has proved to be one of the most effective Dutch policy mechanisms, functioning not only as a powerful fiscal instrument to stimulate green demand, but also as a subsidy scheme to encourage green generation and green investments (Dinica and Arentsen, 2011).

4.3.2 Combining Voluntary Purchase with Mandatory Consumption

Currently, the Shanghai Green Electricity Scheme is fully based on voluntary purchase. Given the relatively high price of green electricity, only some enthusiastic customers are willing to pay for it. Even many government organizations in Shanghai have not taken initiative in subscribing to green electricity. Thus, a shift from this pure voluntary system to a mixed parallel system of voluntary purchase and mandatory consumption might hold the key to the success of this Scheme. Actually, many countries have done very well in combining voluntary purchase with compulsory consumption. For example, all the US local governments are required to join the Green Power Partnership, a program aimed for promoting the purchase of green power, while other businesses, organizations and individuals are free to decide whether to buy green electricity or not. Similarly, in Germany, public utility companies are required to purchase green electricity. By collecting the REB tax, the Dutch government also combines voluntary purchase with compulsory consumption to increase the market demand for green electricity.

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Climate change mitigation and hydropower legislation in Finland

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Abstract:
In connection with mitigating climate change, the European Union has committed to raising the use of energy from renewable sources to 20 % of overall Community energy consumption by the year 2020. The national target set for Finland is a challenging 38 % compared to 28.5 % in 2005. A traditional form of renewable energy is hydropower. In Finland, hydropower generates about 3 to 4 % of total energy supply at the moment, depending on the yearly rainfall. The national target set for hydropower production is 14 TWh in 2020, which means an increase of 0.5 TWh from the present situation. This subtle rise would consist of capacity increases in existing power plants and small hydropower. Although Finland is described as a land of a thousand lakes and therefore rich in water resources, increasing the use of hydropower is difficult on a large scale mainly due to national nature conservation legislation: namely the rapids conservation legislation. Another characteristic in Finnish geography is the flatness of the country; concerning hydropower, the modest differences in altitude mean smaller capacity plants generally.

This paper analyses the existing environmental legislation in Finland concerning hydropower and looks at the targets for promotion of renewable energy in the light of that legislation. The paper suggests some amendments to the existing national legislation: for example, the permit procedure is designed for large-scale hydropower plants, and the administrational burden may seem heavy for small-scale plants. Therefore, a lighter procedure might ease the promotion of small hydropower. One option that would ease the use of hydropower is to loosen the nature conservation legislation at some level without risking conservation values. In conclusion, in order to achieve the goals set for mitigating climate change, some amending of the traditional environmental legislation may be needed.

Keywords:
hydropower, climate change, environmental legislation, nature conservation, water law

1 Introduction

Climate change is one of the biggest challenges facing mankind in the near future. The European Union has taken action in order to mitigate climate change: the so-called EU

20-20-20 target consists of 1) decreasing emissions by 20 %,[1] 2) improving energy efficiency by 20 %,[2] and 3) promoting the use of energy produced with renewable sources by 20 %.[3] The target is set to be accomplished by 2020. The promotion of the use of energy from renewable sources is regulated by Directive 2009/28/EC.[4] The Directive divides the average EU target into more precise national targets; for Finland, this means that by 2020 the share of energy produced with renewable sources should rise up to 38 % of the gross final consumption of energy, compared to 28.5 % in 2005. This binding target is the third highest in the EU; only Sweden exceeding it with 49 % and Latvia with 40 %.[5]

The Finnish Government has drawn up the Long-term climate and energy strategy that defines the main objectives and means for Finnish climate and energy policy in connection with the EU targets.[6] The objectives include the promotion of production and use of energy produced with renewable sources: as the strategy renews the Commission-set obligation of 38 % for renewable energy, it comments that the target is challenging and requires that energy end-use will decrease. The largest potential for promoting renewable energy is seen in wood-based energy, recovered fuels, heat pumps, biogas, and wind energy. Hydropower is described more as a steady energy provider than as a promising sector for increasing the energy production.[7]

According to the Directive 2009/28/EC, EU Member States have to draw up national renewable energy action plans (NREAPs).[8] Finland's NREAP, among other things, breaks down the target of 38 % into different sectors of renewable energy production. The main focus in increasing renewable energy is on wind power and wood-based energy; however, hydropower is also mentioned. By 2020, hydropower production will increase by 0.5 TWh to amount to 14 TWh.[9] This subtle rise will consist of capacity increases in existing power plants and small hydropower, and require no changes to the existing legislation.

Utilisation of hydropower is regulated by the Water Act (587/2011): a permit is needed for establishing and operating a hydropower plant. The Water Act has recently been revised,[10] but regulation concerning hydropower does not alter significantly from the previous Water Act (264/1961). In deciding whether it is possible to grant a permit for a hydropower plant or not, the nature conservation legislation plays a crucial role: the Rapids Conservation Act (35/1987) and the special river conservation acts (concerning rivers Ounasjoki and Kyrönjoki) as well as the Nature Conservation Act (1096/1996)

[1] Decision No 406/2009/EC of the European Parliament and of the Councilof 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020, OJ 2009 L 140/136.
[2] Communication from the Commission – Energy efficiency: delivering the 20% target, COM(2008) 772 final.
[3] Communication from the Commission to the Council and the European Parliament – Renewable Energy Road Map – Renewable Energies in the 21st Century: Building a more Sustainable Future, COM(2006)0848 final, at p. 18.
[4] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ 2009 L 140/52.
[5] Directive 2009/28/EC, *supra note* 4, Annex 1.
[6] Finnish Government (2008), Pitkän aikavälin ilmasto – ja energiastrategia – Valtioneuvoston selonteko eduskunnalle 6. päivänä marraskuuta 2008, 6 November 2008, available on the Internet at <http://www.tem.fi/files/20585/Selontekoehdotus_311008.pdf> (last accessed on 10 June 2011).
[7] Finnish Government (2008), *supra note* 6, p. 9, 36 and 40.
[8] Directive 2009/28/EC, *supra note* 4, Art. 4.
[9] The target is set regarding an average year's rainfall. Ministry of Employment and the Economy (2010), Suomen kansallinen toimintasuunnitelma uusiutuvista lähteistä peräisin olevan energian edistämisestä direktiivin 2009/28/EY mukaisesti (Finnish national renewable energy action plan (NREAP)), p. 5. Also available on the Internet at <http://www.tem.fi/files/27405/NREAP_300610_FINLAND.pdf> (last accessed on 10 June 2011).
[10] The new Water Act was accepted in Parliament on 11 March 2011 and will enter into force on 1 January 2012.

with its regulation concerning the EU Natura 2000 Network. Consequently, the small potential seen in increasing the production of hydropower is caused largely by two reasons: most of the rapids suitable for hydropower plants are already in use or protected by nature conservation legislation.

This paper is a study about hydropower legislation in relation to climate law. The paper analyses the existing environmental legislation in Finland concerning hydropower and looks at the targets for promotion of renewable energy in the light of that legislation. The paper does not examine the economical aspects of electricity production with hydropower (e.g. windfall[1] issues). Neither does the paper thoroughly examine the Finnish legal praxis related to hydropower construction – there are plenty of rulings over the years - which would be a topic of a paper on its own.

This paper starts with an overview of the Finnish energy sector and particularly the role of renewable and hydropower therein (chapter 2). Then we look at hydropower more specifically: past, present and future (chapter 3). Chapter 4 is a review of the Finnish legislation concerning hydropower. This chapter answers to the following questions: who has the right to establish a hydropower plant, on which circumstances is it possible to build such a plant, and what else needs to be taken into account in relation to hydropower. Lastly, conclusions will be made in the final chapter: how does the hydropower legislation appear in the light of climate change and targets for the promotion of energy from renewable sources.

2 Background

According to the Statistics Finland's preliminary data, the total energy consumption in Finland in 2010 was 1445 PJ (petajoules) that is 402 TWh; of this amount 87.5 TWh was electricity consumption. In 2010, 47.5 % of energy was produced with fossil fuels (oil 24.5 %, coal 12.9 %, natural gas 10.3 %), 16.5 % with nuclear power, 6.5 % with peat, 2 % with other sources, 2.5 % with net import and 25 % with renewable energy.[2] The sources of renewable energy in energy production have traditionally consisted largely on wood-based residues. In 2006, the sources of renewable energy were: 1) black liquor and other concentrated liquors from industry (42 %), 2) wood fuels from industry and energy production (26 %), 3) small combustion of wood (13 %), and 4) hydropower (11 %). Other renewable energy accounts for 8 %; this includes wood-chips, heat pumps, recovered fuel, biogas, other biofuels, and wind power.[3] [4]

Energy supply differs from electricity supply due the significance of heating (both for the domestic and industry needs) in energy production and the suitability of different sources in electricity and heat production. As the table below shows, in 2010, combined heat and power production (CHP) and nuclear power account for nearly 60 % of the electricity production leaving hydropower the share of about 15 %. Around half of the

[1] Unexpected money received which is not a direct result of something the recipient did.
[2] Statistics Finland (2011), *Energian kokonaiskulutus nousi 9 prosenttia vuonna 2010.* Available on the Internet at <http://tilastokeskus.fi/til/ehkh/2010/04/ehkh_2010_04_2011-03-29_tie_001_fi.html> (8 June 2011).
[3] Finnish Government (2008), *supra note* 6, p. 41.
[4] One special feature in the Finnish energy business is the Nordic electric power market and the existence of a Nordic power exchange, Nord Pool Spot. More information about Nord Pool Spot on the Internet at http://www.nordpoolspot.com/ (last accessed on 16 May 2011). A good overview of the Finnish energy sector, see International energy Agency (2008), Energy Policies of IEA Countries, Finland 2007 Review. Available on the Internet at <http://www.iea.org/textbase/nppdf/free/2007/finland2007.pdf> (last accessed on 8 June 2011). A good overview of energy law in Finland, see Talus, K., Guimares-Purokoski, A., Rajala, A., Huomo, L., Vesa, P., Kaijalainen, T. and Salminen, L. (2010), Energy Law in Finland.

electricity is consumed by the industry (forest industry consuming 25 %, and the other sectors being chemical, metal, and other) and half is other consumption (heating, transport, and other).[1]

Table 1. Electricity supply in Finland 2010
(Source: Finnish Energy Industries, 20112)

	TWh	Share (%)
CHP - Industry - District heating	28.5 - 11.1 - 17.4	32.6 - 12.7 - 19.9
Nuclear power	21.9	25.0
Hydropower	12.8	14.6
Wind power	0.3	0.3
Seperate	13.5	15.4
PRODUCTION	77.0	88.0
Net imports	10.5	12.0
ELECTRICITY SUPPLY	87.5	100

There is some geographical and climate information that needs to be stated about Finland. There are 187,888 lakes in Finland.[3] Although Finland is rich in water resources, the flatness of our country makes the differences in altitude very modest, which means that we have smaller capacity plants generally. The flatness also causes that possibilities to reserve the water flow are limited since the reserve would need much more horizontal space than in steep terrain. Spring floods are usual because of melting snow and, therefore, the water flow is not even throughout the year. In connection with this, the yearly rainfall varies from year to year making the prediction of water reserves difficult and causing the yearly production of electricity by hydropower vary from year to year notably. Additionally, Finland is located relatively far north in the planet Earth, and the average yearly temperature is about 1.9 ºC.[4] In the wintertime, the need for energy rises significantly due to heating. The energy supply has to be built in a way that extra energy is available when extremely cold days occur causing the so called peak loads when the energy demand is at its highest level; additionally, the extra energy is needed to assure the security of the grid. This extra energy supply is called adjustment power (in Finnish säätövoima), and hydropower is very suitable for this purpose because the extra energy is quickly available.[5] The significance of adjustment power will be emphasized further in the future as the share of wind power increases;[6] on days when there is no wind and therefore no wind power, the lack of wind power has to be replaced with another kind of energy.

[1] Finnish Energy Industries (2011), Energy Year 2010 – Electricity. Available on the Internet at <http://www.energia.fi/en/news/electricity%20year%202010.html> (last accessed on 8 June 2011).
[2] Finnish Energy Industries (2011), *supra note 15*.
[3] A lake is defined as a water area exceeding 500 square metres. http://www.ymparisto.fi/default.asp?node=8103&lan=fi
[4] Between 1971 and 2000, the average yearly temperature in Finland has been about 1.9 ºC.
[5] Finnish Energy Industries (2008), Voimaa vedestä 2007 - Selvitys vesivoiman lisäämismahdollisuuksista, p. 6. Also available on the Internet at < http://www.tem.fi/files/18565/Voimaa_vedesta_2007.pdf> (last accessed on 10 June 2011).
[6] The target is 6 TWh by 2020. Ministry of Employment and the Economy (2010), *supra note 9*, p. 2.

Although hydropower is climate-friendly as a renewable energy source it does have effects on the environment. The watercourse is not in its natural state after establishing a hydroelectric installation. This change affects the biodiversity of the watercourse and the effects are greater in case an artificial lake is founded. One of the most obvious effects is on fishes and fishing. However these effects can be reduced by using fish ladders, fish bypass systems and fish lifts (upstream) as well as fish-friendly turbines (downstream). Moreover, control of the water level has effects both on the upper and lower course: on the upper course flooding and on the lower course too little water/stream may cause harm. On the other hand, hydropower plants may be actors in controlling flood risks, which are assumed to increase due to climate change.[1]

3 Hydropower in Finland

The first hydropower plant that produced electricity nationwide was established in Finland at Imatrankoski in 1929. Till then, the hydropower plants had been smaller and produced electricity only for local use; mills have been used since the Middle Ages. The major rapids located in the Southern Finland were harnessed during 1930's and 1940's; the next few decades after the Second World War were the time of heavy increase in the hydropower capacity as the hydropower construction concentrated at the big rivers of Northern Finland.[2] After a slow phase in the 1980's, the development of hydropower generation picked up at the turn of the millennium when about 15 % of today's hydropower capacity, 3.000 MW, has been build.[3]

Nowadays, the share of hydropower in energy production varies between 3 to 4 % annually depending on the rainfall,[4] which accounts for 10 to 20 % of the electricity production. At its peak the share of electricity produced with hydropower was in the 1950's and 1960's when it accounted for 90 % of electricity at its best. In 2006, there were 207 hydropower plants in use: 57 of those plants were large (production more than 10 MW), 83 were small hydropower plants (production 1-10 MW), and 67 were so called micro hydropower plants (production less than 1 MW). On an average year's rainfall, the electricity production of these plants is 12.9 TWh: of this amount large plants account for 91 %, small hydropower 8 %, and micro hydropower 1 %.[5] [6]

As mentioned above, the current hydropower capacity in use is 3.000 MW. According to a recent study, the whole potential in hydropower is about 5.100 MW; this number includes the hydropower in use and the potential. The potential consists of both water systems that are protected and unprotected; the potential can be divided to large, small and micro hydropower, as well. As can be seen in the table below, the largest potential in Finland for hydropower is situated in waters that are protected by the nature

[1] More information about the environmental consequences of hydro power, see for instance Pienvesivoimayhdistys ry. (2009), Pienvesivoimalaopas, p. 18, also available on the Internet at < http://server.perlasoft.fi/vesivoima/images/Pienvesivoimaopas.pdf> (last accessed on 10 June 2011); Finnish Energy Indistries (2008), *supra note 19*, p. 38-41.
[2] Salokangas, R. (1968), p. 14-17.
[3] During 1990 and 2004, 444 MW of new hydropower (including new plants and capacity increases in existing power plants) was established in Finland. Ministry of Trade and Industry (nowadays Ministry of Employment and the Economy) (2005), Vesivoimatuotannon määrä ja lisäämismahdollisuudet Suomessa, *p. 9.* Available on the Internet at <http://julkaisurekisteri.ktm.fi/ktm_jur/ktmjur.nsf/all/6638E6EBAA886908C225701900465F55/$file/334642004.pdf > (last accessed on 8 June 2011).
[4] Finnish Government (2008), *supra note* 6, p. 40.
[5] Ministry of Trade and Industry (2005), *supra note* 23, p. 8 and 17.
[6] Small hydropower is generally defined as sites with installed capacity of less than 10 MW. European Commission, Directorate-General for Energy, Renewables make the difference, p. 19. Available on the Internet at http://ec.europa.eu/energy/publications/doc/2011_renewable_difference_en.pdf (last accessed on 16 May 2011).

conservation legislation. However, there is some potential left unprotected.[1] Nature conservation legislation will be examined below in chapter 4.3.

Table 2. Hydropower potential not in use (MW)
(Source: Ministry of Trade and Industry, 20052)

	Unprotected	Protected and transboundary waters	Altogether
Large hydropower (more than 10 MW)	375	1.033	1.408
Small hydropower (1-10 MW)	144	286	430
Micro hydropower (less than 1 MW)	144	148	292
ALTOGETHER	663	1467	2130

According to another recent study, there is 934 MW potential in hydropower that is techno-economically significant; of this amount 365 MW is unprotected and 569 MW is protected. Additionally, there is 274 MW potential in other hydropower that is worth building; this amount consists largely of small and micro hydropower. Technically worth establishing small hydropower that is unprotected is 63 MW; about forth of this is in micro level.[3] This study supports the view that the bigger part of the potential for new hydropower for electricity production is protected by the nature conservation legislation. However, there is some potential left outside the protection.

4 Hydropower legislation in Finland

4.1 The right to establish a hydropower plant

Water resources management is regulated by the Water Act (587/2011), which has recently been revised. According to Chapter 3 Section 3 of the Water Act, a permit is required for establishing a hydropower plant;[4] a permit is always required regardless of the size of the plant. A permit is required for altering an existing plant or power increases, which are quite usual. The permit authority is the Regional State Administrative Agency whose decisions may be appealed to the Vaasa Administrative Court and further to the Supreme Administrative Court.[5] There are several conditions that must be fulfilled before a permit may be granted.

The first condition is that either the plant may not hurt much public or private interest or the public or private interests will benefit significantly because of the plant compared to the disadvantages to the public or private interests that the plant would cause.[6] In the first case the plant is regarded as a minor undertaking. In the second case, a comparison between interests will be conducted; as the value of the hydropower production, the

[1] Ministry of Trade and Industry (2005), *supra note* 23, p. 2 and 26.
[2] Ministry of Trade and Industry (2005), *supra note* 23, p. 26.
[3] Finnish Energy Industries (2008), *supra note 19*, p. 177-179.
[4] Water Act (587/2011) Chapter 3 Section 3 point 6 (respectively Chapter 3 Section 2 in the former Water Act 264/1961). In addition, a hydropower plant requires a building permit according to the Section 125 of the Land Use and Building Act (132/1999).
[5] The Finnish courts of law consist of district courts dealing with criminal and civil cases, administrative courts reviewing the decisions of the authorities, and certain special courts (Market Court, Labour Court, Insurance Court and High Court of Impeachment). The decisions of the administrative courts can be appealed in the Supreme Administrative Court.
[6] Water Act (587/2011) Chapter 3 Section 4. On how to assess the public and private advantages and disadvantages, see Sections 6 and 4.

price of average annual amount of electricity produced by the plant at least twenty-folded will be taken into account.[1] Moreover, there are some overriding reasons that prevent from granting the permit, such as danger to public health or security, or substantial harmful changes in the relations of the natural environment or in the water nature.[2] [3]

Second, the applicant must have a right to use the areas needed for the plant and the project.[4] In relation to the permit decision, it is possible to decide coercive measures and compensation issues.[5]

Third, the applicant must have a right to use the hydropower on the site. That can be arranged beforehand (ownership or other right to use) or during the permit procedure (right to use common hydropower).[6] Initiative for the right to use common hydropower can be made by a party or parties together who has/have at least one fifth of the hydropower in question. Primarily, the target is to make an agreement of the common use. Secondarily, the initiative party/parties may offer other parties[7] to participate on the hydropower plant. The participation procedure is done with the assistance of the permit authority.[8] As a preliminary question, it may have to be found out who is entitled to the waterpower in question; this question is for the district court to decide, not the permit authority.[9] [10]

The permits for mills or other kind of hydropower plants have been given for the time being (not for a fixed-term). Therefore, in many cases the old permits are still valid. This situation will remain the same with the Water Act (587/2011).[11]

4.2 Right to waters

The right to waters is based on two concepts: the water material and the ground of the water area. Historical development plays a central role regarding the right to waters.

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[1] Water Act (587/2011) Chapter 8 Section 2 subsection 2 (respectively Chapter 3 Section 2 in the former Water Act 264/1961). In a recent permit decision PSY-2005-y-185 by the Northern Finland Regional State Administrative Agency, the comparison between interests was seen as following: the advantages amount to 112 million € and the disadvantages to 8.3 million € (p.316-327). Also available on the Internet at <http://www.avi.fi/fi/virastot/pohjoissuomenavi/Ymparistojavesitalousluvat/Vesiluvat/Documents/P%C3%A4%C3%A4t%C3%B6kset/2011/psavi_paatos_32_11_2-2011-05-31.pdf> (last accessed on 2 June 2011).
The decision does not have legal force yet; time for appeal is still running.

[2] Water Act (587/2011) Chapter 3 Section 4 subsection 2.

[3] See Supreme Administrative Court, case KHO 2002:86 about a hydropower plant and reservoir project in the Northern Finland. In this ”Vuotos” case, the Court ruled that there was an overriding reason that prevented from granting the permit to the project; it would have caused substantial harmful changes in the relations of the natural environment or in the water nature. The maximum area of the planned reservoir was 237 km2. This case is very important from the national point of view because for the first time the overriding reasons was used to reject a permit application by the Supreme Administrative Court.

[4] Water Act (587/2011) Chapter 3 Section 4 subsection 3 and Chapter 2 (especially Chapter 2 Sections 12 and 13).

[5] According to Section 15 of the Constitution of Finland (731/1999), everyone’s property is protected and expropriation of property is possible only for public needs and against full compensation. In connection with small and micro hydropower, one question arisen is the existence of public needs for coercive measures. It is not possible to go deeper into this issue within this paper. See more on the relation between Water Act and protection of property, Parliaments Constitution Committee (2011), Statement on the proposal for water act PeVL 61/2010, Also available on the Internet at <http://www.eduskunta.fi/faktatmp/utatmp/akxtmp/pevl_61_2010_p.shtml> (3 June 2011).

[6] Water Act (587/2011) Chapter 8 Section 2.

[7] Who own at least one hundredth part of the hydropower in question.

[8] Water Act (587/2011) Chapter 8 Sections 5, 8 and 9.

[9] About the Finnish courts of laws, see *supra note 31*.

[10] In some existing plants, the right to use hydropower is based on fixed-term agreements, which may cause problems when the agreement period is terminated. More on this issue, see Ekroos, A. (2008).

[11] Water Act (587/2011) Chapter 3 Section 8. See also Finnish Government (2009), Hallituksen esitys Eduskunnalle vesilainsäädännön uudistamiseksi HE 277/2009 (Government proposal for a Water Act), p 65.

The right to the water material may be targeted only at a water which the owner holds, in other words water in a water reservoir, well, other intake, spring, or artificial pond. In other cases the water is not owned but governed: the water with an open surface is governed by the owner of the water or land area in question.[1] Traditionally it is seen that open surface water or groundwater cannot be a subject to ownership because water is a natural resource which is continuously in circulation; this is why it is defined as governing. Governing is a special kind of right of possession that takes into account the restrictions set in the Water Act and other parties' rights to water. Governing is a priority right to use and also a limited right to dispose. The exact content of governing cannot be defined generally but case-by-case taking into account the restrictions set in the legislation and other parties' rights to the water.[2]

In Finland, the ownership of the water area is based on private ownership[3] - the leading principle is that "he owns the water, who owns the land".[4] The ownership of water areas can be sorted out to three ways. First, most of the water areas enjoy shared private ownership in which the water area belongs to several real estates nearby (common waters). This is due to historical reasons: the water area used to belong to the nearest village (so called median line principle which means that, for example, a lake between two villages is divided between the two villages by its median line) and since the Great Land Reform[5] the real estates in the village according to their share of the land in the village. Still, in most of the cases these real estates in the village enjoy a shared ownership of the water area. Second, the ownership of some water areas is private but not shared. These water areas belong to a single real estate or form a real estate of their own (so called water real estates). Third, the state owns some water areas: the high seas and the centres of large lakes (so called common water areas); there are eight such lakes in Finland.[6]

Rapids have always been in a highlighted position compared to other water areas due to the importance and financial aspects of hydropower. In the Middle Ages the ownership of a mill site could be established by claim: the claimant had to own a share of the common land in which the mill would have been situated (be a land-owner in the village) or, in some provinces, be a citizen of that province. Additional condition in both cases was that he had to intend to build a mill on the site. Building of mills was promoted because they were considered to be of public interest. Later on, in case of common mill sites[7], the land-owners in the village could build a common mill; if not all the land-owners were interested in building the mill, the court could empower the builder to do one alone[8]. The ownership of private mills could also be based on the

[1] Water Act (587/2011) Chapter 2 Section 1 (Chapter 1 Section 8 in the former Water Act 264/1961).
[2] HE 277/2009, *supra note 43*, p 46.
[3] Private ownership of water areas is defined as German-Scandinavian whereas public ownership is of Roman Law heritage. Hollo, E. (1991) 103-104.
[4] This is stated in the old Land Laws.
[5] The Great Land Reform took place between late 18th century and early 20th century. In the reform, the shared ownership of the land in villages was divided and every land-owner in the village owned his share as piece of real estate. The reform concerned only land, water areas were excluded.
[6] Laki , sisältävä määräyksiä välirajasta vedessä ja vesialueen jaosta (31/1902), Sections 1-3 and 9. See more about the right to waters Haataja, K. (1951), p. 139-236; Belinskij, A. (2010), p. 233-236;
[7] The land-owners of the village owned a share of the mill site (and its waterpower) according to their share of the land in the village.
[8] The court would set conditions, such as in which time the mill had to be build and how long the builder had the right to use the other villagers' share of the rapids. The "licence" was temporary.

ownership of a single real estate, immemorial enjoyment of a mill site, or an old judgement. Additionally, there were mills that were owned by the crown.[1] [2]

Depending on the individual case, the ownership of a mill may include the ownership of the water area in question or just the right to use the discharge and head in question; the building permit of the mill may have an indication of the character of the right to the water.[3] In the Great Land Reform,[4] generally the mills were formed to their own plots of land – either common (shared ownership by the land-owners of the village), or private – separate from other real estates in the village that were formed from the common land in the reform. However, this did not change the ownership of the rapids and the hydropower since the reform did not apply to water areas. Unless otherwise stated, the ownership of a water area, including rapids, is shared among the land-owners of the village according to their share of land in the village.[5]

There is a special rule concerning rapids situated in the water area between two villages: the owners of both sides have equal rights to the water flowing therein. This has been the situation for centuries now but this is stipulated in the Water Act (587/2011), too, concerning water areas that belong to two real estates or common land areas.[6] In these cases, the median line principle does not apply in rapids because it may be that the watercourse is not symmetrical in both banks and most of the hydropower is situated on the other side of the watercourse. That is why it is stipulated that the owners of both sides share the waterpower 50-50%.

4.3 Nature conservation aspects

Since the 1970's, the conservation of rapids has become an important issue of nature conservation. First, the protection in legal context begun in court practice.[7] Thereafter, the rapids have become subject to nature conservation by the special Rapids Conservation Act (35/1987) and two other special rapids conservation acts as well as by the general Natura 2000 nature conservation areas. Additionally rapids may be included in nature parks and wilderness areas.

The Rapids Conservation Act, given in 1987, prohibits the authorities from granting a permit for a new hydropower plant in certain water systems. In the Act, there is a list of 53 water systems or parts of water systems in which the building of a new hydropower plant is forbidden. However, the Act did not interfere with the existing plants on those water systems at the time when the Act was issued. Additionally, the river Ounasjoki is protected under the Act 703/1983 and the river Kyrönjoki under the Act 1139/1991. Consequently, these water systems or parts of water systems are excluded from new hydropower construction.

[1] In case of old mills, the ownership has been stated in the old decisions on the taxation of mills (in the 18th and 19th century).
[2] Haataja, K. (1951), p. 237-310.
[3] Building permits to mills have been required since the 17th century. Haataja, K. (1951), p. 241 and 320.
[4] About the Great Land Reform, see *supra note 48.*
[5] Haataja, K. (1951), p. 310-361 (especially p. 330).
[6] Water Act (587/2011) Chapter 2 Section 1 (respectively Chapter 1 Section 8 in the former Water Act 264/1961). HE 277/2009, *supra note 43*, p. 45.
[7] See Supreme Administrative Court (1978), milestone case KHO 1978-A-II-123, which was the first ruling that rejected a plan for constructin a hydropower plant. In this "Huopanankoski" case, the Court put weight on the beauty of the nature and other values in the landscape, the values of the cultural history around the rapids, and fishes that would be devestad. The Court stated there was no public need for the plant, and advantages of the project were not significant compared to the disadvantages.

Natura 2000 network includes areas protected by the Habitats Directive[1] and the Birds Directive[2]. According to Section 65 of the Nature Conservation Act (1096/1996), if establishing a hydropower plan is likely to have to have significant adverse effect on the ecological value of a site included in Natura 2000 network the applicant is required to conduct an appropriate assessment of its impact. The permit authority may not grant a permit to such a plant, if the assessment procedure indicates that the plant would have a significant adverse impact on the particular ecological value for the protection of which the site has been included in the Natura 2000 network.[3] Therefore, the Natura 2000 network is taken into account in the permit procedure of a hydropower plant.[4]

4.4 Other relevant legislation

Preceding the permit procedure for hydropower plants, an environmental impact assessment usually takes place. The assessment is regulated by the Act on Environmental Impact Assessment Procedure (468/1994) and the Government Decree on Environmental Impact Assessment Procedure (713/2006). The aim of the procedure is to promote the assessment of environmental impacts and their consideration in planning and decision-making as well as increase the information available to citizens and possibilities to public participation.[5]

Other relevant legislation worth pointing out concerning hydro power is the Act on Dam Security (494/2009) and the Act on Flood Risk Control (620/2010).

In general, financial support plays an important role in the promotion of energy from renewable sources. However, this is not the case concerning hydropower because of the little potential seen in its promotion and that the existing plants have succeeded in competing with other sources of energy. Still, when discussing renewable energy it is always justifiable to have a look at the subsidy system.

Legislation related to financial support for renewable energy has been totally renewed in the beginning of year 2011 and there are totally new instruments available. The Act on subsidies for electricity produced with renewable energy sources (1396/2010) introduces a feed-in tariff system to Finland from the beginning of 2011.[6] This new feed-in tariff scheme seeks primarily to increase electricity production based on wind power by 6 TWh, and on forest chips utilisation by 22 TWh. Additionally, the Act includes a fixed subsidies system for electricity production for wind power, forest chips, biogas and hydropower. The fixed subsidy system is intended to power plants which are not applicable to feed-in tariff scheme, because of power limits, or because the spent fuel. This fixed system replaced the former subsidies of the Electricity Tax Act (1260/1996).

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[1] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ 1992 L 206/7.

[2] Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds, OJ 1979 L 103/1.

[3] Nature Conservation Act (1096/1996) Sections 65 and 66. The same applies to sites that are intended for inclusion in the Natura 2000 network and to plants either individually or in combination with other projects and plans as well as plants situated inside the Natura 2000 site or outside the site in case they are liable to have a significantly harmful impact on the site.

[4] The influence of Natura 2000 network on a hydropower plant and reservoir project in the Northern Finland was among other issues under consideration in a recent and quite famous case KHO 2002:86 by the Supreme Administrative Court, *supra note 35*.

[5] Act on Environmental Impact Assessment Procedure (468/1994) Section 1.

[6] The Council of State approved on 24 March 2011, after decisions of the Commission in March, the new Government Decree (258/2011) according to which the Act came fully into force 25 March 2011.

Electricity produced with hydropower is entitled for 4.20 Euros per MWh of fixed subsidy compared to electricity produced with wind power or wood chips which is entitled for 6.90 Euros per MWh; electricity produced with biogas is treated the same way as hydropower.[1] Conditions of fixed subsidy are: 1) plant location and network connectivity meet the general requirements (e.g. located in Finland, economical qualifications) and same size requirements as the feed-in tariff production, 2) power plant is not and has not been part of the feed-in tariff system on the basis of electricity production with the same fuel, and 3) operator of the plant maintains reliable accounting of the fuels spent in the plant and its energy content, if it is possible to use different fuels in the power plant, for the calendar year. For the hydropower plants, there is a special size requirement that the total rated output of the generators may not exceed 1 MVA.[2] Therefore, only relatively small hydropower plants are eligible to subsidies.

The fixed subsidy system is based on the target price, but fixed subsidies will also be paid for those hours when the market price of electricity is negative at the power plant location.[3] There are limitations for the fixed subsidies: subsidies will not be paid if the amount of electricity produced is less than 200 MWh during the calendar year. Production volumes on plant level may vary considerably, but in practice the 200 MWh means annual production of power plants, which generator rated power is about 20-40 kVA. Neither will the subsidy be paid for electricity generated by hydropower if the market price of electricity in the calendar year exceeds the average of 76.6 Euros per MWh.[4]

5 Conclusion

In Finland, the whole potential in hydropower is about 5.100 MW: about 3.000 MW is in electricity production already, about 1.500 MW is protected by nature conservation legislation or as transboundary rivers out of reach for energy production, and around 600 MW is available for hydropower construction, in theory. In practise, of this 600 MW only half is techno-economically significant and the number small-scale hydropower worth harnessing does not add up much. These figures explain the modest potential for increase seen in electricity produced with hydropower. However, since climate change mitigation calls for all the deeds to be exploited, also further promotion of hydropower may have an influence in Finland. The question is what can be done related to the legislation concerning hydropower.

First, the hydropower plant operators feel that the permit procedure is complicated and difficult. For instance, the owners of small and micro hydropower criticise procedure to offer initiative for the right to use common hydropower and see it as a historical remains slowing down the permit procedure.[5] Consequently, the permit procedure is designed for large-scale hydropower plants, and the administrational burden may seem heavy for small-scale plants. Different scale of plants differ with their impacts on the

[1] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 30.
[2] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 31.
[3] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 33.
[4] The feed-in tariff scheme will be financed from funds within the state budget. In the 2011 budget, an appropriation of 55.35 million Euros has been approved for production subsidies under the feed-in tariff scheme. Finnish Government (2010), Hallituksen esitys Eduskunnalle laiksi uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta HE 152/2010 (Government proposal for an Act on subsidies for electricity produced with renewable energy sources), p. 28.
[5] Ministry of Trade and Industry (2005), *supra note 23*, p. 12.

environmental and nature. Therefore, a lighter procedure for small and micro hydropower would be justified and may ease their promotion.

As one example, the utilisation of small hydropower could be exempted from the permit procedure, at least in some cases; at its most unnoticeable form, micro hydropower device can be as small as a microwave oven producing electricity only locally and be comparable to solar power. Its environmental impact would probably be minimal but still, according to present legislation, it would need a permit (since a permit is always required regardless of the size of the plant) and therefore the right to use the waterpower in question. For the purposes of this kind of micro hydropower plant, it does seem as exaggeration.

Second option that would ease the use of hydropower is to loosen the nature conservation legislation at some level without risking conservation values. There are a few ways to conduct this: 1) power increases in existing plants, 2) establishing plants in protected areas which have dams for other purposes, and 3) utilisation of new micro hydropower could be accepted in the protected water systems. In all these situations, the absolute condition would be that conservation values would not be endangered.

In conclusion, in order to achieve the goals set for mitigating climate change, some amending of the traditional environmental legislation may be needed. Although subsidies are available for electricity production by hydropower and the target is in the promotion of energy from renewable sources, it seems that the traditional water legislation does not support this target. This paper shows a need for further research in the topic: an international comparative study to give insight into solutions used in other countries.

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Climate change mitigation and hydropower legislation in Finland

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Abstract:
In connection with mitigating climate change, the European Union has committed to raising the use of energy from renewable sources to 20 % of overall Community energy consumption by the year 2020. The national target set for Finland is a challenging 38 % compared to 28.5 % in 2005. A traditional form of renewable energy is hydropower. In Finland, hydropower generates about 3 to 4 % of total energy supply at the moment, depending on the yearly rainfall. The national target set for hydropower production is 14 TWh in 2020, which means an increase of 0.5 TWh from the present situation. This subtle rise would consist of capacity increases in existing power plants and small hydropower. Although Finland is described as a land of a thousand lakes and therefore rich in water resources, increasing the use of hydropower is difficult on a large scale mainly due to national nature conservation legislation: namely the rapids conservation legislation. Another characteristic in Finnish geography is the flatness of the country; concerning hydropower, the modest differences in altitude mean smaller capacity plants generally.

This paper analyses the existing environmental legislation in Finland concerning hydropower and looks at the targets for promotion of renewable energy in the light of that legislation. The paper suggests some amendments to the existing national legislation: for example, the permit procedure is designed for large-scale hydropower plants, and the administrational burden may seem heavy for small-scale plants. Therefore, a lighter procedure might ease the promotion of small hydropower. One option that would ease the use of hydropower is to loosen the nature conservation legislation at some level without risking conservation values. In conclusion, in order to achieve the goals set for mitigating climate change, some amending of the traditional environmental legislation may be needed.

Keywords:
hydropower, climate change, environmental legislation, nature conservation, water law

1 Introduction

Climate change is one of the biggest challenges facing mankind in the near future. The European Union has taken action in order to mitigate climate change: the so-called EU

20-20-20 target consists of 1) decreasing emissions by 20 %,[1] 2) improving energy efficiency by 20 %,[2] and 3) promoting the use of energy produced with renewable sources by 20 %.[3] The target is set to be accomplished by 2020. The promotion of the use of energy from renewable sources is regulated by Directive 2009/28/EC.[4] The Directive divides the average EU target into more precise national targets; for Finland, this means that by 2020 the share of energy produced with renewable sources should rise up to 38 % of the gross final consumption of energy, compared to 28.5 % in 2005. This binding target is the third highest in the EU; only Sweden exceeding it with 49 % and Latvia with 40 %.[5]

The Finnish Government has drawn up the Long-term climate and energy strategy that defines the main objectives and means for Finnish climate and energy policy in connection with the EU targets.[6] The objectives include the promotion of production and use of energy produced with renewable sources: as the strategy renews the Commission-set obligation of 38 % for renewable energy, it comments that the target is challenging and requires that energy end-use will decrease. The largest potential for promoting renewable energy is seen in wood-based energy, recovered fuels, heat pumps, biogas, and wind energy. Hydropower is described more as a steady energy provider than as a promising sector for increasing the energy production.[7]

According to the Directive 2009/28/EC, EU Member States have to draw up national renewable energy action plans (NREAPs).[8] Finland's NREAP, among other things, breaks down the target of 38 % into different sectors of renewable energy production. The main focus in increasing renewable energy is on wind power and wood-based energy; however, hydropower is also mentioned. By 2020, hydropower production will increase by 0.5 TWh to amount to 14 TWh.[9] This subtle rise will consist of capacity increases in existing power plants and small hydropower, and require no changes to the existing legislation.

Utilisation of hydropower is regulated by the Water Act (587/2011): a permit is needed for establishing and operating a hydropower plant. The Water Act has recently been revised,[10] but regulation concerning hydropower does not alter significantly from the previous Water Act (264/1961). In deciding whether it is possible to grant a permit for a hydropower plant or not, the nature conservation legislation plays a crucial role: the Rapids Conservation Act (35/1987) and the special river conservation acts (concerning rivers Ounasjoki and Kyrönjoki) as well as the Nature Conservation Act (1096/1996)

[1] Decision No 406/2009/EC of the European Parliament and of the Councilof 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020, OJ 2009 L 140/136.
[2] Communication from the Commission – Energy efficiency: delivering the 20% target, COM(2008) 772 final.
[3] Communication from the Commission to the Council and the European Parliament – Renewable Energy Road Map – Renewable Energies in the 21st Century: Building a more Sustainable Future, COM(2006)0848 final, at p. 18.
[4] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ 2009 L 140/52.
[5] Directive 2009/28/EC, *supra note* 4, Annex 1.
[6] Finnish Government (2008), Pitkän aikavälin ilmasto – ja energiastrategia – Valtioneuvoston selonteko eduskunnalle 6. päivänä marraskuuta 2008, 6 November 2008, available on the Internet at <http://www.tem.fi/files/20585/Selontekoehdotus_311008.pdf> (last accessed on 10 June 2011).
[7] Finnish Government (2008), *supra note* 6, p. 9, 36 and 40.
[8] Directive 2009/28/EC, *supra note* 4, Art. 4.
[9] The target is set regarding an average year's rainfall. Ministry of Employment and the Economy (2010), Suomen kansallinen toimintasuunnitelma uusiutuvista lähteistä peräisin olevan energian edistämisestä direktiivin 2009/28/EY mukaisesti (Finnish national renewable energy action plan (NREAP)), p. 5. Also available on the Internet at <http://www.tem.fi/files/27405/NREAP_300610_FINLAND.pdf> (last accessed on 10 June 2011).
[10] The new Water Act was accepted in Parliament on 11 March 2011 and will enter into force on 1 January 2012.

with its regulation concerning the EU Natura 2000 Network. Consequently, the small potential seen in increasing the production of hydropower is caused largely by two reasons: most of the rapids suitable for hydropower plants are already in use or protected by nature conservation legislation.

This paper is a study about hydropower legislation in relation to climate law. The paper analyses the existing environmental legislation in Finland concerning hydropower and looks at the targets for promotion of renewable energy in the light of that legislation. The paper does not examine the economical aspects of electricity production with hydropower (e.g. windfall[1] issues). Neither does the paper thoroughly examine the Finnish legal praxis related to hydropower construction – there are plenty of rulings over the years - which would be a topic of a paper on its own.

This paper starts with an overview of the Finnish energy sector and particularly the role of renewable and hydropower therein (chapter 2). Then we look at hydropower more specifically: past, present and future (chapter 3). Chapter 4 is a review of the Finnish legislation concerning hydropower. This chapter answers to the following questions: who has the right to establish a hydropower plant, on which circumstances is it possible to build such a plant, and what else needs to be taken into account in relation to hydropower. Lastly, conclusions will be made in the final chapter: how does the hydropower legislation appear in the light of climate change and targets for the promotion of energy from renewable sources.

2 Background

According to the Statistics Finland's preliminary data, the total energy consumption in Finland in 2010 was 1445 PJ (petajoules) that is 402 TWh; of this amount 87.5 TWh was electricity consumption. In 2010, 47.5 % of energy was produced with fossil fuels (oil 24.5 %, coal 12.9 %, natural gas 10.3 %), 16.5 % with nuclear power, 6.5 % with peat, 2 % with other sources, 2.5 % with net import and 25 % with renewable energy.[2] The sources of renewable energy in energy production have traditionally consisted largely on wood-based residues. In 2006, the sources of renewable energy were: 1) black liquor and other concentrated liquors from industry (42 %), 2) wood fuels from industry and energy production (26 %), 3) small combustion of wood (13 %), and 4) hydropower (11 %). Other renewable energy accounts for 8 %; this includes wood-chips, heat pumps, recovered fuel, biogas, other biofuels, and wind power.[3] [4]

Energy supply differs from electricity supply due the significance of heating (both for the domestic and industry needs) in energy production and the suitability of different sources in electricity and heat production. As the table below shows, in 2010, combined heat and power production (CHP) and nuclear power account for nearly 60 % of the electricity production leaving hydropower the share of about 15 %. Around half of the

[1] Unexpected money received which is not a direct result of something the recipient did.
[2] Statistics Finland (2011), *Energian kokonaiskulutus nousi 9 prosenttia vuonna 2010.* Available on the Internet at <http://tilastokeskus.fi/til/ehkh/2010/04/ehkh_2010_04_2011-03-29_tie_001_fi.html> (8 June 2011).
[3] Finnish Government (2008), *supra note* 6, p. 41.
[4] One special feature in the Finnish energy business is the Nordic electric power market and the existence of a Nordic power exchange, Nord Pool Spot. More information about Nord Pool Spot on the Internet at http://www.nordpoolspot.com/ (last accessed on 16 May 2011). A good overview of the Finnish energy sector, see International energy Agency (2008), Energy Policies of IEA Countries, Finland 2007 Review. Available on the Internet at <http://www.iea.org/textbase/nppdf/free/2007/finland2007.pdf> (last accessed on 8 June 2011). A good overview of energy law in Finland, see Talus, K., Guimares-Purokoski, A., Rajala, A., Huomo, L., Vesa, P., Kaijalainen, T. and Salminen, L. (2010), Energy Law in Finland.

electricity is consumed by the industry (forest industry consuming 25 %, and the other sectors being chemical, metal, and other) and half is other consumption (heating, transport, and other).[1]

Table 1. Electricity supply in Finland 2010
(Source: Finnish Energy Industries, 20112)

	TWh	Share (%)
CHP - Industry - District heating	28.5 - 11.1 - 17.4	32.6 - 12.7 - 19.9
Nuclear power	21.9	25.0
Hydropower	12.8	14.6
Wind power	0.3	0.3
Seperate	13.5	15.4
PRODUCTION	77.0	88.0
Net imports	10.5	12.0
ELECTRICITY SUPPLY	87.5	100

There is some geographical and climate information that needs to be stated about Finland. There are 187,888 lakes in Finland.[3] Although Finland is rich in water resources, the flatness of our country makes the differences in altitude very modest, which means that we have smaller capacity plants generally. The flatness also causes that possibilities to reserve the water flow are limited since the reserve would need much more horizontal space than in steep terrain. Spring floods are usual because of melting snow and, therefore, the water flow is not even throughout the year. In connection with this, the yearly rainfall varies from year to year making the prediction of water reserves difficult and causing the yearly production of electricity by hydropower vary from year to year notably. Additionally, Finland is located relatively far north in the planet Earth, and the average yearly temperature is about 1.9 ºC.[4] In the wintertime, the need for energy rises significantly due to heating. The energy supply has to be built in a way that extra energy is available when extremely cold days occur causing the so called peak loads when the energy demand is at its highest level; additionally, the extra energy is needed to assure the security of the grid. This extra energy supply is called adjustment power (in Finnish säätövoima), and hydropower is very suitable for this purpose because the extra energy is quickly available.[5] The significance of adjustment power will be emphasized further in the future as the share of wind power increases;[6] on days when there is no wind and therefore no wind power, the lack of wind power has to be replaced with another kind of energy.

[1] Finnish Energy Industries (2011), Energy Year 2010 – Electricity. Available on the Internet at <http://www.energia.fi/en/news/electricity%20year%202010.html> (last accessed on 8 June 2011).
[2] Finnish Energy Industries (2011), *supra note 15*.
[3] A lake is defined as a water area exceeding 500 square metres. http://www.ymparisto.fi/default.asp?node=8103&lan=fi
[4] Between 1971 and 2000, the average yearly temperature in Finland has been about 1.9 ºC.
[5] Finnish Energy Industries (2008), Voimaa vedestä 2007 - Selvitys vesivoiman lisäämismahdollisuuksista, p. 6. Also available on the Internet at < http://www.tem.fi/files/18565/Voimaa_vedesta_2007.pdf> (last accessed on 10 June 2011).
[6] The target is 6 TWh by 2020. Ministry of Employment and the Economy (2010), *supra note 9*, p. 2.

Although hydropower is climate-friendly as a renewable energy source it does have effects on the environment. The watercourse is not in its natural state after establishing a hydroelectric installation. This change affects the biodiversity of the watercourse and the effects are greater in case an artificial lake is founded. One of the most obvious effects is on fishes and fishing. However these effects can be reduced by using fish ladders, fish bypass systems and fish lifts (upstream) as well as fish-friendly turbines (downstream). Moreover, control of the water level has effects both on the upper and lower course: on the upper course flooding and on the lower course too little water/stream may cause harm. On the other hand, hydropower plants may be actors in controlling flood risks, which are assumed to increase due to climate change.[1]

3 Hydropower in Finland

The first hydropower plant that produced electricity nationwide was established in Finland at Imatrankoski in 1929. Till then, the hydropower plants had been smaller and produced electricity only for local use; mills have been used since the Middle Ages. The major rapids located in the Southern Finland were harnessed during 1930's and 1940's; the next few decades after the Second World War were the time of heavy increase in the hydropower capacity as the hydropower construction concentrated at the big rivers of Northern Finland.[2] After a slow phase in the 1980's, the development of hydropower generation picked up at the turn of the millennium when about 15 % of today's hydropower capacity, 3.000 MW, has been build.[3]

Nowadays, the share of hydropower in energy production varies between 3 to 4 % annually depending on the rainfall,[4] which accounts for 10 to 20 % of the electricity production. At its peak the share of electricity produced with hydropower was in the 1950's and 1960's when it accounted for 90 % of electricity at its best. In 2006, there were 207 hydropower plants in use: 57 of those plants were large (production more than 10 MW), 83 were small hydropower plants (production 1-10 MW), and 67 were so called micro hydropower plants (production less than 1 MW). On an average year's rainfall, the electricity production of these plants is 12.9 TWh: of this amount large plants account for 91 %, small hydropower 8 %, and micro hydropower 1 %.[5] [6]

As mentioned above, the current hydropower capacity in use is 3.000 MW. According to a recent study, the whole potential in hydropower is about 5.100 MW; this number includes the hydropower in use and the potential. The potential consists of both water systems that are protected and unprotected; the potential can be divided to large, small and micro hydropower, as well. As can be seen in the table below, the largest potential in Finland for hydropower is situated in waters that are protected by the nature

[1] More information about the environmental consequences of hydro power, see for instance Pienvesivoimayhdistys ry. (2009), Pienvesivoimalaopas, p. 18, also available on the Internet at < http://server.perlasoft.fi/vesivoima/images/Pienvesivoimaopas.pdf> (last accessed on 10 June 2011); Finnish Energy Indistries (2008), *supra note 19*, p. 38-41.
[2] Salokangas, R. (1968), p. 14-17.
[3] During 1990 and 2004, 444 MW of new hydropower (including new plants and capacity increases in existing power plants) was established in Finland. Ministry of Trade and Industry (nowadays Ministry of Employment and the Economy) (2005), Vesivoimatuotannon määrä ja lisäämismahdollisuudet Suomessa, *p. 9.* Available on the Internet at <http://julkaisurekisteri.ktm.fi/ktm_jur/ktmjur.nsf/all/6638E6EBAA886908C225701900465F55/$file/334642004.pdf > (last accessed on 8 June 2011).
[4] Finnish Government (2008), *supra note* 6, p. 40.
[5] Ministry of Trade and Industry (2005), *supra note* 23, p. 8 and 17.
[6] Small hydropower is generally defined as sites with installed capacity of less than 10 MW. European Commission, Directorate-General for Energy, Renewables make the difference, p. 19. Available on the Internet at http://ec.europa.eu/energy/publications/doc/2011_renewable_difference_en.pdf (last accessed on 16 May 2011).

conservation legislation. However, there is some potential left unprotected.[1] Nature conservation legislation will be examined below in chapter 4.3.

Table 2. Hydropower potential not in use (MW)
(Source: Ministry of Trade and Industry, 20052)

	Unprotected	Protected and transboundary waters	Altogether
Large hydropower (more than 10 MW)	375	1.033	1.408
Small hydropower (1-10 MW)	144	286	430
Micro hydropower (less than 1 MW)	144	148	292
ALTOGETHER	663	1467	2130

According to another recent study, there is 934 MW potential in hydropower that is techno-economically significant; of this amount 365 MW is unprotected and 569 MW is protected. Additionally, there is 274 MW potential in other hydropower that is worth building; this amount consists largely of small and micro hydropower. Technically worth establishing small hydropower that is unprotected is 63 MW; about forth of this is in micro level.[3] This study supports the view that the bigger part of the potential for new hydropower for electricity production is protected by the nature conservation legislation. However, there is some potential left outside the protection.

4 Hydropower legislation in Finland

4.1 The right to establish a hydropower plant

Water resources management is regulated by the Water Act (587/2011), which has recently been revised. According to Chapter 3 Section 3 of the Water Act, a permit is required for establishing a hydropower plant;[4] a permit is always required regardless of the size of the plant. A permit is required for altering an existing plant or power increases, which are quite usual. The permit authority is the Regional State Administrative Agency whose decisions may be appealed to the Vaasa Administrative Court and further to the Supreme Administrative Court.[5] There are several conditions that must be fulfilled before a permit may be granted.

The first condition is that either the plant may not hurt much public or private interest or the public or private interests will benefit significantly because of the plant compared to the disadvantages to the public or private interests that the plant would cause.[6] In the

[1] Ministry of Trade and Industry (2005), *supra note* 23, p. 2 and 26.
[2] Ministry of Trade and Industry (2005), *supra note* 23, p. 26.
[3] Finnish Energy Industries (2008), *supra note 19*, p. 177-179.
[4] Water Act (587/2011) Chapter 3 Section 3 point 6 (respectively Chapter 3 Section 2 in the former Water Act 264/1961). In addition, a hydropower plant requires a building permit according to the Section 125 of the Land Use and Building Act (132/1999).
[5] The Finnish courts of law consist of district courts dealing with criminal and civil cases, administrative courts reviewing the decisions of the authorities, and certain special courts (Market Court, Labour Court, Insurance Court and High Court of Impeachment). The decisions of the administrative courts can be appealed in the Supreme Administrative Court.
[6] Water Act (587/2011) Chapter 3 Section 4. On how to assess the public and private advantages and disadvantages, see Sections 6 and 4.

first case the plant is regarded as a minor undertaking. In the second case, a comparison between interests will be conducted; as the value of the hydropower production, the price of average annual amount of electricity produced by the plant at least twenty-folded will be taken into account.[1] Moreover, there are some overriding reasons that prevent from granting the permit, such as danger to public health or security, or substantial harmful changes in the relations of the natural environment or in the water nature.[2] [3]

Second, the applicant must have a right to use the areas needed for the plant and the project.[4] In relation to the permit decision, it is possible to decide coercive measures and compensation issues.[5]

Third, the applicant must have a right to use the hydropower on the site. That can be arranged beforehand (ownership or other right to use) or during the permit procedure (right to use common hydropower).[6] Initiative for the right to use common hydropower can be made by a party or parties together who has/have at least one fifth of the hydropower in question. Primarily, the target is to make an agreement of the common use. Secondarily, the initiative party/parties may offer other parties[7] to participate on the hydropower plant. The participation procedure is done with the assistance of the permit authority.[8] As a preliminary question, it may have to be found out who is entitled to the waterpower in question; this question is for the district court to decide, not the permit authority.[9] [10]

The permits for mills or other kind of hydropower plants have been given for the time being (not for a fixed-term). Therefore, in many cases the old permits are still valid. This situation will remain the same with the Water Act (587/2011).[11]

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[1] Water Act (587/2011) Chapter 8 Section 2 subsection 2 (respectively Chapter 3 Section 2 in the former Water Act 264/1961). In a recent permit decision PSY-2005-y-185 by the Northern Finland Regional State Administrative Agency, the comparison between interests was seen as following: the advantages amount to 112 million € and the disadvantages to 8.3 million € (p.316-327). Also available on the Internet at <http://www.avi.fi/fi/virastot/pohjoissuomenavi/Ymparistojavesitalousluvat/Vesiluvat/Documents/P%C3%A4%C3%A4t%C3%B6kset/2011/psavi_paatos_32_11_2-2011-05-31.pdf> (last accessed on 2 June 2011).
The decision does not have legal force yet; time for appeal is still running.

[2] Water Act (587/2011) Chapter 3 Section 4 subsection 2.

[3] See Supreme Administrative Court, case KHO 2002:86 about a hydropower plant and reservoir project in the Northern Finland. In this ”Vuotos” case, the Court ruled that there was an overriding reason that prevented from granting the permit to the project; it would have caused substantial harmful changes in the relations of the natural environment or in the water nature. The maximum area of the planned reservoir was 237 km2. This case is very important from the national point of view because for the first time the overriding reasons was used to reject a permit application by the Supreme Administrative Court.

[4] Water Act (587/2011) Chapter 3 Section 4 subsection 3 and Chapter 2 (especially Chapter 2 Sections 12 and 13).

[5] According to Section 15 of the Constitution of Finland (731/1999), everyone’s property is protected and expropriation of property is possible only for public needs and against full compensation. In connection with small and micro hydropower, one question arisen is the existence of public needs for coercive measures. It is not possible to go deeper into this issue within this paper. See more on the relation between Water Act and protection of property, Parliaments Constitution Committee (2011), Statement on the proposal for water act PeVL 61/2010, Also available on the Internet at <http://www.eduskunta.fi/faktatmp/utatmp/akxtmp/pevl_61_2010_p.shtml> (3 June 2011).

[6] Water Act (587/2011) Chapter 8 Section 2.

[7] Who own at least one hundredth part of the hydropower in question.

[8] Water Act (587/2011) Chapter 8 Sections 5, 8 and 9.

[9] About the Finnish courts of laws, see *supra note 31*.

[10] In some existing plants, the right to use hydropower is based on fixed-term agreements, which may cause problems when the agreement period is terminated. More on this issue, see Ekroos, A. (2008).

[11] Water Act (587/2011) Chapter 3 Section 8. See also Finnish Government (2009), Hallituksen esitys Eduskunnalle vesilainsäädännön uudistamiseksi HE 277/2009 (Government proposal for a Water Act), p 65.

4.2 Right to waters

The right to waters is based on two concepts: the water material and the ground of the water area. Historical development plays a central role regarding the right to waters.

The right to the water material may be targeted only at a water which the owner holds, in other words water in a water reservoir, well, other intake, spring, or artificial pond. In other cases the water is not owned but governed: the water with an open surface is governed by the owner of the water or land area in question.[1] Traditionally it is seen that open surface water or groundwater cannot be a subject to ownership because water is a natural resource which is continuously in circulation; this is why it is defined as governing. Governing is a special kind of right of possession that takes into account the restrictions set in the Water Act and other parties' rights to water. Governing is a priority right to use and also a limited right to dispose. The exact content of governing cannot be defined generally but case-by-case taking into account the restrictions set in the legislation and other parties' rights to the water.[2]

In Finland, the ownership of the water area is based on private ownership[3] - the leading principle is that "he owns the water, who owns the land".[4] The ownership of water areas can be sorted out to three ways. First, most of the water areas enjoy shared private ownership in which the water area belongs to several real estates nearby (common waters). This is due to historical reasons: the water area used to belong to the nearest village (so called median line principle which means that, for example, a lake between two villages is divided between the two villages by its median line) and since the Great Land Reform[5] the real estates in the village according to their share of the land in the village. Still, in most of the cases these real estates in the village enjoy a shared ownership of the water area. Second, the ownership of some water areas is private but not shared. These water areas belong to a single real estate or form a real estate of their own (so called water real estates). Third, the state owns some water areas: the high seas and the centres of large lakes (so called common water areas); there are eight such lakes in Finland.[6]

Rapids have always been in a highlighted position compared to other water areas due to the importance and financial aspects of hydropower. In the Middle Ages the ownership of a mill site could be established by claim: the claimant had to own a share of the common land in which the mill would have been situated (be a land-owner in the village) or, in some provinces, be a citizen of that province. Additional condition in both cases was that he had to intend to build a mill on the site. Building of mills was promoted because they were considered to be of public interest. Later on, in case of common mill sites[7], the land-owners in the village could build a common mill; if not all the land-owners were interested in building the mill, the court could empower the

[1] Water Act (587/2011) Chapter 2 Section 1 (Chapter 1 Section 8 in the former Water Act 264/1961).
[2] HE 277/2009, *supra note 43*, p 46.
[3] Private ownership of water areas is defined as German-Scandinavian whereas public ownership is of Roman Law heritage. Hollo, E. (1991) 103-104.
[4] This is stated in the old Land Laws.
[5] The Great Land Reform took place between late 18th century and early 20th century. In the reform, the shared ownership of the land in villages was divided and every land-owner in the village owned his share as piece of real estate. The reform concerned only land, water areas were excluded.
[6] Laki , sisältävä määräyksiä välirajasta vedessä ja vesialueen jaosta (31/1902), Sections 1-3 and 9. See more about the right to waters Haataja, K. (1951), p. 139-236; Belinskij, A. (2010), p. 233-236;
[7] The land-owners of the village owned a share of the mill site (and its waterpower) according to their share of the land in the village.

builder to do one alone[1]. The ownership of private mills could also be based on the ownership of a single real estate, immemorial enjoyment of a mill site, or an old judgement. Additionally, there were mills that were owned by the crown.[2] [3]

Depending on the individual case, the ownership of a mill may include the ownership of the water area in question or just the right to use the discharge and head in question; the building permit of the mill may have an indication of the character of the right to the water.[4] In the Great Land Reform,[5] generally the mills were formed to their own plots of land – either common (shared ownership by the land-owners of the village), or private – separate from other real estates in the village that were formed from the common land in the reform. However, this did not change the ownership of the rapids and the hydropower since the reform did not apply to water areas. Unless otherwise stated, the ownership of a water area, including rapids, is shared among the land-owners of the village according to their share of land in the village.[6]

There is a special rule concerning rapids situated in the water area between two villages: the owners of both sides have equal rights to the water flowing therein. This has been the situation for centuries now but this is stipulated in the Water Act (587/2011), too, concerning water areas that belong to two real estates or common land areas.[7] In these cases, the median line principle does not apply in rapids because it may be that the watercourse is not symmetrical in both banks and most of the hydropower is situated on the other side of the watercourse. That is why it is stipulated that the owners of both sides share the waterpower 50-50%.

4.3 Nature conservation aspects

Since the 1970's, the conservation of rapids has become an important issue of nature conservation. First, the protection in legal context begun in court practice.[8] Thereafter, the rapids have become subject to nature conservation by the special Rapids Conservation Act (35/1987) and two other special rapids conservation acts as well as by the general Natura 2000 nature conservation areas. Additionally rapids may be included in nature parks and wilderness areas.

The Rapids Conservation Act, given in 1987, prohibits the authorities from granting a permit for a new hydropower plant in certain water systems. In the Act, there is a list of 53 water systems or parts of water systems in which the building of a new hydropower plant is forbidden. However, the Act did not interfere with the existing plants on those water systems at the time when the Act was issued. Additionally, the river Ounasjoki is protected under the Act 703/1983 and the river Kyrönjoki under the Act 1139/1991.

[1] The court would set conditions, such as in which time the mill had to be build and how long the builder had the right to use the other villagers' share of the rapids. The "licence" was temporary.
[2] In case of old mills, the ownership has been stated in the old decisions on the taxation of mills (in the 18th and 19th century).
[3] Haataja, K. (1951), p. 237-310.
[4] Building permits to mills have been required since the 17th century. Haataja, K. (1951), p. 241 and 320.
[5] About the Great Land Reform, see *supra note 48.*
[6] Haataja, K. (1951), p. 310-361 (especially p. 330).
[7] Water Act (587/2011) Chapter 2 Section 1 (respectively Chapter 1 Section 8 in the former Water Act 264/1961). HE 277/2009, *supra note 43*, p. 45.
[8] See Supreme Administrative Court (1978), milestone case KHO 1978-A-II-123, which was the first ruling that rejected a plan for constructin a hydropower plant. In this "Huopanankoski" case, the Court put weight on the beauty of the nature and other values in the landscape, the values of the cultural history around the rapids, and fishes that would be devestad. The Court stated there was no public need for the plant, and advantages of the project were not significant compared to the disadvantages.

Consequently, these water systems or parts of water systems are excluded from new hydropower construction.

Natura 2000 network includes areas protected by the Habitats Directive[1] and the Birds Directive[2]. According to Section 65 of the Nature Conservation Act (1096/1996), if establishing a hydropower plan is likely to have to have significant adverse effect on the ecological value of a site included in Natura 2000 network the applicant is required to conduct an appropriate assessment of its impact. The permit authority may not grant a permit to such a plant, if the assessment procedure indicates that the plant would have a significant adverse impact on the particular ecological value for the protection of which the site has been included in the Natura 2000 network.[3] Therefore, the Natura 2000 network is taken into account in the permit procedure of a hydropower plant.[4]

4.4 Other relevant legislation

Preceding the permit procedure for hydropower plants, an environmental impact assessment usually takes place. The assessment is regulated by the Act on Environmental Impact Assessment Procedure (468/1994) and the Government Decree on Environmental Impact Assessment Procedure (713/2006). The aim of the procedure is to promote the assessment of environmental impacts and their consideration in planning and decision-making as well as increase the information available to citizens and possibilities to public participation.[5]

Other relevant legislation worth pointing out concerning hydro power is the Act on Dam Security (494/2009) and the Act on Flood Risk Control (620/2010).

In general, financial support plays an important role in the promotion of energy from renewable sources. However, this is not the case concerning hydropower because of the little potential seen in its promotion and that the existing plants have succeeded in competing with other sources of energy. Still, when discussing renewable energy it is always justifiable to have a look at the subsidy system.

Legislation related to financial support for renewable energy has been totally renewed in the beginning of year 2011 and there are totally new instruments available. The Act on subsidies for electricity produced with renewable energy sources (1396/2010) introduces a feed-in tariff system to Finland from the beginning of 2011.[6] This new feed-in tariff scheme seeks primarily to increase electricity production based on wind power by 6 TWh, and on forest chips utilisation by 22 TWh. Additionally, the Act includes a fixed subsidies system for electricity production for wind power, forest chips, biogas and hydropower. The fixed subsidy system is intended to power plants which are not applicable to feed-in tariff scheme, because of power limits, or because the spent

[1] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ 1992 L 206/7.
[2] Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds, OJ 1979 L 103/1.
[3] Nature Conservation Act (1096/1996) Sections 65 and 66. The same applies to sites that are intended for inclusion in the Natura 2000 network and to plants either individually or in combination with other projects and plans as well as plants situated inside the Natura 2000 site or outside the site in case they are liable to have a significantly harmful impact on the site.
[4] The influence of Natura 2000 network on a hydropower plant and reservoir project in the Northern Finland was among other issues under consideration in a recent and quite famous case KHO 2002:86 by the Supreme Administrative Court, *supra note 35*.
[5] Act on Environmental Impact Assessment Procedure (468/1994) Section 1.
[6] The Council of State approved on 24 March 2011, after decisions of the Commission in March, the new Government Decree (258/2011) according to which the Act came fully into force 25 March 2011.

fuel. This fixed system replaced the former subsidies of the Electricity Tax Act (1260/1996).

Electricity produced with hydropower is entitled for 4.20 Euros per MWh of fixed subsidy compared to electricity produced with wind power or wood chips which is entitled for 6.90 Euros per MWh; electricity produced with biogas is treated the same way as hydropower.[1] Conditions of fixed subsidy are: 1) plant location and network connectivity meet the general requirements (e.g. located in Finland, economical qualifications) and same size requirements as the feed-in tariff production, 2) power plant is not and has not been part of the feed-in tariff system on the basis of electricity production with the same fuel, and 3) operator of the plant maintains reliable accounting of the fuels spent in the plant and its energy content, if it is possible to use different fuels in the power plant, for the calendar year. For the hydropower plants, there is a special size requirement that the total rated output of the generators may not exceed 1 MVA.[2] Therefore, only relatively small hydropower plants are eligible to subsidies.

The fixed subsidy system is based on the target price, but fixed subsidies will also be paid for those hours when the market price of electricity is negative at the power plant location.[3] There are limitations for the fixed subsidies: subsidies will not be paid if the amount of electricity produced is less than 200 MWh during the calendar year. Production volumes on plant level may vary considerably, but in practice the 200 MWh means annual production of power plants, which generator rated power is about 20-40 kVA. Neither will the subsidy be paid for electricity generated by hydropower if the market price of electricity in the calendar year exceeds the average of 76.6 Euros per MWh.[4]

5 Conclusion

In Finland, the whole potential in hydropower is about 5.100 MW: about 3.000 MW is in electricity production already, about 1.500 MW is protected by nature conservation legislation or as transboundary rivers out of reach for energy production, and around 600 MW is available for hydropower construction, in theory. In practise, of this 600 MW only half is techno-economically significant and the number small-scale hydropower worth harnessing does not add up much. These figures explain the modest potential for increase seen in electricity produced with hydropower. However, since climate change mitigation calls for all the deeds to be exploited, also further promotion of hydropower may have an influence in Finland. The question is what can be done related to the legislation concerning hydropower.

First, the hydropower plant operators feel that the permit procedure is complicated and difficult. For instance, the owners of small and micro hydropower criticise procedure to offer initiative for the right to use common hydropower and see it as a historical remains slowing down the permit procedure.[5] Consequently, the permit procedure is designed for large-scale hydropower plants, and the administrational burden may seem heavy for

[1] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 30.
[2] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 31.
[3] Act on subsidies for electricity produced with renewable energy sources (1396/2010), Section 33.
[4] The feed-in tariff scheme will be financed from funds within the state budget. In the 2011 budget, an appropriation of 55.35 million Euros has been approved for production subsidies under the feed-in tariff scheme. Finnish Government (2010), Hallituksen esitys Eduskunnalle laiksi uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta HE 152/2010 (Government proposal for an Act on subsidies for electricity produced with renewable energy sources), p. 28.
[5] Ministry of Trade and Industry (2005), *supra note 23*, p. 12.

small-scale plants. Different scale of plants differ with their impacts on the environmental and nature. Therefore, a lighter procedure for small and micro hydropower would be justified and may ease their promotion.

As one example, the utilisation of small hydropower could be exempted from the permit procedure, at least in some cases; at its most unnoticeable form, micro hydropower device can be as small as a microwave oven producing electricity only locally and be comparable to solar power. Its environmental impact would probably be minimal but still, according to present legislation, it would need a permit (since a permit is always required regardless of the size of the plant) and therefore the right to use the waterpower in question. For the purposes of this kind of micro hydropower plant, it does seem as exaggeration.

Second option that would ease the use of hydropower is to loosen the nature conservation legislation at some level without risking conservation values. There are a few ways to conduct this: 1) power increases in existing plants, 2) establishing plants in protected areas which have dams for other purposes, and 3) utilisation of new micro hydropower could be accepted in the protected water systems. In all these situations, the absolute condition would be that conservation values would not be endangered.

In conclusion, in order to achieve the goals set for mitigating climate change, some amending of the traditional environmental legislation may be needed. Although subsidies are available for electricity production by hydropower and the target is in the promotion of energy from renewable sources, it seems that the traditional water legislation does not support this target. This paper shows a need for further research in the topic: an international comparative study to give insight into solutions used in other countries.

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Nuclear Power: Ecologically Sustainable or Energy Hot Potato? A case study

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Abstract:

> "Man is here only for a limited time, and he borrows the natural resources of water, land and air from his children who carry on his cultural heritage to the end of time. One must hand over the stewardship of his natural resources to the future generations in the same condition, if not as close to the one that existed when his generation was entrusted to be the caretaker."
>
> (Delano Saluskin, 1991)

We are now facing the prospect of fossil fuels running out. The magnitude of the hydrocarbon resource gap, lack of significant alternative energy sources and disastrous impact on society of energy shortfalls leave few choices. Any gap between supply and demand must be met through increased efficiency or increased nuclear/renewable energy production. With the proposed development of 10 nuclear power stations providing 16GW of new capacity, the government appears committed to obtaining a significant percentage of the country's energy from this source. The sustainability of this power source in comparison to other forms of low carbon energy is of paramount importance.

The World Nuclear Association stated: '[nuclear power] is robust from a sustainable development perspective …' Using the basic pillars of sustainable development (economic, environmental and social) this paper examines this statement using the proposed reactors at Hinkley Point, Somerset and Oldbury, (South Gloucestershire), as a case study.

EDF Energy plans to develop two new reactors at Hinkley Point with forecasted construction costs in excess of £9bn to produce a capacity of 3.2GW. The Company believes this will boost the regional economy by over £500m, particularly through job creation, during the construction period and beyond. Horizon Nuclear Power is to invest £15bn to produce a capacity of 6 GW and again positively impact on the regional economy.

These nuclear power stations will be located on the Severn Estuary, and thus enabling the abstraction of seawater for the cooling process. However, water is then returned to the sea at a 'slightly raised temperature'. Even small increases in temperature can create fluctuations in environmental conditions enabling the establishment of invasive/non-native or eurybiontic species that can rapidly colonise and threaten marine and coastal biodiversity.

Studies have also shown a decline in phytoplankton and zooplankton abundance close to the discharged water with possible impacts upon the wider food chain and overall ecosystem services.

Highly uncertain decommissioning and waste disposal costs are of key public and governmental concern when assessing the relative competitiveness and sustainability of nuclear power against other forms of low carbon energy. The Nuclear Decommissioning Authority shows current discounted decommissioning and clean-up liabilities for existing nuclear facilities of over £45bn. If sufficient provision for costs of decommissioning waste from the new proposed nuclear facilities are not properly provided for, the burden will fall on the taxpayer (either directly or indirectly).

The key issue here is to ensure that nuclear energy is truly sustainable and not simply shifting the economic and environmental burden of responsibility onto future generations to satisfy short-term political energy objectives.

Keywords:
nuclear power, sustainable development, thermal pollution, economics, intergenerational equity.

1 Introduction

Given the move to low carbon technologies in order to mitigate the effects of climate change (with nuclear generation currently reducing carbon emissions by 7-14%) (DECC,2011), the UK plans to invest heavily in nuclear power, with the impact on the Severn region now to be significant, following the rejection of the Severn Tidal Barrage scheme. However, there is currently a great deal of uncertainty and debate over the likely costs of expanding the UK's nuclear electricity generating capacity. Aside from the ecological and legal issues surrounding the building and operation of new nuclear facilities, economic considerations are very much to the fore, for the energy companies themselves, the government and the region.

The energy companies involved in new nuclear development in the Severn area are keen to promote the regional economic benefits from the schemes. Job creation and impact on the regional economy are seen as being key benefits. Horizon Nuclear Power state that 800 permanent jobs will be created at Oldbury (South Gloucestershire) during operation and a peak of 5000 jobs during construction(Horizon,2011). Hinkley C. (Somerset) is projected to provide "£100m of economic benefit for the regional economy during every year of construction" and "£40m per year in economic benefit for every year of the site's 60 year operation" (EDF Energy,2011a). EDF Energy reveals that 700 permanent and 200 contract staff will be required during the operation of Hinkley C. Furthermore, forecasts suggest a peak construction workforce of 5600, with 20,000-25,000 individual jobs being created over the 10 year construction period, with up to ¼ of these going to local people. To further support the local workforce, the company is to invest £6.1m in local colleges to help train potential employees and

create more new apprenticeships to provide 200 of the technicians required by the new power station. The company also has plans to establish a £20m community fund to be spent on local projects (EDF Energy, 2010).

The modern concept of sustainability has its roots in the technique of forest management practised by central European foresters in the eighteenth and nineteenth centuries (Schutt,1992). It was fundamentally an economic management technique and was not inspired by ecological or biological considerations (Schutt, 1992). The current definition of sustainable development is as much concerned with economic and social development as it is with environmental protection (Brundtland, 1987). According to Brundtland sustainable development (SD) is a process of transformation which, by combining economic growth with broader social and cultural changes, enables individuals to realise their full potential. This dimension of sustainability brings with it the recognition that development must adhere to the physical constraints imposed by ecosystems, so that environmental considerations have to be embedded in all sectors and policy areas. Sustainable development was one of many issues discussed by the International Court of Justice in the Danube Dam case (The Gabcikovo-Nagymaros(1998). In this case Judge Weeramantry in his dissenting opinion argued that the principle of sustainable development had already become part of modern international law and practice, however the court in its infinite wisdom stated that the 'concept of sustainable development' was one which expressed the need to reconcile economic development with the protection of the environment.

The EU incorporated the principle of sustainable development into Article 2 of the Treaty on European Union provided that the Community "shall have as [one of its tasks]…to promote throughout the Community harmonious, balanced and sustainable development of economic activities(Treaty of Amsterdam,1997), and Article 6 provides "Environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities referred to in Article 3, with a view to promoting sustainable development"(Treaty of Amsterdam,1997). The Lisbon Treaty made this commitment stronger and the new Article 3 provides that "Union shall…work for the sustainable development of Europe…" indicating that strengthened sustainable governance is in place (Treaty of Lisbon,2007). In the UK the definition changed, from a trade off between the economy and the environment (DEFRA,1994) in 1994, to 2005 where the definition expanded to incorporate five guiding principles (Five principles include living within environmental limits, just society, sustainable economy, good governance and sound science). The effectiveness of UK sustainable development legislation however remains questionable, and none go as far as to impose a duty to achieve sustainable development. For example it is questionable to what extent the legal duty in the Planning and Compulsory Purchase Act 2004 Section 39(2) which requires all plan making bodies to exercise their function '*with the objective of contributing to the achievement of sustainable development*' has any real content or value. However, the non-binding wording allows a great deal of discretion.

Sustainable development has been incorporated into national law in India, through the Vellore Citizens' Welfare case(Vellore Citizens' Welfare Forum v Union of India AIR [1996]) and in Sri Lanka through the Eppawela case(Bulankulama and Others v Secretary, Ministry of Industrial Development and Others SLR [2000]) and could under certain circumstances be said impose duties and obligations on public and private bodies (Razzaque,2002). This development, further suggests that the issue of the needs of the current generation and those of future generations are central to the Brundtland definition of sustainable development (Rauschmayer, *et al*., 2011). Needs can be

distinguishable from preferences as they are considered the very minimum necessary for the survival of a species i.e. food, clean air and water and shelter a tolerable climate. There is however considerable debate about what we really 'need' (Redclift,1993). The problem is further compounded when we engage in judging the needs of the future generations owing to the fact that what is valued by one generation will not necessarily be held in the same esteem in the preceding generation (Bell, & McGillivray, 2008) .

In this context nuclear technology can amongst other things contribute significantly to the creation of a steady and abundant supply of electrical energy. It is suggested that electricity generated from the use of nuclear power satisfies the economic and environmental protection goals of the Rio Principles (Joskow,2009). Furthermore the energy aspect of nuclear power has links with the three dimensions of sustainable development – economic, environmental, and social. Energy services are fundamental for economic and social development. As energy use will continue to grow, its health and environmental impacts will have to be controlled, alleviated or mitigated in order to achieve sustainable development goals.

In a bid to establish nuclear energy as the solution to UK's the energy problem, the government in 2010(Cabinet Office,July-2009) rebranded nuclear energy as a means of delivering a sustainable energy supply which mapped on to the internationally agreed Millennium Development Goals(UN Millennium Development Goals). To truly appreciate this aspect of nuclear energy we will analyse its environmental and economic implications.

2 Environmental Implications

The environmental concerns over nuclear power, such as the difficulties with the disposal of intermediate and high level waste, are well documented and it is beyond the scope of this work to address all these issues. However, a significant and little considered area of concern that could call into question the 'sustainability' of nuclear power is the 'death by a thousand cuts' ecological impact from the new power stations. The cumulative impacts of a small number of 'minor adverse' or 'moderate adverse' impacts (EDF, 2011b) combined over the operational lifetime of the power station could, ultimately, result in major adverse impact.

The consultation process for the Hinkley Point C (HPC) power station finished on 28 March 2011 (EDF, 2011b). As one of the statutory consultees, the Environment Agency (EA) provided a detailed response to the proposal and, in particular, addressed a number of ecological concerns (EA, 2011). These focussed upon three key areas of the main HPC development.

The locations considered for the intake and outflow pipes are shown in fig. 1. EDF (2011)b advised their preferred configuration to be intake at point A and outflow at point B. It is anticipated that the intake rate will be 'low velocity' at 120cumecs. Temperature of the discharged water will be raised by 12.5^{o}C. The locations for the intake and outflow pipes represent the least damaging option. However, the Environment Agency (EA, 2011) expressed concern about a lack of appropriate assessment of the impact from the thermal plume particularly modelling in different conditions for example a 'hot summer'. They require further studies to be undertaken and reviewed by the EA prior to a planning application being submitted.

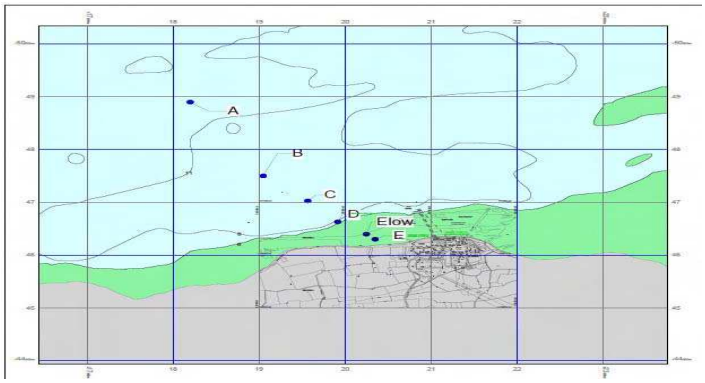

Fig. 1 Proposed locations for intake / outflow pipes (Source: Forster, *et al.*, 2011).

The thermal plume will have an impact upon the species assemblage within the Severn Estuary with warmer water loving fish, such as bass, thriving and colder water species, for example cod, moving away from the area (Forster et al. 2011). There is no mention within either the EDF (EDF,2011b) assessment or the Environment Agency (EA, 2011) response as to the potential for invasive / non-native species to colonise the area. There are no definitive criteria for determining whether a non-native species will become invasive. It is possible that the niche created by a cold-water species moving away could provide an ideal opportunity for a non-native species already present within the ecosystem to exploit (DEFRA 2011).

The BEEMS (Forster et al. 2011) study highlighted the likely impacts from cooling water discharge without biocide and discharge with biocide (likely hydrazine). There are no studies, as yet, into the impact of this chemical on the marine environment within the Severn Estuary. The Environment Agency has recommended further study (EA,2011).

2.1 Fish impingement / entrainment

It is this aspect of the nuclear power plant development that could, potentially, result in significant impact on the marine ecology of the Severn Estuary. Again, the Environment Agency expressed concerned over a lack robust survey methodology used by EDF to establish likely impact. They note that only using a beam trawl would not have sufficiently sampled the marine environment and would have missed those species present in the water column. Although it is acknowledged that the turbidity of the water within the Severn Estuary results in limited commercial fishing activity, the population of eel within the area is significant. It is reported that 95% of elver catch in the UK comes from the Severn Estuary (EA, 2011).

3 Relevant International, EU and UK Legal Instruments

There are several International, European and National legislation that need to be taken into considered in relation to the proposed developments. These can be broken down into preventive and sanctioning legislation (Ginige,2002) and have been considered in depth in the April 2011 report produced by EDF Energy(EDF, April 2011). It is suggested that the majority of legislation can be adhered to with appropriate monitoring(EDF,2011b) by regulatory agencies. However it is suggested that there may be issues with regard to the Eel Regulations of 2010(SI 2009 No. 3344) and EU Habitats Directive(Dir.92/43/EEC (1992).

The European Eel Regulations 2010(COUNCIL REGULATION (EC) No 1100/2007) state that it is a requirement that mitigation is in place at the intake point for power stations to prevent impingement by eel. The European Eel has also been placed on the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES),1973) register thereby adding a further level of protection for this species (E A, 2011). In addition, the impact on the marine food web of impingement / entrainment of smaller species, for example the brown shrimp (*Crangon crangon*) have not been assessed. Significant destruction of populations of these species could have impacts upon the ecosystem within the region and the possible further decline of protected species, for example Allis shad (Forster et al. 2011).

The Environment Agency (2011) subsequently supported the inclusion of a fish return device within the intake / outflow system for HPC. However, they require further details of the location of the fish return to ensure it is not within the vicinity of the thermal outflow (Payne, 2011).

3.1 Cumulative Impacts

The European Commission published a booklet titled *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive92/43/EEC* in 2000(European Commission, 2000), giving detailed guidance on Articles 6(3) and (4) (European Commission, 2001) in 2001 and in 2007 a guidance document on Article 6(4)((European Commission, 2007) which was intended to 'further develop and replace' the section on Article 6(4) of the booklet of 2000((European Commission, 2007). The main aim of these documents was to ensure a coherent application of the Directive's provisions at national, regional and local level. Thus contributing to the establishment of sound management of the Natura 2000 network.

Habitats Directive attempts to ensure that those habitats that come under its jurisdiction per Article 6 are not significantly affected by plans or projects. Therefore, such plans or projects should not normally be authorised (Article 6(3)). The provisions of Article 6(4), which provide for compensatory measures, constitute an exception to those of Article 6(3) and must therefore be interpreted restrictively(European Commission, 2000), (European Commission, 2007). Thus in the context of Article 6(4), the question that needs to be asked is whether a plan or a project is likely to have a significant effect on the site concerned within Article 6(3) of Directive 92/43. Whenever the responsible authorities consider it probable that there might be a significant effect, they have to make an assessment. The requirement for an appropriate assessment of the implications of a plan or project is that there is a probability or a risk(Case C-127/02 *Waddenvereniging* [2004]at 43) that the latter will have significant effects on the site concerned(Case C-127/02 *Waddenvereniging* [2004]at 44). Furthermore any reasonable scientific doubt as to the absence of adverse effects on the integrity of the site must be removed *for authorisation to be given*(Case C-127/02 *Waddenvereniging* [2004]at 59) and Case *C-239/04 Commission v Portugal* [2006] at 31). In order to determine whether there is likely to be a significant effect, an appropriate assessment has to be made, according to Article 6(3) of Directive 92/43. The assessment under Article 6(3) of Directive 85/337(Dir. 85/337 (1985) OJ NO. L 175/40)only requires an assessment of a project on the environment in general, while the assessment under Article 6(3) is site-specific and must examine whether a plan or project adversely affects the integrity of the natural site in question: ‘assessments carried out pursuant to Directive 85/337 or Directive 2001/42 cannot replace the procedure provided for in Article 6(3) and (4) of the Habitats Directive’(*Case C-418/04, Commission v Ireland* [2007] at 231). The

Commission documents suggest the type of considerations that should be take into account for the assessment; in particular, the necessity to identify *all* potential impacts, including cumulative impacts, and to use the best available techniques and methods, to examine the most effective mitigatory measures in order to avoid, reduce or cancel the negative impacts and to use the best possible indicators for ensuring the biological integrity of the Natura 2000 network (Kramer,2009). In the UK this aspect is reflected in regulation 61 of the Conservation of Species and Habitats Regulations 2010 (SI 2010 No.490) which states that the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which—is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and is not directly connected with or necessary to the management of that site, must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.

The Marine report (EDF, 2011b) made references to ecological impact from the HPC development with the majority deemed to be 'minor adverse'. However, there are no studies assessing the cumulative effects of the 'minor adverse' and 'moderate adverse' impacts. An area of concern expressed by the Environment Agency (EA, 2011) was the, as yet unknown, potential impact from both Hinkley Point B (HPB) and HPC operating at the same time. This is a theoretical possibility with HPB due for decommissioning in 2016. Any delay in that decommissioning could result in a combined impact from both power stations.

Concerns regarding this oversight were flagged by EA in their report stating that "under regulation 61 of the Conservation of Habitats and Species Regulations 2010, if the combined impacts cannot be concluded to have no adverse effect on the integrity of the Severn Estuary SAC (Annex II fish species), then compensation may be required under regulation 66 of the Conservation of Habitats and Species Regulations 2010" (EA, 2011).

4 Nuclear Economics

The World Nuclear Association (WNA) believes that nuclear power is competitive against other methods of electricity production in terms of costs (World Nuclear Association (WNA), 2011) and Government consultants Mott Macdonald project "nuclear to be the least cost option in longer term, assuming DECC's central fuel and carbon assumptions" (Mott Macdonald, 2010).

4.1 Uncertainty of Capital Construction Costs

In a 2008 White Paper on Nuclear Power, the UK Government originally forecast the construction costs of a new 'first of kind' reactor with capacity of 1.6GW to be £1250/KW(BERR,2008). EDF Energy, who are consulting on plans to build 4 new European Pressurised Water Reactors (EPR's) by 2025 have forecast the costs to be much higher. EDF Energy's forecasts on their plans to construct two reactors at Hinkley Point, show costs of £9bn to produce a capacity of 3260MW, equating to a cost of £2760/KW (more than double the Government's 2008 forecast)(EDF Energy 2010). Horizon Nuclear Power (a joint venture between E.ON UK and RWE) plan to invest £15bn in new facilities to generate 6000MW of electricity, with up to 3 new Pressurised Water Reactors (PWR's) at Oldbury producing 3300MW(Horizon, 2011).

The capital construction cost of reactors is the greatest proportion of cost for nuclear power (70%) (Thomas,2009), with the fuel cost being relatively low. “Nuclear fuel costs make up only a small proportion (around 10%) of the overall plant running costs, compared to gas plant where fuel costs represent around 70% of running costs” (Horizon, 2011). As such, the assumptions made in the appraisal of such long term energy projects can have a huge effect on the financial viability and performance.

When comparing the economic costs and benefits of different technologies, it is important to have a common measure in which to express this comparison. The levelised cost expressed in £/MWh represents “the lifetime discounted cost of ownership of using a generation asset...expressed in cost per unit of energy produced” (Mott Macdonald, 2010). The 2008 White Paper forecast an overall positive Net Present Value (NPV) of £15bn, on plans to generate an extra 10GW of electricity using nuclear power. The central scenario used in this forecast (using a 10% discount rate) resulted in levelised costs of £38/MWh for nuclear power, although this varied between £31/MWh - £42/MWh when different discount rates were applied over a 40 year period(BERR,2008). Given the uncertainty surrounding the capital costs of construction, the levelised costs/MWh could be far higher than detailed in the 2008 White Paper.

The UK Government’s own 2010 study into the Severn Tidal Barrage scheme showed that nuclear power compared favourably against other low carbon technologies. However, the levelised costs/MWh projected by consultants Mott Macdonald for that study, were significantly higher than originally thought. Using the Government’s central scenario of a 10% cost of capital (to reflect the return required by a private investor), Nuclear Power was forecast to cost £69/MWh, as against Coal with Carbon Capture and Storage at £110/MWh and Offshore Wind at £129MWh(DECC 2010a).

However the modelling undertaken by Mott Macdonald produced a wide range of estimates dependent on the discount rate used, the start date of the project and whether the technology represented First of a Kind (FOAK) or Nth of a Kind (NOAK). Under their ‘medium’ scenario for a FOAK PWR, the projected cost increased to £3744/KW and then fell to £2913/KW as the learning curve took effect. Mott Macdonald caution however, that although the NOAK costs are much less, they are “not applicable this decade” (Mott Macdonald, 2010).

The DECC now estimates that plans to provide 16GW of new capacity in the form of 10 new reactors, will require some £40bn of investment (DECC, 2011). However, given the uncertainty of forecasting, this may be many billions higher.

4.2 Decommissioning Cost Concerns

The costs of decommissioning are also of key concern when assessing the relative competitiveness of nuclear power against other forms of low carbon energy. Decommissioning and waste disposal costs are forecasted as being approximately 9-15% of the capital construction cost of a nuclear plant (Semple Fraser 2011). In its Annual Report and Accounts for 2009/10, the Nuclear Decommissioning Authority (NDA) shows existing discounted decommissioning and clean-up liabilities of over £45bn(Nuclear Decommissioning Authority (NDA) 2010). Public concern exists that the costs of decommissioning are being stored up for future generations to deal with and that the burden will fall on the taxpayer. The 2008 White Paper makes clear that in addition to energy companies funding the development and building of new nuclear

power stations, the full burden of decommissioning and waste management will lie with those energy companies((BERR,2008). The argument is made that decommissioning costs are factored into the initial investment appraisal process. Decommissioning and waste costs (of £1.27bn for an example individual reactor) were included as part of the Government's 2008 forecasts. When discounted over a 40 year period, these costs added only £0.31/MWh to the overall cost (BERR,2008). However, Mott Macdonald's 2010 projections used a standard discounted increase of £2.1/MWh to account for decommissioning and waste costs in all scenarios, providing a levelised cost incorporating a "cradle to grave aspect" (Mott Macdonald, 2010). These wide ranging forecasts highlight the uncertainty surrounding the provision of adequate resources to fund these future decommissioning costs, whether from the energy companies themselves or ultimately through the taxpayer.

4.3 Proposals to Meet Decommissioning Costs

The UK Government is currently consulting on proposals to introduce a Funded Decommissioning Programme (FDP) which will establish a framework for financing the eventual decommissioning and waste management of the new nuclear facilities. Final guidance on this is expected to be published in the latter part of 2011. The purpose of the FDP is to ensure that energy companies "are able to meet the full cost of decommissioning and their full share of waste management and waste disposal costs" (DECC, 2010b). Each energy company will be required to set up an approved fund, making regular payments to contribute sufficient resources over the lifetime operation of the nuclear plant. An appropriate investment strategy will be required to generate sufficient returns to cover the estimated costs of decommissioning, waste management and disposal, with arrangements to be made in the event of shortfall in the fund value. However the fairly recent problems associated with endowment mortgages within the financial services industry, illustrate perfectly the problems of ensuring adequate financial performance of investments when projecting decades into the future. Volatile market performance, wide ranging growth estimates and highly uncertain future costs, create a difficult environment for the operation of the fund. The flaw within the endowment mortgage industry was overambitious growth projections and therefore highly prudent financial planning will be the key to successful accumulation of sufficient funds to meet the eventual liabilities. This of course is not an insurmountable problem given the financial instruments available for financial planning. Low risk, undated government stock with a current redemption yield of 4.91% could be employed to calculate the required annual contribution to the fund. Changes in the contribution would be required when yields change to keep the fund on track. Long dated government stock (15 years+ to redemption) could be used towards the end of the operation of the plants, with maturity coinciding with plant closure. Potentially, ultra-long dated stock running for say a 40-50 year period might even be available, although yields are not necessarily attractive over such a long time frame(Telegraph 2011). Fund assets will be periodically compared to the target value of the fund and appropriate action required should a shortfall be evident. Protection against a material shortfall may take the form of insurance, financial instruments or an upfront endowment (DECC 2010 b).

4.4 Uncertainty Surrounding Cost Assumptions and Potential Final Liabilities

The government will assume liability for the eventual spent fuel disposal, with the money from the fund being used as compensation for this service. The government proposes to set an index-linked 'Final Price' for the provision of this waste disposal service. This final price will be set at the end of a deferral period (30 years into the

operation of the plant) when it is believed that there will be less uncertainty over waste disposal costs (DECC 2010 c). This final price will take the form of a variable cost per unit expressed as £/tU (pounds per tonne of uranium). The government plans to introduce a maximum cap to this final price for the disposal costs of spent fuel, to create a degree of certainty for the energy companies. Using an example 1.35GW PWR operating for 40 years, this cap would be set at £1,104m(DECC 2010 c) based on a cap price of £978k/tU. However concern exists that the cap price may prove to be insufficient to meet the eventual waste disposal costs and that the taxpayer will end up heavily subsidising the industry. Analysis of NDA liabilities shows that spent fuel disposal costs are rising at 4.5% above inflation(Jackson,2011). Using this information, it can be forecasted that the spent fuel disposal base cost (being used by the government) of £193k/tU will rise above the cap price by the year 2047. For a reactor operating over a 40 year period between the years 2020-2060, this will lead to a £131m shortfall in the amount necessary to cover the full cost of decommissioning and waste disposal. Jackson (2011) forecasts even greater subsidy requirements of £1,127m for a 60 year PWR. A second concern highlighted by analysts, is that the government's base cost of £193k/tU for the disposal costs of new nuclear waste is based on optimistic assumptions when compared to the disposal costs of existing nuclear waste. Jackson(Jackson,2011) believes that "it is likely that disposal costs of Advanced Gas Cooled Reactor (AGR) and PWR spent fuels will be very similar" and that "disposal costs of PWR spent fuels may have been significantly underestimated and may need a public subsidy". This is evident when comparing the spent fuel disposal cost of AGR at £659k/tU against the government's base cost for PWR of only £193k/tU. This variation comes about from the government's questionable assumption that PWR spent fuel will cost 50% less to dispose of than AGR spent fuel, with a further 42% reduction applied for economies of scale arising from a 10 reactor new nuclear build programme(Jackson,2011). In an independent report for Greenpeace, Jackson(Jackson,2011) quantifies the underestimation of the actual disposal cost of spent fuel for PWR at £280k/tU, leading to a further required subsidy of £296m (for a 40 year PWR) or £445m (for a 60 year PWR). The uncertainties involved in both government and independent forecasts, cast doubt on whether by setting a maximum cap, the full costs of decommissioning and waste disposal will actually be met by the nuclear operators despite strong assurances from the government. Any indirect subsidy for the nuclear industry actually penalises other forms of renewable energy as they suffer cost comparison on a potentially unfair basis. The risk is, that in the desire to create energy security using the (so called) least cost option, more truly sustainable forms of energy may be overlooked with economic and environmental legacies left for the next generation to tackle.

5 Future Generations

We have up to now looked at the environmental implications and the economic aspects of nuclear energy related to this case study. The focus has been on the effects that new nuclear development will have for the current generation. However, in order to fully appreciate the issue of sustainability and legacies we need to turn our attention to the effects on future generations.

As mentioned earlier one of the groundbreaking aspects of the Brundtland report was putting the very long-term onto the environmental policy agenda as reflected in the Rio Declaration 'The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations'(Rio

Declaration, 1992) .This aspect was further reinforced by the Johannesburg Declaration which contained references to 'the generations that will inherit this earth'(Johannesburg Declaration 2002) and 'a long-term perspective'(Johannesburg Declaration 2002 at para 26). Much of the theoretical debate on future generations revolves around the feasibility of formulating duties and rights in respect of people who do not yet exist (Carter,2001). Furthermore, it is still unclear how normative concepts like 'obligations', 'rights' or 'harms' may be interpreted when applied to the intergenerational context. It is suggested that in the absence of a coherent ethical theory most people tend to attribute moral importance to the lives of future generations and the discussion on the matter is typically a rights based one. If you declare universal human rights for every individual, why should individuals born tomorrow not impose obligations on present individuals? It seems appropriate to consider future people as right bearers-even in the absence of a clear definition of what this implies for the present generation practically and legally (Gopel, and Arhelger, 2010). Furthermore reference to future generations from a European Union perspective is moving gradually from the implicit and non-binding level to an explicit and more binding one. Comparing references with regard to future generations in the Commission's 1974 recommendation concerning the protection of birds and their habitats (Commission Recommendation 75/66) and that seen in the Aarhus Convention (Aarhus Convention, 1998). The former is a good example of an indirect reference to future generations reflected in the statement that "[p]ublic opinion is coming to consider migratory birds more and more as common heritage"(Commission Recommendation 75/66) and the latter 1998 Convention contains specific description of how rights of future generations transformed into present duties "every person has the right to live in an environment adequate to her or his health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations"(Aarhus Convention, 1998 Art. 1). It should be noted that European environmental legislation to date has only referred to future generations randomly and inconsistently (Gopel, and Arhelger, 2010 pg 4).

6 Conclusion

As stated earlier future needs and preferences are themselves dependent on several factors and therefore may make it difficult to evaluate. However thanks to the spread of sustainable development policies there is emerging a fundamental norm concerning the relationships across generations which requires each generation to pass the planet on in no worse condition than it received and provide equitable access to its resources and benefits (Weeramantry, 2011).

In order for the nuclear energy sector to declare itself 'sustainable' its environmental and economic legacies must be assessed from the perspective of "*respecting the limits of the planet's environment, resources and biodiversity*"(DEFRA, 2005) together with the cumulative effects of ALL the new nuclear power stations.

Indeed as Ambassador Frans Van Haren noted with regard to the responsibilities faced in relation to the environment:

'We are its custodians. If we destroy the Earth wilfully through greed or through ignorance we will destroy life. There is therefore also a normative, or if you prefer, an ethical aspect to environmental policy formulation and planning'
(Van Haren, 2003).

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is an intergovernmental treaty, with 175 parties that provides the necessary framework for regulating trading threatened species of wildlife. The overriding goal of the convention is to ensure that the international trade in specimens of wildlife does not affect the survival of species, and to demonstrate that the effective and sound management of resources may be beneficial to the conservation of species and ecosystems and the development of local communities.

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Legal Research Symposium: ENVIRONMENTAL REGULATION IN MEXICO CITY

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Abstract

Lately, as the population in the big cities has increased, it has become necessary to pay attention to some environmental situations, perhaps not very harmful in past years, but that now can cause very serious and irreversible health problems to population .The industrial development in these urban areas has released very high levels of pollution, and it has become necessary that the regulations and public policies respond to the new environmental conditions, initiating a new culture of protection of the ecology.

Keywords:
ecology, environment, habitat, Mexico, pollution

1 Introduction

It is mandatory, indeed, that the government reviews the conditions in Mexico City, the ninth most populated urban area in the world. The lack of zoning restrictions and emission controls have aggravated the problems of overcrowding, a high pollution level, and the degradation of the health of the individuals. The government has promoted the issuance of legal ordinances, as well as the implementation of diverse actions and public policies, in order to prevent and control the problem.

2 The problem of the contamination in Mexico City.

A clean environment for a healthy development of individuals is considered, without a doubt, a right of those who live in this planet. The conservation and restoration of the ecological conditions that protect all the living species is an activity that must be important to all, government, individuals, and companies in general.

By nature, the species grow and develop in natural environments, and these provide the elements that encourage their procreation and perpetuity, with the unique reservation of the proper changes of the evolutionary process. The environment also can be managed, to a degree, so that some species, as in humans, can develop to fulfill their natural assignment and provide the satisfaction of their own needs. Independent of whether it is a natural or managed environment, it is the right and obligation to accomplish these actions and to maintain, whenever possible, the standard of life and development within a concept of dignity and well-being.

Cullet, (Cullet, 2011), considers that the right of the people to a healthy environment can be located in the context of the human rights. On this matter, he points out "that international environmental law and human rights law, have intertwined objectives and ultimately strive to produce better conditions of life on earth…they both seek to challenge universal that must often be solved at the same time at the individual and global levels…"

Without a doubt, a healthy atmosphere improves the well-being of individuals and tends to protect the primary value, which is life, as well as its natural or managed habitat for existence and subsistence. This can be translated into a human right, from this point of view.

At present, it is important to mention that the protection of the environment is not included in the Universal Declaration of Human rights. For that reason its legal standing, according to the doctrines and regulations, at this time, does not establish a legal instrument that allows its enforcement when the environmental laws are violated.

Although some countries do not regulate the preservation, conservation and restoration of the environment like a human right, it is necessary to state that the degradation and reduction in the conditions of the environment, can impact seriously on health, food and life, which is part of the Universal Declaration of Human rights, therefore, indispensable its observance so that the individuals reach a worthwhile life.

Mexico is a country that in the last 50 years has increased the industrial activity, as well as the growth of the population. Therefore, this is the subject of the highest priority for the government to protect the environment by setting the congruence in industrial activities, population increase and environmental protection.

In Mexico, since the seventies, the ecological subject has reached a paramount importance, and preoccupation at the same time. The topic of the environment had its highest world-wide level, and environmental laws were issued in all of the states. Many public actions were accomplished. Public policies were implemented by the Federal government as well as international treaties were signed, in order to avoid or control the contamination.

The important subjects that have been handled in this matter are, for example, the management of toxic waste from the industries; moderation in the use of automotive vehicles; official environmental opinions about polluting agents as a mandatory requirement for those who wish to initiate an industry; high fines to the violators of the ecological regulations; establishment of minimum quality standards for products and services in order to avoid contamination; national and local urban and ecological plans; proper zoning of industrial areas, etc.

The problem of deterioration of the environment in Mexico, was aggravated by the disorderly migration of people, from the rural areas towards urbanized zones, where they thought that it was easier to obtain the satisfaction of their needs that their native places of origin did not provide to them.

One of the reasons for the movement of farm workers to the larger cities was the inability to endure the rising costs and interest rates that the government organizations and banking institutions charged them for working the ground in better conditions,

reaching, therefore, a greater productivity. There is no doubt that the urban centers of the industrialized countries with their disproportionate population growth contribute to the deterioration of their environment. That is the reason why they need to take sufficient measures to avoid or to lessen the impact of an irresponsible activity, as well as a deficient environmental regulation.

Therefore, the Mexican legislation, from the seventies, began to see the necessity to maintain an environment healthy where their population can be developed under favorable conditions.

2.1 Regulation about settlements of human groups.

In 1976, the federal government issued a general law regulating the population to settle down irregularly across the country. Some changes, to date have been made to this original regulation. The intention was that the population centers, irregular and disorderly established in the different cities and towns across the country, would stop becoming a potential or real danger for the environment. As a result of mistaken or insufficient planning of the urban zones, the needs of the increasing population, such as education, housing, services, entertainment, food, employment and others were not addressed adequately.

In order to establish the modalities in the real estate zoning determining the form to take best advantage of the soil and the conservation and restoration of the environment, the Political Constitution of the Mexican United States was modified, creating the legal frame of this new subject.[1]

The General Constitution,[2] was modified, as needed, in order to define the congruence between the federal government and the states for regulating the population across the country, setting a concurrent coordination among them all.

The law about the regulation of populace,[3] has as a main objective, to plan the arrangement and stabilization of the population in the country, therefore, the establishment of the basic norms for the foundation, conservation, improvement and growth of the populated centers.

The figures about provisions, uses, reserves and destinies were created, as a means for the rational use of urban areas, now and in the future. It is in this law where the subject regarding the environmental protection is introduced, with the fundamental objective to maintain the balance of the ecological conditions and the conservation of the natural resources.

Therefore, as an indirect result of the control and stabilization of the population groups inside the Mexican Republic, it was an important and necessary issue to regulate the environmental protection. In the capital city, the Federal District, DF, the subject of the population density was regulated by the Law of the Urban Development of the Federal District, in 1999, with some reforms at the present.

By this law, the basics for the planning, programming and regulation of the territorial ordinances, as well as the development, improvement, conservation and urban growth in

[1] Article 27.
[2] Article 73, XXIX, C.
[3] Original title: Ley General de Asentamientos Humanos.

the zone are taken into consideration. It also has the intention to protect, conserve, recover and consolidate the urban landscape of the DF and the elements that integrate it.

2.2 Environmental regulation

Mexico is considered a developing economy, and although its industry does not reflect high tech standards, it accomplishes several types of manufacturing activities, many of them produce a high index of pollution and are harmful to the environment by all kind of emissions, with irreversible consequences in the health, natural resources, and resulting, in some cases,with an alteration in the genetics in foods.

Therefore, there is a need for creating a new cultural behavior in the care of the environment. In that context, the Federal Constitution is modified once more in 1987 creating the legal framework for the environmental protection, preservation and restoration of the ecological balance.[1]

According to changes in the Constitution, the congruency between the federal government and the states was made. This constitutional reform established the legal support, so in 1982 the General Law of the Ecological Balance and Protection to the Atmosphere[2], was issued by the Congress. The objectives of this law are:

1 To guarantee the right of the people to live in an suitable atmosphere for their development, health and well being.
2 To define the principles of the environmental policy and the instruments for its application.
3 Preservation, restoration and improvement of the environment.
4 Preservation and protection of the biodiversity, as well as the establishment and administration of the protected natural areas.
5 Prevention and control of the water, airborne and soil contamination.
6 To involve the people in the task of protection of the environment.
7 Establishment of measures of control and security to fulfill enforcing the administrative and criminal penalties that may be deserved.

It is important to notice that the DF is one of the most populated cities on the planet, with excessive urbanization, even in the areas considered as ecological reserves, and rating a very high contamination index.

As pointed out earlier, the migration from the farms to the cities, particularly towards the center of the country, contributed to the overpopulated condition. In the year 2000 the Environmental Law of the Federal District was issued, as a measurement to mediate the problem and to lessen its aggravation, which as of now, has not been effective in diminishing the emission of polluting agents in the zone.

The reasons are mainly the high population index, the lack of a committed environmental culture of the inhabitants, and suitable handling and implementation of the public policies.

[1] Article73, XXIX, G.
[2] In 1971 there was a background of this law in Mexico City, it was the Federal Law to Prevent and Control Contamination

> The capital city, the DF, is a political boundary, but the growth of the urban area has extended into other bordering localities and has formed a geographic continuity called conurbation, named technically as Metropolitan Zone of the Valley of Mexico.[1]

The metropolitan zone, according to the last population census of 2010,[2] has around 21 million inhabitants, in a surface of 7815 square kilometers, which makes it an area of extreme population density, which means that there is an average of almost 2800 inhabitants per kilometer.[3]

These data is not totally indicative, because the more affluent economic zones have a smaller population density, unlike those of lower income that have bigger number of inhabitants by square kilometer. If the environmental quality is based on the population index, the geography of the city that is surrounded by hills and prevents the circulation of the air aggravates it. The establishment in zones of high risk, like gorges, the deforestation, the erosion of the ground, contamination of the water, the illegal toxic waste handling, the apathy of the public servants to enforce the ecological public policies, the excessive number of automobiles with high smog emissions, excessive and irregular operation of the water-bearing mantles that produce the drought of the wooded zones, lacking of technology in the treatment of the domestic wastes, as well as a lack of awareness of the inhabitants,it is easy to imagine the great environmental deterioration in the metropolitan area.

The main polluting agents emitted to the air in the capital city are ozone (O3), sulphur dioxide (SO2), nitrous oxide (NOX), carbon monoxide (CO), lead (Pb) and other particulates of soot and dust, all of them highly harmful to the health of the people and almost all coming from automotive vehicles; besides the proliferation of factories in the city and constant maintenance work in the streets and the avenues.

An Atmospheric Monitoring System was established, by means of which a scale is set to measure the pollution levels in the DF, denominated Metropolitan Index of Quality of the Air, better well known by its abbreviations IMECA. This indicator measures from 0 to 500 the concentrations of polluting agents based on the repercussion that they can produce on the health of an individual when breathing the contaminated air.

A scale of 50 IMECA is equivalent to a quality of air not harmful to the health of the people, whereas 300 IMECA means serious damages to the respiratory system and to health in the general. It is considered highly contaminated air and in that case, the government of the city can implement emergency measures to control the overall impact. Also colors have been used to warn the people on the levels of the airborne contamination in the city. This means that the representative fraction of the IMECA indicates the pollution level of the air, and the color, the degree of risk to which the health of the population in the city is exposed.

The values of IMECA are as follow:

1 From 0 to 50 IMECA: The quality of the air is good and has yellow color.

[1] At the present, there are 55 metropolitan zones in all the country.
[2] Source: Nacional Geography and Statistic Institute, INEGI.
[3] The whole country, continental and insular areas included, has a surface of 1 964 375 of kilometers squared, with a population, to 2010, of 112,3 million inhabitants.

2 From 51 to 100 IMECA: The air continues being acceptable and has green color.
3 101 to 150 IMECA: The quality of the air is not appropriate for certain sensitive groups, like people with respiratory or cardiovascular conditions; or children and elderly people. Outdoor activities that imply a vigorous exercise should be limited when the color orange is issued.170 IMECA or more: The phase of environmental pre contingency is activated by the existence of organic or inorganic particles in the air. In a greater level than 175 IMECA, phase I of the program of environmental contingency activates.
4 From 201 to 250 IMECA, is represented by the purple color. In this situation, the quality of the air represents a serious danger for the health of the people.
5 More than 250 IMECA, represents a serious risk to health, and the government of the city will declare an environmental alarm and activate phase II of the environmental contingency program.

This subject is regulated by the Environmental Law of the Federal District, issued on1996, whose main object is to protect the environment, as well as the limitation and control of contamination and the restoration and ecological conservation of the zone. By this law any action or omission, that become a potential or real risk to the health of the people, may be punished and a compensation can be claimed as a repayment of the deterioration caused by any work or activity, when the previous situation cannot be restored.

This law is innovative because it introduces a series of ecological concepts and introduces as a public policy, the figure of the environmental verification to businesses and factories, and the obligation to make a environmental impact report when opening.

3 Environmental programs

The public policies concerning the environment issued by the city government have not been effective in bringing about an acceptable air quality. Before that, the city government had created the Program of Environmental Contingency, with two important policies established in order to diminish the problem of the contamination.

These programs are as follow:

1 Program “Does not circulate today”
2 Program of mandatory vehicle verification

The program “Does not circulate today” initiated by the end of 1989 restricts the circulation of one fifth of the automobiles with registry in Mexico City and the surrounding urban area of the metropolitan zone, from Monday through Friday, on the basis of the last digit of the vehicle plate number.

Initially the program was implemented for winters only, subsequent to rains. That was when the phenomenon of the thermal inversion in the city was most significant. It was at that time that the number of polluting particles in the atmosphere was heaviest. In 1990 it was extended to a permanent program.

In this program, only the automobiles 1993 or newer that do not meet the limits of polluting emissions allowed and those of model previous to the 2004 destined to public service, stop circulating one day of the week. Emergency vehicles, or those whose

motors use liquefied petroleum gas, LPG, or vehicles used for the transportation of stolen, wrecked vehicles or vehicles needing repair, as well as in the case of people with permission by reasons for incapacity, are excused of this restriction.

For the operation of this program, a label of a determined color is adhered in the windshield to indicate what vehicles must not circulate on certain days of the week, from 0500 to the 2200 hours, as it is shown next:

Day	Last plate number	Color
Monday	5 or 6	yellow
Tuesday	7 or 8	rose
Wednesday	3 or 4	red
Thursday	1 or 2	green
Friday	9 or permissions and plates without a number	blue

A modification to the program is the "Does not circulate on Saturday", effective from 2008, because a high level of IMECA is registered on Saturdays.

This program is for those vehicles of internal combustion and works as follows:

1 First Saturday of every month, vehicles with plates ending in 5 and 6, do not circulate;
2 Second Saturday of every month, vehicles with plates ending in 7 and 8;
3 The third Saturday of every month the vehicles with plates ending in 3 and 4;
4 Fourth Saturday of every month the vehicles plates ending in 1 and 2;
5 Fifth Saturday, when the month has one, the vehicles with plates ending in 9 and 0, as well as circulating permissions for cars that do not have a plate number.

The program is not mandatory on holidays and Sundays; all automobiles are allowed to circulate, unless a severe environmental contingency appears unusually. Also, the holograms with plates ending double 00 "zero", or 0 "zero" are exempted of the program.

The program "Does not circulate today" is also for vehicles with registry in other states of the Mexican Republic or other countries. There is a table for them so they can follow the rules of the program. For those who do not obey the program "Does not circulate today", fines can be levied and the automobile can be towed away, at their own expense.

b) The mandatory vehicle verification program "establishes the calendar and the rules according to which all the registered automotive vehicles of internal combustion in the Federal District will have their emissions tested during the first semester of year 2011, except the motorcycles, the automotive hybrids (gasoline - electricity) that by their technological characteristics are impossible to apply established protocols to them, according to the Official Mexican Norm NOM-047-SEMARNAT-1999, automobiles for collection and the agricultural tractors, the machinery dedicated to the mining and construction industries."[1] are exempt.

The obligation to verify the vehicles extends to owners, possessors and in general, to any driver of an automotive vehicle. The units whose plates end in 00 "double zero", are

[1] Official page of the Program of Mandatory Vehicle Verification of the Secretariat of the Environment of the City of Mexico, http://www.sma.df.gob.mx/verificentros/ viewed the 25 of May of 2011.

verified every two years because they fulfill the required conditions to avoid the airborne contamination, according to the rules of the program.

For the operation of the mandatory verification, "verifying centers",[1] have been created in the city, and they must adhere to the established protocols of the NOM.

Each verification center has cameras in order to prevent maneuvers taking place for disobeying the environmental dispositions that rule this program. The verification procedure consists of three stages:

a) Visual inspection of the systems and devices of the vehicle such as filter of activated charcoal, air filter, seals of the oil and fuel tanks.
b) Measurement of the smoke emissions and its coloration in order to determine the level of polluting agents that the unit produces.
c) Measurement of hydrocarbon emissions and carbon monoxide, through technical tests.

Besides the verification, there are also some control operative actions in the streets and avenues, such as mandatory supervision and monitoring of the verification centers; inspection of the operation, procedures and proper handling of documents and official labels; accreditation of factories and evaluation of the technical quality.

4 Legal aspects of the environmental regulation in Mexico City.

As was mentioned before, the protection of the environment in Mexico is not considered a human right, but "a diffused" right. This means that the right for a clean environment is not entitled to a certain person, but to an undefined group of people, in this case, to all the inhabitants of Mexico City.

In other words, there is not an entitled person who can claim a legal standing to his right for a clean environment, and cannot demand it through a judicial procedure, since the environmental affectation appears at a general level, not individually or personalized.

This affectation does not occur to a single person but all throughout the world, which means that it has expansive effects towards the communities of a city. The environmental rights also denominated by "third generation" or collective rights of the towns or groups. The protection to the environment, in the Mexican legal doctrine, is considered a right, when claimed ,does not have a procedural support that the affected people can make valid in a trial, even though an administrative regulation about environment exists.

The aspects that the environmental laws regulate in Mexico, have to do with periodic inspections by the administrative authorities to industries and the power to fine them, or close them, when the NOM[2] is not observed. Also, the deterioration of the environment can have criminal repercussions and the violation of the effective environmental legislation, can constitute a serious corporal penalty.

[1] Mandatory Vehicle Emission Verification Centers.

[11] Mexican Official Norm, NOM, are mandatory dispositions that establish standards of values, measures and characteristics, maximums and minimums to that they must subject the production of benefit or consumer goods of services, to guarantee the quality of the same. The NOM are regulated in article 3, fraction X of the Federal Law on Metrology and Normalization. The NOM are equivalent to ISO (International Standard Organization)

As mentioned before, by constitutional disposition, there is a legislative concurrence in the environmental regulation, therefore, it is considered a non centralized function, which means that each state is allowed to enforce the dispositions that its independent power considers advisable to protect the environment.

The capital city, DF, Environmental Law establishes several obligations for the individuals, for example, an obligatory official opinion about prevention, risk and impact to the environment of a new factory to be opened bordering the protected zones, or constructions in lots bigger than 5.000 square meters, or the management of dangerous and toxic residuals in companies with industrial activities. This regulation also establishes penalties for those that do not fulfill these dispositions, nevertheless, does not indicate a jurisdictional action for the rest of the people by which they can demand the reestablishment of the ecological order when the environmental laws and regulations are violated.

This means that it is an imperfect or incomplete right, since there is not a procedure that allows the inhabitants of the city to exercise this prerogative. In other words, there is not a guarantee in the environmental laws for claiming a violation to their right in this subject. The inhabitants of the capital city can only report to the authority any disobedience to the ecological regulation, but more severe and effective public policies are required, enforced and entitled to the population, in order to obtain and keep a healthier environment, providing all needed legal tools.

It is necessary to continue presenting populace campaigns for creating consciousness among the people and authorities for observing all environmental regulations, not because of a fine but by conviction; to enforce the recycling systems; rationing of natural resources; reduction in the use of automotive vehicles, and understand that this is the only place we have and it is our responsibility to take care of it.

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CCS Directive Article 21: The Third Party Access- Comparative Study Between Finland and UK

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Abstract:
Carbon dioxide capture and storage (CCS) is a relatively new technology in the context of climate change mitigation strategies. Its legal and regulatory implications are not yet wholly developed. This paper takes a brief comparative look at the regulatory principles in Finland and UK especially relevant to the Article 21 of the CCS Directive that regulates so called third party access to CCS infrastructures. The Article 21 of the CCS Directive provides regulations of a third party access regime for both CO2 transportation and storage infrastructure. Third party access regulations are essential when promoting co-operation between owners and potential users both on the construction and use of CO2 infrastructure. What is more, regulations try to ensure that smaller third parties are not disadvantaged or overcharged when seeking access to storage sites or pipelines and that infrastructure resources are brought forward in a way that reflects likely foreseeable future demand.

Creating an effective fit for purpose regulatory regime is also crucial to the demonstration of CCS. National and EU legislation has been agreed to address this. An (European Union) EU CCS Directive contains requirements to ensure that third parties are able to access CO2 transportation and storage sites in a transparent and non-discriminatory manner.

Keywords:
CCS, CCS Directive, Finland, Third Party Access, UK

1 Introduction

Creating an effective fit for purpose regulatory regime is also crucial to the demonstration of CCS. National and EU legislation has been agreed to address this. An EU CCS Directive contains requirements to ensure that third parties are able to access CO2 transportation and storage sites in a transparent and non-discriminatory manner.

Arrangements for third party access are important because there are considerable up-front costs and economies of scale in pipeline construction. Access to CO2 infrastructure could also become a significant competitive factor in the power generation and other high emitting industries. This could lead to a conflict between the efficient use of resources and wish for greater competition. There are currently no CCS pipelines or storage sites in the UK and CCS is not currently a commercially demonstrated technology. Economic factors will also be important in determining the timing and scale of investment in CCS infrastructure.

Arrangements for potential users to obtain fair, open and non-discriminatory access to carbon dioxide (CO2) transport networks and storage sites are required because such access could become a condition for entry into, or competitive operation within, the internal electricity and heat market, depending on the relative prices of carbon and carbon capture and storage (CCS).

The current regulations involve the establishment, as required by Article 22 of the CCS Directive, of a dispute settlement mechanism to enable expeditious settlement of disputes regarding access to CO2 transport networks and storage sites which recognises the transport and storage capacity which is available or can reasonably be made available.

In the UK, demonstration of the full chain of CCS – capture, transport and storage – at commercial scale is the vital next step, the various technological stages of the CCS chain have been shown to work but have not yet been demonstrated end-to-end at large scale on a power station. In Finland there are no storage places so the chain of CCS will be restricted to capture and transport. On the other hand, it is probable that the importance of effective transport will emphasize.

The introduction section should provide an overview of the article as well as the background and context of the paper. Starting from general to provide the 'big picture' moving down to specifics, this section should provide a rationale that justifies the research, i.e. why there is a necessity to conduct a research on this particular subject. This can be done by providing evidences of problems that needs solution and/or identified knowledge gap in a specific domain, level, geographical location, society, sector, industry, and so on supported by key references. As the response, a clear research agenda can be described specifying research aim and objectives in order to clarify the purpose of conducting the investigation.

Following this, the author needs to describe in general how the research can be or had been done to satisfy the aim and objectives, i.e. a brief discussion on the research methodology. This should highlight the research design, data collection methods and data analysis conducted or to be conducted in the research. Research limitations, scopes and boundaries should be explained as well to manage the expectations of the readers/audience.

The findings of the research at this stage have to be outlined here emphasising on the originality and general contributions of the investigation and preferably specific contributions of this paper. It is also a good practice to clarify who exactly will or expected to benefit from such investigation. This should be closely linked to the research rationale, aim and objectives.

2 Literature Review: Current CCS Legislation

2.1 Legislation in the UK

The UK already has a legal framework which covers pipelines. This is set out in the Petroleum Act 1998 (offshore pipelines) and the Pipe-lines Act 1962 (long distance onshore pipelines) in combination with the Planning Act 2008. While these Acts are not specific to CO2, their provisions extend to pipelines carrying CO2 and already go a very long way to meeting the Directive's requirements in relation to pipelines. There is currently no equivalent legislation for CO2 storage sites.

The existing arrangements for pipelines essentially allow regulatory intervention to require modification of a pipeline prior to construction where this would avoid the construction of an additional pipeline and also to secure access for third parties to existing spare capacity. In both cases the consenting authority is also able to determine the associated financial arrangements. In more detail, the existing legislation on pipelines prohibits the construction of a pipeline without consent, allows the consenting authority to require the modification of the design of a pipeline to provide additional capacity to convey the same or similar material or, for an offshore pipeline, to change its route, determines the financial arrangements for any modification, provides for the consenting authority to be able to secure access by a third party to an existing pipeline designed for the purpose of conveying the substance in question and set the conditions under which that access should be granted.

Under these arrangements the onus is on the parties to reach agreement on commercial terms on the joint development of, or access to, pipelines but if the process of commercial negotiation fails then the consenting authority has the power to intervene to ensure fair access.

These arrangements also protect the rights of pipeline owners. For example under the Pipe lines Act 1962, modifications to a proposed pipeline (by way of conditions in a pipeline construction authorisation) can be required only where the consenting authority is satisfied that there is evidence of demanding existing or likely to arise over the same or a similar route. And, when imposing requirements related to third party access to an existing pipeline, the consenting authority must be satisfied that granting such access would not prejudice the proper and efficient operation of the pipeline for the owner's use.

2.2 Legislation in Finland

In finland the Act on the Redemption of Immoveable Property and Special Rights (603/1977) regulates situations where regulatory intervention is required to be done in the case of “common needs of the society”.

Accrodind to Article 1, in the case of Redemption of Immoveable Property and Special Rights that law must be followed if no other regulation says otherwise. So far there is no other regulations that could meet the requirements of the CCS Directive and its third party access regulations.

According to the Article 3, immoveable property and special rights can be gained with the redemption or make restrictions to one’s rights to use one’s property.

Article 4 states, that redemption of the property or the special rights is allowed when common needs of the society requires so. It is not allowed when the same target could be reached with another means or if the negative consequences of the redemption are bigger than the profits.

The party that applies for the redemption can be a public or a private party; essential thing is the reason of common need of the society.

Both neither UK or Finland, there is currently no equivalent legislation for CO2 storage sites. In order to transpose the Directive’s obligations in relation to storage sites the intention is to introduce arrangements based on those for pipelines. The main additional burden from implementing the Directive will thus come from the extension of the

pipeline arrangements to storage sites. Depending on how those powers are discharged they could require a storage site to be expanded, or a third party to be given access to an existing site, and also determine the financial terms on which this will take place. Such an intervention could significantly change the financial risk profile for an investor in a storage project, especially in relation to contingent storage liabilities. The exercise of these powers will therefore be constrained (as they already are for pipelines) in order to ensure that the integrity of the infrastructure is maintained, the owners reasonable needs are protected and any determination strikes a reasonable balance between the interests of the parties and the risks they are bearing.

However, if the redemption would be done for building gaspipes or s omething that could be compared to those and noone opposes these plans or it is case of less significant redemption the allowance will granted by local authority(local surveying office.) Also if some other allowance also alouds redemption at the same time other allowances aren't needed.

The preferred option is to extend existing legislation to bring them in line with the EU Directive on geological storage of carbon dioxide. Regulations of on pipelines and storage sites using the principles already contained in UK pipeline third party access legislation, including new provisions on making information available on capacity and technical specification to meet transparency requirements. The do nothing- option is not tenable as it would not implement the CCS Directive and thus leave the UK Government open to infraction proceedings.

It is believed that only in rare cases would a third party be seeking to access capacity on another's storage site at a time when its capacity was capable of being modified economically. A dispute over the terms for that access would be most likely if both parties were electricity generators and the owner saw advantage in restricting supply in that market by refusing access to a competitor. Whether that happens in practice would depend on the scale of the generators and which generation plant was expected to be price setting.

2.3 CCS And The Third Party Access From The Point Of View Of Competition

Where there is competition for limited capacity then the consenting authority is unlikely to require the owner to make the capacity available to a prospective user who values the capacity less than other prospective users.

In practice this means that in most cases the terms that would be determined by the Secretary of State are likely to be in line with those that would be offered by infrastructure owners were they to face effective competition from other infrastructure owners who also have sufficient spare capacity to store or transport carbon dioxide.

The terms determined by the consenting authority would also reflect the risks borne by the parties. For example, one of the issues that will have a significant impact on the cost of storage is the extent to which the contingent liabilities (that might arise in circumstances where the storage site requires remediation after it has closed for example) would be shared between the storage site operator and the originator of the CO2 or the owner of the additional pipeline or storage site capacity. Whilst the CCS Directive makes the storage site permit holder legally responsible for such events, this would not stop the emitter and the storage site operator reaching agreement to share the cost in the unlikely event that such remediation was required. The extent that such risk sharing is practical will depend on the financial strength of the parties involved and the

availability of risk transfer instruments, such as insurance. Clearly the balance of risk in such circumstances would have an impact on the commercial terms of storage. Any determination by the consenting authority, where one of the parties assumed risks for the remediation of the site, would be very different from the terms in circumstances where those risks are shared. The consenting authority would use its judgement in such circumstances having regard to the specific commercial, financial and technical circumstances of the projects the come forward for determination.

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CCS and clean fossil fuel technologies must be encouraged in the EU so that the Member States who choose to can keep carbon-based sources in their energy mix. The challenge facing European Union is the need to complete the fair internal energy market. Many national energy markets are still beleaguered by protectionism and these national reflexes keep energy infrastructure of the EU uncompetitive and possibilities to energy related activities unequal.

The Member States have their own competence to determine the rules of the CCS storage permits while they fall in the scope of energy policy. As there will be commercial inducements involved, it becomes a matter of internal market and competition too, in which the EU has an exclusive competence.

The situation concerning the division of the competences between the Member States and the EU is undefinite when it comes to CCS as a part of both competition and energy policies. When defining competences in energy policies, internal energy market and competition issues relating especially to CCS storage places, there could be more equal competition between energy companies at European level and CCS technologies, security and competitiveness of the energy supply in Europe can be guaranteed better.

According to the TFEU 26 Article The Union shall adopt measures with the aim of establishing or ensuring the functioning of the internal market and the internal market shall comprise an area without internal frontiers in which the free movement of goods and services.

Free movement of goods and services include also CCS-infrastructures and technologies. Reliable energy supplies at reasonable prices for businesses and consumers and with the minimum environmental impact are crucial to the European internal market and economy. The European Union has therefore identified energy as one of its priorities (COM(2006) 10). During the 1990s, when most of the national electricity and natural gas markets were still monopolised the European Union and the Member States decided to open these markets to competition gradually.

CCS-directive (Directive 2009/31/EC on the geological storage of carbon dioxide) sets criteria for the national competences to define eligilibity to CCS storage permits in order to secure equal treatment of the energy suppliers. Member States do not need to set admission criteria for procedures for granting exploration permits, but where they do, they should at least ensure that the procedures for the granting of exploration permits are open to all entities possessing the necessary capacities. Member States should also ensure that the permits are granted on the basis of objective, published and non-discriminatory criteria. In order to protect and encourage exploration investments, exploration permits should be granted for a limited volume area and for a limited time during which the holder of the permit should have the sole right to explore the potential CO2 storage complex. Member States should ensure that no conflicting uses of the complex are permitted during this time. If no activities are carried out within a reasonable time, Member States should ensure that the exploration permit is withdrawn and can be granted to other entities.

Chapter 5 of the CCS-directive regulates the third-party access to member states' own storage sites. Member States shall take the necessary measures to ensure that potential users are able to obtain access to transport networks and to storage sites for the purposes of geological storage of the produced and captured CO2. Member States shall ensure that the procedures for the granting of storage permits are open to all entities posessing the necessary capacities and that the permits are granted on the basis of objective, published and transparent criteria.

The CCS-directive defines the common criteria in Articles 5-8 that must be obeyed when considering whether to accept potential users' exploration or storage applications. The access shall be provided in a transparent and non-discriminatory manner determined by the Member State. The Member State shall apply the objectives of fair and open access, taking into account the storage capacity which is or can reasonably be made available and the transport capacity which is or can reasonably be made available, the proportion of its CO2 reduction obligations pursuant to international legal instruments and to Community legislation that it intends to meet through capture and geological storage of CO2, the need to refuse access where there is an incompatibility of technical specifications which cannot be reasonably overcome and the need to respect the duly substantiated reasonable needs of the owner or operator of the storage site or of the transport network and the interests of all other users of the storage or the network or relevant processing or handling facilities who may be affected.

On the other hand, the right to have an access to another Member State's storage site does not have to be absolute or unconditional. As it is said in Article 8 of the CCS-

directive, transport network operators and operators of storage sites may refuse access on the grounds of lack of capacity. Duly substantiated reasons shall be given for any refusal. Member States shall take the measures necessary to ensure that the operator refusing access on the grounds of lack of capacity or a lack of connection makes any necessary enhancements as far as it is economic to do so or when a potential customer is willing to pay for them, provided this would not negatively impact on the environmental security of transport and geological storage ofCO2.

It must be acknowledged, that the geological CCS-storage sites may be subject to high level competition in the future because of their rather limited number that are not divided constantly through the Europe or the World. Naturally, this can have an effect on the functioning of the energy market in common. Hesitations whether there will be storage sites to utilize, may limit energy production with co2 emissions and due to this also technical development of CCS.

So, as a Summary of the proposed Third Party Access Regime it gives a frame that covers CO2 transportation and storage infrastructure pre and post construction. It also suggests examples of access are modification of existing or planned infrastructure include increasing capacity, extending or adding taps to allow access. What is more, access should not be denied for lack of capacity or lack of connection if it is economic or the applicant is willing to pay for necessary enhancements. The first point is of course that the developer and applicant negotiate the terms of access. In UK, applicant can refer the issue to the Secretary of State for resolution but in Finland that is not confirmed yet.

3 Research Methodology

The starting point of the research is the national legislative environment of Finland. Legislative evaluation will make use of research methodology of legal dogmatics and environmental policy instruments research tradition. The problem-based point of view is highlighted in the sense that the research seeks to find a theoretical approach for analyzing the impacts of environmental legislation on innovation on the CCS technologies. The sources for the research are mainly the traditional sources of legal studies including sources such as national and international legal literature and scientific articles, the preparatory works of legislation and case-law. The challenges set by the evolvement of environmental innovations on legislation are studied also by means of legal comparison. Additionally interviews are conducted in order to fully understand the complex issues involved in innovation forces in the environment sector.

This research project centralized in legal policy instruments supporting CCS innovations in order to mitigate the climate change is a part of a planned larger scale programme concentrating on climate law and regulative means of mitigating climate change.

4 Findings and Discussion

If becoming more and more essential technology in the context of climate change mitigation strategies, it is important that CCS can be deployed without unnecessary regulatory hindrances.

Starting point for the CCS functions between the actors is surely voluntariness and freedom of contract. It might be expected that CCS actors will want to work together to exploit economies of scale in sharing CO2 infrastructure and maximise the value out of the assets they have invested in.

There may however be circumstances where developers are more reticent about sharing their infrastructure, drag out negotiations and seek overly high terms. These could be as developers may be competing upstream with applicants and could achieve commercial advantage through refusing access. It may also be the case that a local monopoly develops which could exploit other potential users. As such, the opportunity to refer a negotiation to an independent party is likely to help support timely and fair negotiations. This will promote efficient use of infrastructure, realise economies of scale, help prevent multiple pipelines along similar routes and thereby reduce the environmental impact.

Failure to transpose these elements leads of course both Finland and UK open to infraction proceedings for not implementing the EU Directive on geological storage of carbon dioxide.

5 Conclusion and Further Research

Where there is competition for limited capacity then the consenting authority is unlikely to require the owner to make the capacity available to a prospective user who values the capacity less than other prospective users.

In practice this means that in most cases the terms that would be determined by the Secretary of State are likely to be in line with those that would be offered by infrastructure owners were they to face effective competition from other infrastructure owners who also have sufficient spare capacity to store or transport carbon dioxide.

The terms determined by the consenting authority would also reflect the risks borne by the parties. For example, one of the issues that will have a significant impact on the cost of storage is the extent to which the contingent liabilities (that might arise in circumstances where the storage site requires remediation after it has closed for example) would be shared between the storage site operator and the originator of the CO2 or the owner of the additional pipeline or storage site capacity. Whilst the CCS Directive makes the storage site permit holder legally responsible for such events, this would not stop the emitter and the storage site operator reaching agreement to share the cost in the unlikely event that such remediation was required. The extent that such risk sharing is practical will depend on the financial strength of the parties involved and the availability of risk transfer instruments, such as insurance. Clearly the balance of risk in such circumstances would have an impact on the commercial terms of storage. Any determination by the consenting authority, where one of the parties assumed risks for the remediation of the site, would be very different from the terms in circumstances where those risks are shared. The consenting authority would use its judgement in such circumstances having regard to the specific commercial, financial and technical circumstances of the projects the come forward for determination.

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In Finland, this how the CCS Directive is still not implemented. In addition to this as CCS becomes much more widespread in the future, competition is likely to But would be there a develop which would limit the need for intervention. eel there is sufficient evidence that the benefits of a more interventionist approach is justified by the additional regulatory burden.

CCS and clean fossil fuel technologies must be encouraged in the EU so that the Member States who choose to can keep carbon-based sources in their energy mix. The challenge facing European Union is the need to complete the fair internal energy market. Many national energy markets are still beleaguered by protectionism and these national reflexes keep energy infrastructure of the EU uncompetitive and possibilities to energy related activities unequal.

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6 Acknowledgement

This paper is a part of a larger research project. The larger research project deals with environmental innovations, CCS techniques as one example of them, and how they play a central role when it comes to climate change mitigation.

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Environmental management

Analysis of CO_2 Emission in the Construction Industry of Hong Kong

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Abstract:
The amount of CO_2 emission in the world has grown alarmingly, leading to a series of global environmental problems such as global warming and ocean acidification. All of these environmental changes threaten the existence of mankind. Since the construction industry accounts for 50% of the total carbon emission, holding down the CO_2 emission of the industry would be an effective way to slow down environmental deterioration. The construction industry in Hong Kong is developing rapidly accompanying with problems of energy consumption and carbon emission. This paper aims to compare the CO_2 emissions in the phases of construction process, maintenance and demolition, and estimate the carbon emission rate of different construction materials. Moreover, this study introduces some measures that the Hong Kong Government has taken to reduce carbon emission and their impact. Besides, several suggestions on potential effective methods are also introduced to help attain the objective of carbon reduction.

Keywords:
CO_2 emission, construction industry, structures of buildings, construction materials

1 Introduction

Greenhouse effect has become a critical problem around the world. The harms so induced include global warming, acid rain, rise in sea level, etc. Lives on the earth are threatened by all these phenomena. The primary cause of this bad situation is excessive greenhouse gas (GHG) emission, especially carbon dioxide (CO_2). Being regarded as one of the major carbon emission sources in the world, the construction industry has the responsibility to reduce the CO_2 emission. This study has summed up several major construction materials' impacts on CO_2 footprint and generalized the efforts that have been taken in Hong Kong for creating a sustainable environment. In addition, several potential measures which can help to slow down the GHG emissions are also discussed in this paper.

2 Literature Review

Greenhouse effect is one of the most serious problems threatening the existence of mankind on the earth. Being affected by the greenhouse gas, the global mean temperature rose by 0.74℃ during the hundred year period between 1906 and 2005. Nine (2010, 2005, 2003, 2002, 2009, 2006, 2007, 2004, 2001) of the last ten years (from 2001 to 2010) rank among the 10 warmest years on record (HKO, 2011) (Figure 1). Moreover, greenhouse gas effect had led to global average sea level rose at an average

rate of 1.8 mm per year over 1961 to 2003 (HKO, 2011). The only way to suppress this crisis is to reduce the GHG emissions. GHG include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), tropospheric ozone (O_3) and chlorofluorocarbons (CFC_s) (Buchanan and Honey, 1994). CO_2 is the most important one among these, which apportions 72% of the annual global GHG emissions. In order to slow down the environment deterioration, people around the world are pursuing effective ways to cut down GHG emissions. The Kyoto protocol limits national emissions to 13% above the 1990 baseline, and the EU Commission's "20-20 by 2020" policy commits Europe to cut GHG emissions by 20% by the year 2020 (Acquaye and Duffy, 2010). In French, a climate action plan was edited in 2005 which aims to reduce carbon emissions in the developed countries in 2050, in order to reach a global world reduction of 50% of the 1990 level. Additionally, the Inter-government Panel on Climate Change (IPCC) also stated that in order to constrain the global warming between 1.4 ℃ and 3.1 ℃, a reduction of current annual GHG emissions by 52-90% by 2100 would be needed (Habert and Roussel, 2009).

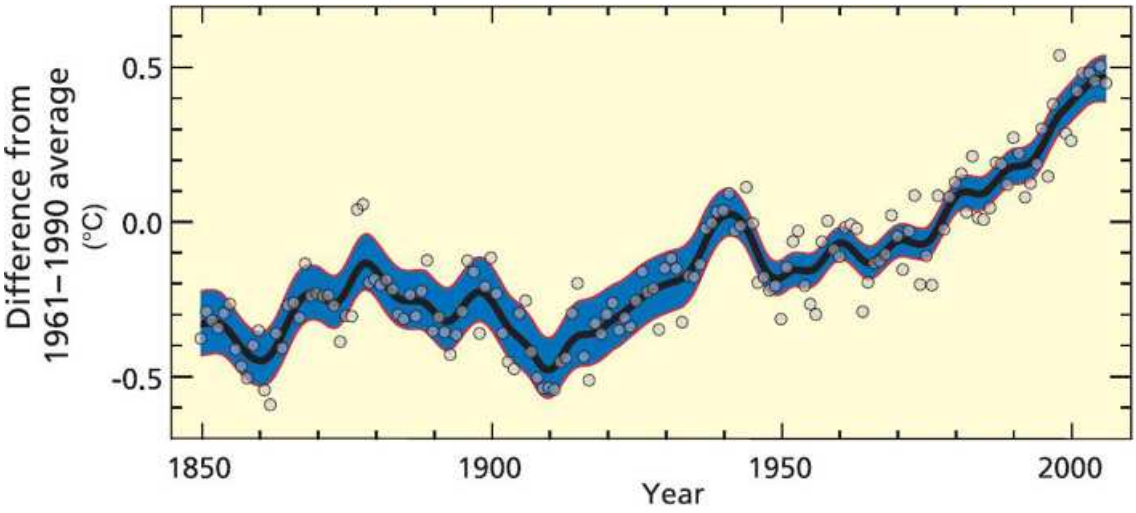

Figure 1. Global Temperature Change
(Source: Hong Kong Observatory, 2011)

The construction industry is always regarded as the main source of GHG emissions around the world. A report (BIS, 2010) has revealed that the amount of CO_2 emission from construction is accounting for almost 47% of total CO_2 emissions of the UK. Li *et al*. (2010) also showed that construction is the third largest industry sector in terms of contributions to greenhouse gas emissions in the United States. Hong Kong, as a metropolis in the world, undoubtedly has to take the responsibility of GHG emissions, especially CO_2 emission. In 1998, Hong Kong emitted 0.1% of the global CO_2 production and 9% of which is produced by manufacturing and construction. From 1990 to 2005, the total carbon emission in Hong Kong has increased by 11% (Lam, 2007). Till 2007, the annual CO_2 emission in Hong Kong had reached 39,963,000 metric tonnes, which is 0.14% of the global total. Although carbon emission has been increasing in Hong Kong, its rate of growth has been lowered (Figure 2). In order to cut back carbon emission more effectively, efforts should be paid on anywhere which has the highest reduction potential. This study has compared CO_2 emission of different structures and construction materials for buildings. It also provided several methods to help reduce the CO_2 emission in Hong Kong, which can serve as a reference for construction projects.

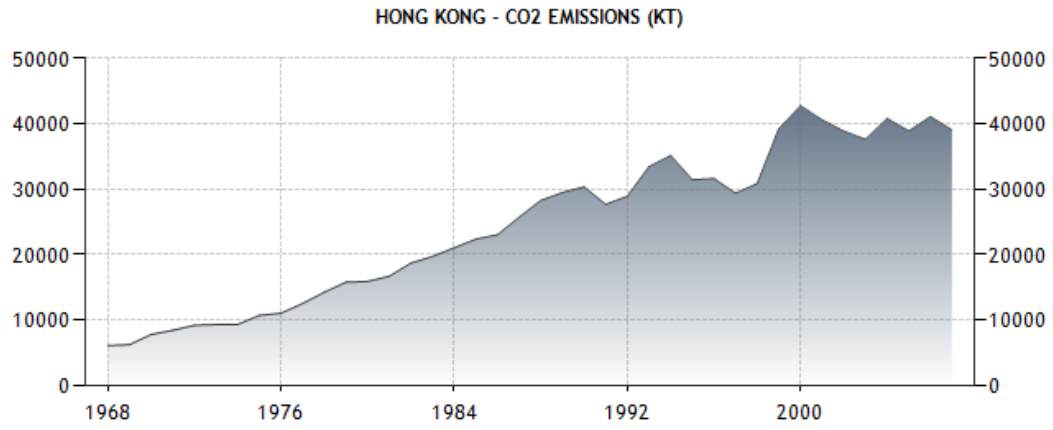

Figure 2. CO_2 emissions (kt) in Hong Kong
(Source: TradingEconomics.com, 2010)

3 CO2 emissions of the construction industry in Hong Kong

The whole life-cycle of a building, from construction and maintenance to demolition, has certain impact on the environment, so the aggregate effects make it much more complex than any other products. In this study, each phase of the life-cycle of a building is analyzed in detail, in order to estimate the importance of each factor in contributing to CO_2 emission.

3.1 Construction process

Hong Kong is a dynamic commercial and financial centre with a large population of about 7.09 million at the end of 2010. The increasing population and the limited land resource (1,103 square kilometres) impel that most of the buildings in Hong Kong are of high-rise construction, leading to a high population density of 6,428 per square kilometre. Thereby, the common structural forms in Hong Kong are of reinforced concrete, steel and steel-reinforced concrete (SRC) structures.

3.1.1 Building materials

Reinforced concrete adopts rebars, reinforcement grids, plates or fibers to strengthen its tensile strength. Nowadays, the most common mode of reinforcement is the insertion of rebars, which are made of steel.

As described above, the main construction materials used in Hong Kong are concrete and steel although timber is also widely adopted. However, it is not possible to widely use timber as a structural material and timber structures are not suitable for high-rise construction. Therefore, in this study, wood will not be considered.

Concrete is a kind of composite material, of which the compositions are cement (commonly Portland cement), fly ash, slag cement, aggregate (crushed rocks and sand), water and chemical admixtures. Cement takes up the largest part other than aggregates. Nevertheless, the cement industry is one of two primary producers of CO_2, creating up to 5% of worldwide man-made CO_2 emissions, of which 50% is from the chemical process, and 40% from burning fuel (WBCSD, 2002). Mahasenan *et al*. (2003) indicated that yielding one tonne of cement will release 900kg of CO_2. Hence, the process of producing concrete contributes a lot to carbon emission. It is reported that the

embodied CO_2 of one tonne of concrete is around 100 kg (Sustainable Concrete Forum, 2010).

Another main construction material, steel, is an alloy that consists mostly of iron and with a carbon content between 0.2% and 2.1% by weight, depending on the grade. There are two ways to produce steel. The first one (blast furnace route) is accomplished using several interrelated processes including coke production, sinter production, iron production and steel production. Another one is achieved through an electric-arc furnace (EAF) using scrap steel as input (Climate leaders, 2003). The former method contains 25% of scrap steel while the raw material of the latter one is 100% of scrap steel. As a result, the CO_2 emitted by separated routes are different. Sandberg *et al.* (2001) showed that the global average of the total CO_2 emission by blast furnace route is 1.97 ton CO_2/ton steel, while by the EAF method, it is only 0.59 ton CO_2/ton steel. In order to make a clear comparison with other construction materials, the study will focus on the blast furnace route, and the EAF route will be further discussed in section 3.2.

As discussed above, reinforced concrete is made of both concrete and steel, the amount of carbon it generated per tonne has to be counted separately. Buchanan and Honey (1994) provided the data that the density of reinforced concrete is 2400 kg/m^3, and the net carbon emitted from reinforced concrete is 182 kg/m^3. Consequently, every tonne of reinforced concrete contains 0.08 tonnes of CO_2. Figure 3 shows the net carbon emissions from different construction materials.

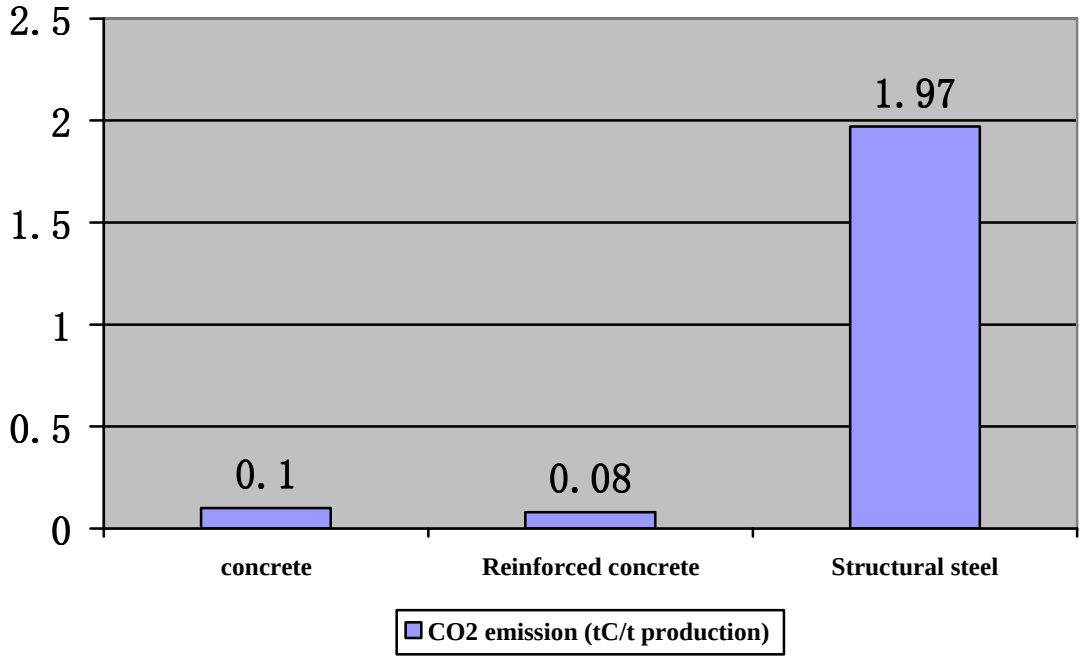

Figure 3. Net CO_2 emissions from manufacture of different building materials

3.1.2 Equipment and ancillary materials

During the construction process, utilization of equipment and ancillary materials generates CO_2 emissions. The specific activities which consume energy and generate CO_2 include: workers transportation, materials transportation, heavy machines transportation, equipment operation, and some temporary supporting measures such as heating and cooling, etc. The most highly consumed energies are electricity and diesel.

Electricity is crucial to the construction process, which supports most on-site equipment and help to create proper environment. There are mainly four modes of electricity generation: hydraulic electrogenerating, thermal power generation, wind power generation and nuclear power generation. In Hong Kong, thermal power generation and nuclear power generation are the dominating approaches. Census and Statistics Department (2010) reported that coal dominates the fuel mix for power generation (about 54%), followed by natural gas (about 23%) and nuclear power imported from the Mainland (about 23%). Coal burning power system has the largest carbon emission of all these systems. Conventional coal combustion systems result in emissions in the order of >1,000 g CO_2eq/kWh, and current gas powered electricity generation has a carbon emission around half that of coal (~500g CO_2eq/kWh), because gas has a lower carbon content than coal (POST, 2006). By contrast, nuclear power generation emits little CO_2 to the environment (about 5g CO_2eq/kWh). As a result, the average carbon emission by electricity is 656.15g CO_2eq/kWh. Since the average utility power for building construction per square metre is about 359 kWh, the impact on the environment is estimated at 235.56kg CO_2/m^2.

Diesel is another energy source mostly used for materials, workers and equipment transportation and operation of some machines. In the research of Oka *et al.* (1993), they found that primary energy of 8-12 GJ is necessary to construct one square metre of floor area. Meanwhile, Acquaye and Duffy (2010) presented the fossil fuel emission factor of 0.073 t CO_2/GJ. Thereby, the average carbon emission brought by fossil fuel is 730 kg CO_2/m^2.

3.2 Maintenance and demolition

3.2.1 Maintenance of buildings

Building maintenance includes: maintaining the normal operation of the facilities (for example, lift and air-conditions), maintaining the power supply, repair of the inner structure and surface of the building, keeping cleanliness of the building, etc. During this phase, large amount of electricity has to be consumed. Suzuki and Oka (1998) made an estimate and obtained the result that the average annual energy consumption was determined to be 1.21 GJ/m^2, which is equal to 220.54 kg CO_2eq/m^2.

3.2.2 Demolition of buildings

To obtain the life cycle figure of carbon emission of a building, it is necessary to consider the work of demolition. In this phase, the recycling of construction materials has a great effect on carbon emission estimation. Most of the demolished concrete is transported to the landfill for disposal, but large amount of steel can be collected and refined by EAF.

Steel is the world's most recycled construction material and approximately 40% of all steel production is based on recycled scrap. In the construction industry, steel used in construction has a very high rate of recycling at the end of life. As reported by Galvanizers Association (2011), some 86% of structural steel is recycled as scrap charge used in furnaces and 13% is dismantled and used directly for new structures. It is easy to collect and treat the steel, and no mater how many time it is recycled, its inner properties will not change at all. Therefore, the average CO_2 footprint of steel of a construction activity is equal to only 0.02 t CO_2/t steel.

4 Measures to reduce CO2 emissions

4.1 Efforts for CO2 reduction

The Hong Kong government is striving hard to reduce CO_2 footprint and create a more sustainable environment. In order to provide a sustainable future and ensure that the future generations can continue to thrive in a clean and green environment, many departments have devoted efforts on supporting a sustainable environment and cut down GHG emissions, which include: Architectural Services Department (ASD), Development Bureau, Electrical and Mechanical Services Department (EMSD), Hong Kong Housing Authority (HKHA), Environmental Protection Department (EPD) and Urban Renewal Authority (URA).

In the aspect of energy efficiency and conservation, the government has drawn up many plans to improve energy utilization ratio and reduce pollution. For instance, the voluntary Energy Efficiency Labelling Scheme, Mandatory Energy Efficiency Labelling Scheme, Energy Efficiency Registration Scheme for Buildings, Mandatory Implementation of Building Energy Code and Scheme on Fresh Water Cooling Towers. These activities and schemes can enhance the energy utilization ratio effectively, reducing the energy end-use per GDP (HK$ billion) by 32.81%, and the energy end-use per capita from 41.02 GJ in 1998 to 40.91GJ in 2008 (EMSD, 2010).

For the construction industry, the Hong Kong government has also made many efforts to promote green building construction. The policy of allowing private buildings to increase floor areas including green and amenity features for enhancing the living environment has been designed to create a more healthy and comfortable living environment for residents and cut down the workload of the building facilities. The government has also launched “the considerate contractor site award scheme” and “the green contractor award scheme” to encourage the private sector to make a sustainable design and save energy during the life-cycle of buildings. Wetland Park and the Stanley Municipal Services Building are two models of green buildings constructed by the government.

4.2 Other potential methods

In order to slow down the greenhouse effects and create a sustainable environment, more and more individuals and organisations have participated to search for effective methods. Some potential measures are introduced as follows:

First and the basic method is the production of a sustainable design for a building. A rational design, fully exploiting natural light for illumination and natural wind for ventilation, will not only save electricity for lighting and air-conditioning, but also enhancing the indoor air quality.

Secondly, select environment-friendly materials. These materials include recycled construction materials, renewable resources, and some newly developed materials with low or non-toxicity/ noxious gases. By taking full advantage of these materials, the GHG emission can be reduced as much as possible and resources could be saved. On the other hand, it provides a comfortable living and working environment for people as well.

One more useful way is to apply new power sources. Solar energy is a clean and renewable energy convenient to use. Nowadays, solar energy has been widely used in

different aspects of people's daily life; for example, solar water heater and solar powered auto. Solar energy could be used for electricity generation, heating and cooling, boosting chemical reaction etc. Since solar energy is not available at night and in the cloudy or rainy days, people have conceived good methods to store it. In the construction industry, solar energy has also been introduced into the architecture. Many countries have tried to combine this energy with their sustainable buildings, and have obtained some positive effects. However, the high cost of equipment and the geographical limitations limit the wide application of solar energy. More efforts are needed to solve these problems.

Concrete recycling is another useful measure to mitigate GHG emission. In the phase of demolition, concrete of buildings can be recycled. The recycled concrete can be used as the aggregate in new concrete, particularly the coarse portion (PCA, 2011); not only saving the resources consumption, but also save the cost of production. It is estimated that the cost of transporting concrete to the landfill can be saved as much as $0.25 per tonne/mile, and the cost of disposal as high as $100 per tonne can be eliminated (Concrete Network, 2010). Recycling of concrete has been adopted in many countries such as the United States, Japan, China and Taiwan etc. It is believed that more and more countries and districts will adopt this technology.

5 Conclusion and Recommendations

The construction industry, one of the major energy-consuming sectors, has to take the responsibility of mitigating GHG emissions in the world. In Hong Kong, the increasing population and limited available land resources constrain buildings to be high-rise. As a result, concrete and steel become the most popular construction materials. By comparing these two materials, it reveals that producing 1 tonne of concrete creates 0.1 tonne of CO_2. Additionally, little concrete can be recycled during the demolition period in Hong Kong. Correspondingly, the CO_2 footprint of steel production is 1.97t CO_2/t steel. However, 99% of the steel are renewable and put into use after reprocessing. Hence, the total carbon emission rate of steel of one building is about 0.02t CO_2/t steel, which is far less than that of concrete. Reinforced concrete, which is comprised of concrete and rebars (steel), has the carbon emission rate between concrete and steel, which is about 0.08t CO_2/t reinforced concrete.

During the life-cycle of buildings, electricity and fuels (mainly fossil fuel) generate large amount of GHG as well. Their CO_2 footprints are also estimated. For electricity, its carbon emission rate in the construction period is 235.56kg CO_2/m^2, and in the maintenance period is 220.54 kg CO_2/m^2, totally 451.60kg CO_2/m^2. For fossil fuel, it is 730kg CO_2/m^2.

The four materials discussed above are the main sources of the GHG emission. However, there are also many other influencing factors which could change the quantities of carbon emissions of buildings such as the environment around the buildings, some micro and local climates, and personal factor, etc. Therefore, when deciding on the use of the major construction materials, other measures from externality should also be considered.

During the last decade, Hong Kong has always been struggling for the carbon reduction and a sustainable environment. What is gratifying is that both the energy end-use per capita and carbon consumption per capita have declined comparing with ten years

before since more and more people attach importance to the greenhouse effect and greater efforts will be taken to create a low carbon environment.

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A Critical Review of the Potential for the Implementation of Rainwater System in Nigeria

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Abstract:
Rainwater harvesting (RWH) in its broadest sense, is a technology used for collecting and storing rainwater for human use (including small scale industries) from rooftops, land surfaces or rock catchments using simple techniques such as jars and pots as well as engineering techniques. In most urban areas, population is increasing rapidly and the issue of supplying adequate water to meet societal needs is one of the most urgent and significant challenges. This work is part of a wider ongoing study to investigate the environmental engineering and socio-economic benefits/barriers of RWH in Nigeria. The purpose of this is to: appraise the various RWH technologies available nationally and internationally and evaluate the potential for their sustainable application in Nigeria and adoption. The review reveals studies on RWH have been mainly: potentials of domestic RWH to provide water in rural and peri-urban areas, recycling of storm water for household use such as WC flushing, household garden and car washing, recharge of groundwater through RWH, RWH systems for improving crop production. There seems to be few reports on the combination of rainwater and grey water to promote potable water savings, GIS-decision support tool for RWH and optimization of rooftop RWH system to provide energy saving approach for the community. The paper therefore concludes that RWH is an option where good quality fresh surface water or groundwater is deficient.

Keywords:
potential, rainwater system, implementation, rainwater harvesting, Nigeria

1 Introduction

Water is an essential element for all life and is used in various ways – for domestic and industrial purposes. It is also part of the larger ecosystems on which biodiversity depend. Water is a key resource whose unavailability, will lead to non sustainability of other resources, human and natural. However, climate change and a steady increased in industrial and agricultural activities have revealed that water as a resource is restricted in availability on an ad-lib basis (Madulu, 2000). It has been noted that as human population increases and people seek better living standards; as economic activities continue to grow in scale and diversity, the demand for fresh water resources will continue to grow (Vasudevan and Pathak, 2005).

Rainwater is a major source of fresh water and the activity of collecting rainwater directly for beneficial use or recharging it into the ground to improve groundwater

storage in the aquifer is known as rainwater harvesting. Dependence on groundwater to meet the growing demands has increased tremendously. When there is a gross misbalance between the natural recharge and extraction of water over a period of time, the decline of water table becomes significant with reduction of yield. The only option available for the present day society is to improve the recharge over and above the natural processes. RWH and recharge is one such promising option that has artificial recharge methods. It is estimated that with prudent artificial recharge schemes and waste water recycling, *circa* 25% of India's water requirements in 2050 can be met (Sakthivadel, 2002).

The world's population has reached approximately 6.6 billion in 2010. It is expected that under a medium fertility scenario, the global population will likely reach 8.9 billion by the year 2050 (Andrew –Lo, 2003). About 20% of the population currently lacks access to safe drinking water, while 50% lacks access to safe sanitary system (Turshaa *et al*., 2000). RWH is of high importance in sustainable development, unlike other sources which may be subject to depletion or possible pollution. RWH is one of the renewable resources and have no adverse environmental impacts.

The purpose of the study is to appraise the various RWH technologies available nationally and internationally and evaluate the potential for their sustainable application in Nigeria and adoption.

1.1 Location

The study areas are three cities in Nigeria namely Ibadan, Lagos and Port-Harcourt selected on some basic considerations as shown in Fig. 2.

Ibadan is the capital of Oyo state (7^0 $23^1 16^{11}$N, $3^0 53^1 47^{11}$E), situated in the south-western Nigeria. Ibadan was chosen because it is a residential area and groundwater pollution rate is also high. The cost of developing surface water is very prohibitive due to poor management of wastes which are usually dumped into streams and other surface water. Yet, being located in the rainfall rich area of the country with up to 1350mm annual precipitation, rainfall resources can be gainfully explored.

Lagos lies in the south-western Nigeria ($6^0 27^1$N, $3^0 24^1$E) and was selected due to her susceptibility to sea intrusion and prevalent industrial wastes resulting in groundwater pollution. These scenarios have made both groundwater and surface water resources to be expensive. Incidentally, rainfalls are usually torrential especially during the wet season leading to severe floods. Hence, tapping of rainwater will help alleviate this problem as well as providing potable water for the hugely populated city of Lagos.

Port-Harcourt is the capital of Rivers state in Nigeria, situated in the south-eastern ($4^0 47^1 21^{11}$N, $6^0 59^1 55^{11}$E). It is an oil refining city, being a main export earner of crude oil. Port-Harcourt was chosen because it is an oil exploration and industrial region and so there is the potential of high levels of groundwater pollution. The streams and rivers are also prone to contamination by oil exploration businesses. The city is one of the most abundantly blessed cities, rainfall wise in Nigeria with 2,300mm annual precipitation. Rainfall harvesting thus constitutes a veritable source of water provision and a means of flood control.

Fig.1- Map of Nigeria showing the study areas.

2 Objectives

The main objective of this paper is to review the various rainwater harvesting technologies available nationally and internationally and evaluate the potential for their sustainable application in Nigeria and also the potential of their uptake/adoption. It is envisaged that the work will develop a framework for improved and sustainable rainwater harvesting regime in Nigeria.

3 Research Methodology

A desktop study was carried out to review:

(i) Rainwater harvesting techniques globally.
(ii) Existing RWH techniques in Nigeria.

4 Findings and Discussion

4.1 Global Initiatives on Rainwater Harvesting

Africa

In Tanzania, only about 50% of the rural population has access to reliable water supply and over 30% of the rural water scheme is not functioning properly despite the significant investments in the provision of water between 1965-1985 (Kariba 2002; Madulu 2000). Kossa (2005) concluded that a participatory problem analysis performance and sustainable management of RWH will be greatly enhanced in Tanzania. In South Africa (SA) the potential of domestic rainwater harvesting (DRWH) has been explored to provide water in rural and peri-urban areas that conventional technologies cannot supply. A GIS based decision support system was developed by (Mwenge *et al*., 2009) to indicate the areas of SA suitable for RWH and quantify its hydrological impact as runoff reduction for any selected percentage of adoption. Work on population growth induced agric intensification of Ewaso Ng'iro river basin, Kenya was conducted by Stephen *et al*. (2007). This study has led to the formulation of sustainable land and water resources management policies and strategies for water-scarce river basins. The social sector rehabilitation and development programme, 1993-1996 revealed that only 43% of the urban population of Zambia had access to safe water and sanitation. This led Lubinga *et al*. (2003) to study the potential of RWH in urban Zambia. The laboratory analysis of the harvested water showed that the water was suitable for drinking purposes.

Asia

In the Trans Indo–Gangetic plain (India), Ambast *et al*. (2006) helped solve the problem of groundwater decline due to indiscriminate use of groundwater for cultivation of rice-wheat. It was revealed that the recharge rate through this system is almost equal to a shallow cavity/filter well yield (about 11litres/second and its cost is about INR 10/100m^3). Singapore has an annual rainfall of 2250mm, but water demand are constantly increasing due to industrial development and increasing population. A study was carried out on roof water harvesting from high rise building in which over 84% of the population lives (Adhityan 1999). The study reveals that a monthly saving of about $14,449.78USD in water expenditure was realized with this system. The major cities in South Korea are experiencing water scarcity, which implementation of rainwater harvesting systems has the potential to mitigate. Ju *et al*. (2010) studied the micro-biological and chemical characteristics of harvesting rainwater and reservoir water as alternative water resources in South Korea. The study reveals that all the harvested rainwater met the requirement for grey water and not for drinking water. In the city of Taipei, Taiwan Ming-Daw *et al*. (2009) developed a method for establishing the probabilistic approach relationship between storage capacities and deficit rates of rain harvesting.

European Union

In Sweden, water is still an abundant natural resource where only 0.5% per year of available resource is used. However, local drinking water supply system is vulnerable to shortages and water quality deterioration. *Edgat et al*. (2005) used a computer model to analyse use of rainwater for WC flushing, laundry, irrigation and car washing. The

analysis showed that rainwater will contribute to important savings in drinking water. Furthermore, the south and east of the UK are under water stress which will worsen with hotter summers and increased development. This led to a study by Hassell (2005) on solutions to increasing water shortage in these areas. The researcher concluded that RWH is a solution to the increasing water shortages, since its usage in buildings will reduce demand for potable water and reduces storm water problems in overloaded sewers.

Oceania

Australia is experiencing fresh water scarcity due to declining rainfall and increasing temperatures. The cost effectiveness on the use of rainwater tank for residential environment was carried out in Australia due to its serious water crisis (Vivian *et al*., 2010). The research revealed that rainwater is an economic option for all households in the region. Integration of local water resources (rainwater, storm water and sewage effluent) was carried out in South Australia (Marks *et al*., 2006) as a potential to increase population grown from 800- 2,400. Rainwater tanks was assess as adequate for all in-house uses excluding toilet flushing while a combination of reclaimed sewage effluent and harvested storm water resources was found adequate for non-potable uses, including toilet flushing, household gardens and public open space.

The Americas

In the USA, the influence of climatic cycles on water availability, increase in retirement communities in the semi-arid south-west and a drift in population density in coastal areas has led community planners to adopt the interaction of land-use with the quality/quantity of water supplies. Sekar *et al*. (2007) developed a spatially-explicit method to evaluate the cost of harvesting in the Taunton River Watershed in Eastern Massachusetts, USA. The results demonstrated that a spatially-variable harvesting strategy can be used to minimize runoff loss and to augment water supplies. Germany is not a water poor country as rainwater utilization in households has become widespread since 1980s. Research was carried out on the recycling of storm water (polluted rainwater from streets and courtyards surfaces) and its reuse as service water (Erwin 2007). The study revealed that with simple inexpensive treatment rainwater from polluted surfaces, such as traffic areas can be treated to a high quality service water for household use such as toilet flushing and laundry activities without hygienic risk and comfort loss for the user. Rainwater harvesting is abundant in most of Brazil. The potential for potable water saving using 62 cities was investigated (Enedir *et al*., 2006). The study revealed that 34-92% has potential for potable water saving using rainwater depending on the potable water demand. They also conducted a study on the potential for potable water savings by using rainwater and reusing grey water in a multi-residential building composed of three blocks in Southern Brazil. The result of the study found grey water as the most cost effective system.

4.2 Rainwater Harvesting in Nigeria

RWH is a worldwide practice of meeting the increasing demand for fresh water. In Nigeria, it is practiced in the southern part as rainfall is widely for eight months in a year with mean intensity of 180-225cm. RWH is practiced at individual, household, community and occasionally local or state government level to augment dwindling water supply to urban centres. Oni *et al*., (2008) examined the techniques and materials

used for RWH with a focus on the geographical spread of its use in Edo state, Nigeria. Their study reveals that majority of the people empty their tanks mid-way into dry season, suggesting that the current volume of the tanks is inadequate for water sustenance during the dry seasons. The influence of ageing roof on the quality of harvested water from various roofs in Nigeria was studied by Eletta and Oyeyipo (2008). The concentration of zinc and iron were found to be significantly different from the aged and the new roofing sheets and the sample collected from the source. Rim-Rukeh *et al*., (2007) investigated the efficiency of pollutant removal in raw harvested rainwater through adsorption of a fixed-based filled with bone char in Agbor, Nigeria. Their study revealed that raw harvested rainwater subject to such treatment has a good quality compared to WHO standard for drinking water. A rainwater harvesting system was designed in Otukpa community, Benue sate, Nigeria using local materials Onoja *et al*., (2010). Although RWH is a practice of everybody in this community, the supply is inadequate for their sustenance through the dry period of the year. A conceptual research framework was developed for this study as illustrated in Fig. 2.

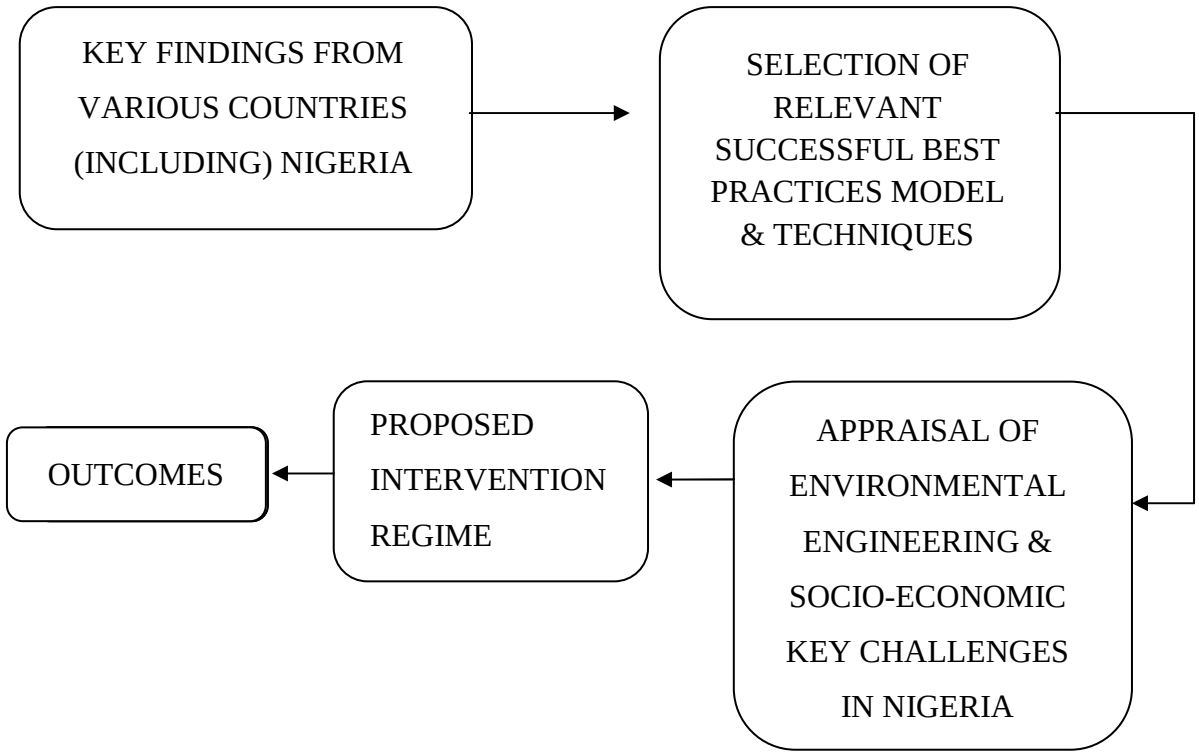

Fig.2- Conceptual Research Development Framework

5 Conclusion

The paper seeks to investigate the potential of RWH in Nigeria as part of efforts aimed at improving adequate water supply to meet societal needs and to ensure equity of access to water in Nigeria. Studies on RWH have been mainly: (1) Potentials of domestic RWH has been explored to provide water in rural and peri-urban areas, (2) Recycling of storm water for household use such as WC flushing, household garden and car washing, (3) Recharge of groundwater through RWH, (4) RWH systems for improving crop production. There seems to be few reports on the combination of rainwater and grey water to promote potable water savings, GIS-based decision support tool for RWH and optimization of rooftop RWH system to provide energy saving approach for the community. The paper therefore concludes that RWH is an option where good quality fresh surface water or groundwater is deficient. RWH system as a potential of serving as alternative water sources for increasing water supply. Although the work will primarily be focused on developments for the Nigerian context, it is envisaged that the output will engender wider application in similar developing countries and form the basis for future sustainable technology transfer to such countries from the developed world.

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Financial analysis of the property market and property assets

Redlining in residential mortgages in Johannesburg, South Africa

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Abstract:
The term "redlining" was coined in the late 1960s by John McKnight, a Northwestern University sociologist and community activist. It describes the practice of marking a red line on a map to delineate the area where banks would not invest; later the term was applied to discrimination against a particular group of people (usually by race or sex) no matter the geography.

Even though the practice is widely reported in the United States, redlining occurs in many developed economies of the world, especially in the major cities of developed countries. The exposure of the practice in the United States is a result of the legislation framework that has been developed to combat redlining.

The aim of the research on the paper was to study redlining practice within the greater Johannesburg area. The aim can be summarised by the following objectives: firstly, to investigate the evidence of redlining in the greater Johannesburg area, to test its existence; secondly, to investigate the reasons why the areas were redlined; thirdly, to understand what the South Africa government and society did to combat the redlining practice.

Keywords:
mortgages, mortgage risk, redlining, reinvestment

1 Introduction

Redlining is defined as the practice of denying or increasing the cost of services such as banking, insurance, access to jobs, access to health care, or even supermarkets to residents in certain areas. Redlining is associated with a geographical area rather than a population profile. In the earlier days of redlining, a line would be drawn on a map, by a mortgage lender, showing an area where the lender would not grant mortgage bonds.

The main debate in the paper was between the mortgage lenders and the mortgage seekers. The debates were based on the reasons for redlining, why mortgage lenders practice redlining. The mortgage lenders' arguments were based on finance and default risk principles whereas the mortgage seekers based their arguments on socio-economic issues and their rights to access to finance in order to improve their economic status.

This paper is based on research carried out in 1997 and 1998. The findings, reported on this paper, are based on interviews with the stakeholders: mortgage seekers and mortgage lenders, which consisted of four major banks in Johannesburg.

The paper seeks to address three key issues:
1. whether there was redlining in greater Johannesburg
2. the reasons why mortgage lenders redlined certain areas
3. what the South African government and society did to eradicate redlining

2 Literature review

2.1 Existence of redlining

As far back as 1978, a study in Newcastle Upon Tyre, United Kingdom, by Kirby (1978) indicated that some districts in the city were entirely overlooked by Building Society Associations funds, usually on the grounds of the age of the properties. It was in fact commonly assumed that many Building Society Associations operated a system of Redlining whereby certain inner-city districts are regarded as off limits to investment.

In South Africa, in the 1990s, a similar practice, whereby the South African Weekly Mail (1993) was quoted, "a red menace is spreading through the leafy northern suburbs of Johannesburg: not communists in the shrubbery by bank Redlining policies in the figurative line demarcates a no lend area". A study carried out by the Human Sciences Research Council (HSRC) in 1991 found evidence of redlining in Johannesburg and supported the inner-city phenomenon. The study found that redlining in greater Johannesburg was dominant in Hillbrow, Berea, Joubert Park and the Central Business District (CBD) residential, which are all within the inner-city boundaries of Johannesburg. Crankshaw and White (1991) in their paper, "Racial desegregation and the origin of slums in Johannesburg's inner-city" also found evidence of redlining in Johannesburg. Crankshaw, *et al* noted racial bias and argued that allowing non-whites to live in the inner-city of Johannesburg contributed in the redlining of the "grey areas" by financial institutions before the new interracial and democratic government of 1994. Nsibande (1999) found evidence, in his research, of the practice of redlining in the greater Johannesburg area.

In the United States of America, Holmes (2000) in his article "neighborhood racial composition and mortgage redlining: a nationwide analysis" found that redlining was also widely practiced in the USA across the whole country. Holmes study provided statistical evidence that neighborhood racial composition may affect the flow of mortgage credit in some regions. Squires et al (1996) have published many findings of the practice of redlining in residential mortgages in the United States of America.

From the above articles, it is clear that redlining is widely practiced in many areas around the world. This makes it necessary to seek an understanding behind the reasons for redlining in mortgage lending, why financial institutions practice it.

2.2 Reasons for redlining

2.2.1 Risk versus return

In modern finance theory, Sharpe (1964) explains best how an investor prices assets in uncertainty. The capital asset pricing model, Sharpe developed, explains that an investor requires higher returns from more risky assets as compensation for the additional risk taken on the more risky asset. The theory is widely applicable in pricing of investment instruments and can be applied to residential mortgages. In residential mortgages, applying this principle means, a mortgage lender will require a higher return from

granting mortgages in higher risk areas. Hence, areas that mortgage lenders perceive as more risky will be expected to yield higher returns for the mortgage lender to compensate for the additional risk a mortgage lender is taking.

2.2.2 Pricing of residential mortgage loans

In areas that mortgage lenders perceive as risky, the mortgages must be priced to an extent sufficient for the mortgage lender to compensate the risk being taken. In an ideal market, the mortgage lender could price the mortgages "high enough" to compensate whatever risk being taken in the lending to a risky area. However, legislation and market forces prevent the mortgage lenders from going "high enough" to cover all their risk. Therefore, mortgage lenders are limited to a cap on the interest or required return that they can charge on a mortgage loan. This means that if the mortgage lender has a limit or a cap, the mortgage lenders would not be sufficiently compensated which compels the mortgage lender to abstain from making that investment. This results in redlining of areas that are perceived to be too risky or areas where the mortgage lenders cannot charge sufficient interest to cover the additional risk they are taking.

A mortgage lender will only grant a mortgage loan if the interest charge compensate for the required return on the investment.

2.3 Combating redlining in the USA

In the United States, it is easier to investigate and charge the mortgage lenders because of the "home mortgage disclosure Act of 1975" and the "community re-investment Act of 1977". These two laws work hand in hand. The disclosure Act requires Financial Institutions to release their mortgage lending records, including rejections. If there is evidence of redlining based on the data released under the disclosure Act, the community re-investment Act mandates the Financial Institutions (culprits) to provide access to Home Mortgage Loans through their local branches and service the local areas. Nowadays, there are other laws that support these two Acts like the Equal Credit Opportunity Act.

In recent times, there are several other organisations and State Institutions who monitor Financial Institutions' Mortgage lending practices. To name a few, there is the Association of Community Organisations for Reform Now (ACORN); Green-lining Coalition (San Francisco group); and the Southern Christian Leadership Conference (SCLC). In recent years, these organisations have advised minority group in the United States to deposit their savings with minority banks to avoid being discriminated in cases where certain Financial Institutions proved to be practicing discrimination. With the help of these organisations, communities have managed to bring forward charges of redlining in Baltimore, Chicago, Atlanta and Los Angeles. According to Roberts (1994), in some instances, there has been compensation paid out to communities, as it was the case in Hartford. In this case, the Justice Department, Federal Reserve of Hartford, and the Federal Trade Commission ordered Shawnut National Corporation to pay one million dollars in a discrimination suit in Mortgage lending before they could be granted permission to operate in Hartford. Shawnut National Corporation had to find seventy to one hundred people to share the one million dollars compensation.

3 Research methodology

The research on this paper was based on interviews carried out in 1997 and 1998 in greater Johannesburg. The participants in the research were made up of mortgage

seekers, consisting of estate agents, home owners, valuers and property professionals, civic organisations and Council employees, and mortgage lenders, consisting of the four major banks in Johannesburg, namely, Standard Bank, ABSA Bank, First National Bank and Nedbank.

4 Findings and Discussion

4.1 Mortgage seekers

4.1.1 Estate Agents

The mortgage seekers all agreed to the existence of redlining in greater Johannesburg. Two contradicting views were expressed by the mortgage seekers as to why mortgage lenders were practicing redlining. One group found redlining policies justifiable while the other found the redlining policies detrimental to the real estate industry.

The first group believed that redlining policies were economic and financial measures applied by the mortgage lenders to protect themselves against unwanted and unnecessary exposure to risk. The Estate Agents believed that redlined areas were not conducive for investment and accepted that such areas should be redlined. They emphasized the importance of client profiles of the applicants rather than the area and believed the redlined areas were a result of poor credit worthiness. The Estate Agents emphasized that a good applicant with low default risk could get a mortgage bond in any area irrespective of whether the applicant believed an area was redlined or not. This view was supported by arguments made by mortgage lenders to be discussed in later sections of this paper. It was a hard line approach to the subject and it was worth exploring and debating with the Estate Agents who supported that view.

The latter group believed the mortgage lenders' redlining policies were not justifiable and were in fact worsening the condition and environment of the areas already redlined. The Estate Agents believed the mortgage lenders were critical players in unlocking the potential of areas and were controlling the destiny of suburbs in greater Johannesburg. The Estate Agents saw redlining as a form of segregation of areas and people. They saw mortgage lenders as "engineers" of urban slums through redlining. This line of discussion supports arguments made by activists and other human rights organisation that fight segregation of areas or people. Similar arguments have been made in the United States and the United Kingdom.

On the failure or non-existence of secondary mortgage markets in South Africa, the Estate Agents acknowledged that the current government had initiated positive measures but felt it was not enough to provide guarantees for mortgage lenders to lend in any area of Johannesburg. The Estate Agents felt more needed to be done to provide sureties for mortgage lenders.

4.1.2 Residents

The views of the residents of the inner-city supported the argument that mortgage lenders were to blame for all the redlining that was happening in their areas. They felt it was unfair and was a segregation measure by the Financial Institutions. However, it must be noted that the residents were not familiar with lending criteria applied by Financial Institutions in granting mortgage bonds or loans. They were also not familiar with default risks or the concept of pricing of risk that the Financial Institutions were applying.

4.1.3 Property experts

The valuer's opinions and the building inspector's opinion that value and depreciation of real estate in areas that were redlined was justifiable for redlining by mortgage lenders supports the arguments of the Financial Institutions interviewed in the research. Literature does not support the hypothesis that redlined areas are a result of negative collateral as it could not be proven in the United States that there was a correlation between falling real estate prices and redlining of areas. This was recorded in the study Swago (1996) entitled, "low cost housing developments have no effect on the values of neighbouring properties".

The experts' opinion vested more on the values of the real estate than on the attributes of the residents as they felt Financial Institutions considered extensively the future values of the real estate in granting mortgage bonds.

4.1.4 Property Project Managers

Project Managers had a better understanding of the subject of redlining in greater Johannesburg and also had better success in getting mortgage bonds in areas that were perceived to be redlined. The Project Managers had established firm relationships with the mortgage lenders and worked closely with them in raising funding for their projects in the inner-city of Johannesburg. The mortgage lenders even went further to advise them on how to better succeed in getting mortgage bonds in the inner-city. However, they were also faced with the same challenges as the residents, especially the deteriorating conditions of the inner-city of Johannesburg and the crime. They even went further in understanding the extent of exposure of the mortgage lenders in high risk areas like the inner-city of Johannesburg. None the less, they also acknowledged the existence of redlining in the inner-city of Johannesburg.

4.1.5 Civic Organisations

Civic organisations in greater Johannesburg followed the argument of the activists and the residents of the inner-city of Johannesburg. They believed that racial and economic segregation was a major factor in determining areas that were redlined. They followed their arguments with examples like, the fact that the majority of the people living in the inner-city, where redlining was prevalent, were Blacks and low income earners, hence the Financial Institutions found it justifiable to redline such areas on the basis of high default risk. Studies in the United States of America were inconclusive on determining the correlation between racial groups in the United States and higher default risks. Such findings are recorded in the study completed by Andrew Holmes in 2000.

However, Civic Organisations in South Africa were restrained as they could not prove their assumptions since Financial Institutions were not compelled to reveal their mortgage bonds applications' records. There were no laws in South Africa similar to the home mortgage disclosure Act of the United States.

4.2 Mortgage lenders/Financial institutions

The Financial Institutions took a hard line on the discussions of redlining. They defended their lending criteria on the bases of sound financial decisions, according to lending practices and government regulations.

The biggest problem in greater Johannesburg though, particularly in the areas that were redlined, was the poor demographic profile of the residents. This presented the Financial

Institutions with a case of poor real estate characteristics coupled with applicants who had poor credit worthiness, resulting in the areas being prone to be segregated and redlined.

The Financial Institutions all objected to racial bias on their practices and emphasized that their criteria was based on credit worthiness, irrespective of race. In South Africa, the racial bias is complicated by the demographic make- up of the income levels whereby most of the poor and low income earners are the Blacks and most of the rich and high income earners are the Whites. It is often easier to blame everything on race rather that income levels when one considers why certain racial groups are not getting mortgage bonds approval, for example.

5 What the South African government and society did to combat redlining

In the United States, redlining policies began in the 1930s and were based on racial bias. In the South African scenario, the Lending Institutions, together with developers, withdrew from the "black" townships in the 1980s (notably, in 1984 and 1986) because of boycotts to mortgage repayments. These boycotts were not directed at only Financial Institutions, but at all service providers in the "black" townships in protest against the government's segregation Laws. This was at the height of the struggle against apartheid. The communities in the "black" townships developed a culture of not paying for services. The Financial Institutions withdrew from whole areas without appraisal of investment opportunities and risks. In a similar way, electricity would be switched off from whole areas without discrimination of who has paid or not. Lending to the "black" townships was considered off-limits.

In October 1994, the post-apartheid government made an agreement with the Financial Institutions to return to the Black townships is what was known as the Housing Accord. The accord can be summarised by the following statements made by the communities and the association of Mortgage Lenders, respectively, "we commit ourselves to an intensive campaign to change the hostilities between Financial Institutions, Local governments and communities and bring to an end the tradition of non-payment for rent and Bond Boycotts...", and "greater accessibility of credit for lower income earners can dramatically reduce the numbers of families relying solely on government housing subsidy. Absent from the lower end of the housing market for some time, we representatives of the banks and broader financial sector commit ourselves to a resumption of lending on a scale large enough to allow a significant number of South Africans to become first time home owners".

The accord was followed by the Record of Understanding (ROU) signed by the Government and the Association of Mortgage Lenders. The Financial Institutions pledged to provide fifty thousand loans to low income earners in the Black townships and the Government pledged their commitment to encourage the residents to repay the loans. The Government launched the "Masakhane" campaign. "Masakhane" means "let's develop one another".

In addition, the post 1994 Government took it upon itself to encourage businesses to re-invest in the inner-cities of all major towns in South Africa. The Government introduced tax breaks under Urban Development Zones (UDZ), passed under the Revenue Laws amendment of 2003, whereby inner-city areas in all major towns around the country

were demarcated and any investment companies make within the demarcated areas receives a tax break. This has encouraged re-investment into the inner-city of Johannesburg and there has been a surge in development projects from 2004 to 2010. There have been a lot of conversions of office buildings in Johannesburg to rental stock. Security has also been improved and the overall conditions in the inner-city have improved.

During the research, there were a number of Housing Trusts and a mortgage Indemnity Fund that was operating in greater Johannesburg. One of these funds was the Inner-city Housing Upgrading Trusts (ICHUT). Then there was the Mortgage Indemnity Fund (MIF). The main objective of the trusts and funds was to combat redlining and allow financial institutions to return to areas where they had stopped lending to. They assisted with projects' deficiencies and additional risks associated with redlined areas. The areas covered by the trusts and funds were the inner-city and the "black" townships where Financial Institutions had stopped lending in the 1980s and early 1990s. The trusts and the funds offered various forms of assistance including short term insurance and sureties (indemnity). The trusts and funds also engaged with the communities to try and stabilise the environments and bring stability to an area where lending had ceased. One way they carried out this was to encourage ownership and owner-occupancy in the inner-city. They aimed to bring up the owner-occupancy to about 30% as they believed higher owner-occupancy resulted in more stable environments.

The MIF's other objective was to eradicate redlining completely in Johannesburg and bring about an environment that was conducive to investment in the whole of Johannesburg. The MIF covered political risks and operated mostly in areas where there were rents and Bonds boycotts as a result of the resistance to Apartheid. They engaged with the communities and encouraged them to pay for services and for Bonds' instalments. They also assisted in ensuring there was rule of law and order in the areas and supported all court orders that were made in the areas which had previously experienced civil unrest.

6 Conclusion and further research

The research showed that redlining practise existed in greater Johannesburg. During the research the findings brought to light the reasons for redlining, why mortgage lenders were engaged in the redlining practice. The research also brought into light some strategies that could be used to combat the redlining practice. The research did not test if the measures taken by the South African government and society were effective in eradication the redlining practice in greater Johannesburg completely.

This research could be extended to other areas to determine if the redlining practice exists in those areas. The literature review showed that it is applicable to many areas around the world. More research, on strategies and measures for combating redlining, need to be made for effective eradication of the redlining practice.

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Health and safety

Concrete Construction Safety: Investigating (Western) Australian Formwork Practice

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Abstract:
Preventing accidents from occurring is a primary concern for the Australian construction industry. One area where incidents have occurred, at a more than acceptable rate, is in the use of formwork; recent formwork failures in Australia illustrate these are just as significant as a permanent structure failure. Whilst most formwork failures are found to concern differing inadequacies in practice, the occurrence of formwork failures may be prevented by targeting reform at their root cause; this paper presents the findings of detailed investigations examining the guidance and legislation governing formwork practice in Australia. An analysis of documentation governing Australian formwork practice, alongside industry perceptions provide a rounded and extensive view of the current situation. Findings highlight the limitations of using a legislative-based model of control, and also express the importance of formwork design education and training.

Keywords:
concrete, formwork/scaffolding, construction-saftey, Western-Australian

1 Introduction

Accidents and work-practice incidents can be costly, time-consuming and damaging for company reputations. Even more concerning is that anytime an incident occurs there is a chance that human life may be impacted - even lost. To prevent incidents, safety in practice must be a primary thought for all engineers. The Engineers Australia Code of Ethics (EA, 2010) makes specific reference to the importance of health and safety in its charter, placing responsibility for this aspect above private interests, including profit. However, despite this emphasis, there are occasions when safety standards lapse and incidents occur. One area where incidents have occurred, at a more than acceptable rate, is in the use of formwork.

To ensure a high standard of practice is pursued by all engineers, this paper is concerned with current safety standards in Australian formwork practice. Standards Australia (SA, 2010a) defines ‘formwork’ as the “temporary works erected to mould and support cast in-situ concrete”. Even though, as this definition indicates, formwork is ‘temporary’ it should not be subject to lesser safety standards than any permanent structure. Recent formwork failures in Australia illustrate the catastrophic consequences that formwork failures have and can be just as significant as a permanent structure failure. Whilst most formwork failures are found to concern differing inadequacies in practice, the occurrence of formwork failures may be prevented by targeting reform at their root

cause. Therefore, this paper presents the findings of detailed investigations examining the guidance and legislation governing formwork practice in Australia. In addition, it highlights the limitations of using a 'legislative-based model of control' and also expresses the importance of formwork design education and training.

The following discussions communicate existing knowledge on formwork practice, as well as a summary of the findings of various case studies of formwork failure in Australia. This is followed by an analysis of documentation governing Australian formwork practice, alongside industry perceptions to provide a rounded and extensive view of the current situation. Industry professionals interviewed in this investigation were senior representatives from: Global Construction Services; Foundation Engineering; Hawkins Engineering & Construction; Syntect Consulting; Engineers Australia National Industry Relations Management; Standards Australia Formwork Development Committee.

2 Background Information

Formwork as we know it today has largely been shaped in parallel with the major developments of concrete construction observed throughout the twentieth century. Previously perceived as 'merely a tool used in construction', literature suggests formwork is now being regarded as the complex works it is. This may be a reason for principal contractors' now largely taking project management roles and, subcontracting-out formwork practice (Ferguson, 2010). Construction technology has also developed over time and proprietary formwork systems are now frequently used in the Australian concrete construction industry. These systems are largely pre-engineered and prefabricated, leading to economies in the design and construction of formwork. However, studies have shown that assumptions made in the design of such systems are often inadequately communicated (Pallet, 2001). Care must also be taken in regard to the continued re-use of such systems, which removes the opportunity to seek economies in design on the premise of its 'short life'. With new entities becoming involved in the construction process, whether it is formwork suppliers or subcontractors, issues with cooperation, coordination and communication have become apparent.

Project management is complicated by the fact that its key parameters - cost, schedule, safety and quality, are often competing objectives. In the context of formwork, its use is on the critical path and it can contribute to as much as 60% of the total concrete construction costs (Hurd, 2005). Formwork will therefore often determine project success in terms of both schedule and budget. With most businesses driven by their bottom line, it is important to remember project cost-saving measures that lead to formwork failure defeat their own purpose. However, with the moral need to address safety subject to differences in opinion (Hinze, 2000), regulated guidance stands as the only consistent means to address safety.

Australian Standards are often perceived to be the figurehead litigation that holds engineers to account. However, this ideology comes with a false belief that compliance with Australian Standards outweighs the fundamental responsibility and obligation to provide a safe workplace in line with the occupational health and safety legislation (Travers, 2009). Safety of formwork practice in Australia is governed by state-based occupational health and safety legislation, which varies from state to state. Common to all legislative frameworks is the condition to comply with the national Formwork Standard, AS3610, for structural integrity requirements. Codes of practice are

sometimes provided as advice on acceptable ways of complying with the obligations under state legislation and should be adopted as a method of risk management. Under Western Australian legislation, AS3610 is referenced as a code of practice for formwork, however its suitability in addressing legal obligations is arguable. More concerning, the suitability of using AS3610 in its intended purpose as a design Standard is also open to debate. Research has demonstrated many flaws in understandings of formwork practice that have not been effectively communicated through the Standard (Ferguson, 2010).

3 Australian Formwork Failures

Although there have been significant legislative developments in formwork practice over the years, the level of safety in Australian formwork practice appears to have changed very little. In 1966 formwork for a bridge in Welshpool collapsed due to standards of design, which were deemed to be, at best, "barely adequate" (MRWA, 2010). This issue of standard appears to still exist as evident by an August 2010 bridge formwork collapse in Canberra, caused by trivial design flaws (SMEC, 2010). The fact that these incidents, decades apart, have occurred from issues in design standard highlights a pertinent topic for engineers, especially considering there have been incidents in formwork that have put lives at risk and cost construction companies millions of dollars. The following discussions provide a brief summary of the major findings of three recent Australian formwork failures.

3.1 Robert Sergi Bridge Collapse (October, 2000)

In October, 2000, a formwork collapse occurred during the construction of a bridge in Corio, Victoria. This collapse demonstrated the full destructive potential of formwork failures with the bridge now posthumously named to commemorate the fatality of Robert Sergi. A report released by the State Coroner's Office (SCV, 2000) has found the collapse was largely attributed to false economies, with the principal contractor requesting a change in the formwork design to reuse material that was already in stock. Furthermore, it is believed that the principal contractor altered the headstock beams with little consultation, under pressure to get the job finished within existing timelines. Many other factors were found which demonstrated poor standards of design and construction practice; however these were not directly attributed to the collapse. The findings of this collapse drew attention to many important variables that influence the standard of formwork practice in Australia. Aside from the importance to recognise potential for false economies, key considerations were: when using subcontractors, the principal contractor cannot extricate itself from the works; and education and training of engineers needs improvement.

3.2 Christchurch Grammar School Slab Collapse (November, 2009)

In November 2009, a formwork collapse occurred during the construction of a suspended slab at Christchurch Grammar School in Claremont, Western Australia. No injuries were recorded. A report released by the Construction, Forestry, Mining and Energy Union of Western Australia (CFMEU, 2009) detailed the findings of preliminary investigations into the collapse. The report suggested that the formwork failed due to insufficient bracing, which led to buckling of the formwork standards (supporting column elements). Despite such trivial design flaws, it appears as though the collapse may largely be attributed to poor construction management, which allowed these flaws to remain unnoticed.

3.3 Gungahlin Drive Extension Collapse (August, 2010)

In August, 2010, a formwork collapse occurred during the construction of a bridge forming part of the Gungahlin Drive Extension works in Canberra, Australian Capital Territory. The collapse was catastrophic; 15 workers were injured and the project was expected to be delayed by four to six months. A report released by Snowy Mountains Engineering Corporation (SMEC, 2010), found the collapse was attributed to the main girders (spanning 13m) not being braced to prevent lateral movements induced by the three percent cross fall of the bridge deck. A number of additional shortcomings in the formwork design and construction practice were also found, with several differences noted between the 'as-constructed' details and the documented design. A concerning element to this case is that considering the collapse occurred after substantial completion of the concrete pour, it may follow that there has been several other cases in the Australian construction industry where formwork could have been considerably close to failure and no one was even aware. Although the collapse was attributed to trivial design flaws, this collapse again highlights the importance of maintaining a high standard of construction management.

3.4 Communicating Lessons Learned from Past Failures

Despite improvements in the industry over time, the above case studies demonstrate that formwork incidents are still occurring in modern construction. Given the periodic similarities between the failures, one could argue this may be due to the restrictions placed on communicating lessons learned from failures. Due to litigation and confidentiality under the Privacy Act of Australia, information available on construction failures is often limited and rarely covered, unless the incident is particularly dramatic or results in loss of life. The Office of the Federal Safety Commissioner (OFSC, nd) has worked with industry to develop case studies on various occupational health and safety issues, which present 'anonymous' findings and overcomes issues with the Privacy Act. However, beyond the immediate provision of the Privacy Act, one must also consider the need to preserve intellectual property rights, as well as the prevention of community apprehension. Thus, the release of information on formwork failures needs to be mediated, which may reduce the effectiveness of the system.

4 The Australian Formwork Standard, AS3610

The Australian Formwork Standard, AS3610, was last fully revised in 1995. Two years following its release, the Standards Development Committee for Formwork (BD-043) started reviewing AS3610 in an attempt to keep up with developments and innovation in the industry. Since then, the Development Committee has produced two drafts for public comment, one interim amendment and partially republished the Standard with the introduction of AS3610.1-2010 covering 'Documentation and Surface Finish' in February 2010. Despite draft revisions of AS3610 focusing on enhancing design guidance, proposed amendments to the Standard in this respect have failed to reach consensus. Consequently, the guidance governing Australian formwork design practice is limited to that provided fifteen years ago and the suitability of AS3610 is currently in doubt. While Part Two of the Standard remains undeveloped, further shortcomings exist through the coexistence of AS3610.1-2010 and AS3610-1995. Releasing the Standard in parts potentially has long-term benefits of improving the development process; however, both Standards currently cover the same material. This presents a high risk of confusion and could potentially lead to inconsistent practice.

Industry professionals actively involved in Australian formwork practice have presented alternative views on the suitability of AS3610 in its current state. However, many have expressed strong concern that change is needed or at least desirable. Continued development of AS3610 will bring the Standard up to date with current construction practice and ensure suitable guidance and accountability. Although drafted developments of AS3610 have largely focused on improving design guidance, it may be argued that a consensus would have been reached by now if any substantial shortcomings did exist. Regardless, it has been recognised there is always room for improvement; even if it is just to improve efficiency in practice. It must therefore be asked what is happening to AS3610 now?

Andrew Caswell (Caswell, 2010), a Senior Project Manager with Standards Australia, suggested there were no developments currently taking place, nor have there been any developments since the release of AS3610.1-2010 in February 2010. With recent changes in the way Standards Australia develop standards (SA, 2010b), it is necessary to propose a 'Net Benefit Case' demonstrating the positive impact the development will have. Given the recognised shortcomings of AS3610 in its current state, there are considerable grounds to pursue continued development of the Standard. However, with a lack of consensus in its development and 13 years to trial conflict resolution measures, it is likely that continued support of invested interests would no longer exist.

In addition to the abovementioned limitations of the 'Standards Development Process', there is also considerable resistance to future development of AS3610 for a number of other reasons. Industry opinion has suggested a large portion of the Australian formwork industry believe nothing is wrong with AS3610 in its current state, while another segment of the industry is opposing change due to the effects it may have on their competitive standing. On a more general note, the industry support for future development of AS3610 may come down to it being written in terms of 'performance-based' requirements. This is an issue as it has become apparent there is industry demand for a more user-friendly form of guidance. Thus, it may be appropriate to consider the development of alternative forms of guidance.

Parallel to recent developments of AS3610, a 'Formwork Design Handbook' (Ferguson, 2010) was drafted by active members of the Development Committee. The Handbook was initially intended to overcome the lack of consensus in the development of AS3610, allowing for the communication of good work that had been achieved by the Committee. However, its development identified many flaws in the Standard, which needed to be addressed first, therefore slowing the progress on drafting the Handbook. In line with the proposed changes to AS3610, the Handbook was then intended to replace the existing commentary to the Standard and align supplementary guidance with these changes. As a result of the draft Standard failing to reach consensus, and a change in the conditions of contract for the Handbooks development, the drafting of the Handbook is currently stagnant (Ferguson, 2010b). Given the handbook seems to more suitably address the industry demand, it may be appropriate to continue its development and publish it with the intentions of it being adopted as an "informal standard". In the absence of suitable guidance in the current industry, it is necessary to consider the actions that must be adopted by practising professionals to ensure safe formwork practice.

Compliance with AS3610 is a primary obligation; however it should not be the only requirement. It is impossible to expect an Australian Standard to address every conceivable situation. An engineer's defence therefore lies in their ability to prove they

have carried out their due diligence, highlighting flaws in relying solely on AS3610 regardless of its recent developments. However, given the doubt placed over the suitability of the Standard, there is increased importance for engineers to consider new research and developments that conflict with the provisions of AS3610 and make informed engineering decisions. This is to uphold a commitment to the Engineers Australia Code of Ethics and act on the basis of adequate knowledge (EA, 2010). To assist this process, it is suggested communication of new research and developments should be conveyed to the industry through an online database.

5 Western Australian Legislative Framework

In addition to its use as an Australian design Standard, AS3610-1995 is also referenced under Western Australian Regulations as a code of practice. Given Australia is governed by a 'State-based Regulatory Scheme', the legislative approach to governing formwork practice varies nation-wide. New South Wales and Queensland have both developed independent codes of practice to govern formwork practice and this arguably puts doubt over the Western Australian legislative framework given the State Government has not adopted the same approach. A comparison between AS3610 and the New South Wales and Queensland codes of practice indicated substantial shortcomings for regulating safety for formworkers. Given AS3610 is a 'performance-based' standard it tends to list the required outcomes rather than giving practical guidance on suitable processes to achieve those outcomes, as the interstate codes do. This is because Australian Standards are not legal documents and must be applicable on a national level. Thus, the use of AS3610 to provide practical guidance on meeting the statutory obligations set by differing state legislation is arguably inappropriate. It may be suitable to reference AS3610 within a code of practice, but it should not be adopted as a standalone document for such purposes. This has been supported by the opinions of various industry professionals, some of those actively involved in the Standard's development.

As part of a commitment to the Engineers Australia Code of Ethics to act on the basis of adequate knowledge, it can be argued that industry professionals practising in Western Australia should be aware of the interstate codes of practice. However, findings suggest this may not be an accurate perception. In any case, the choice to adopt interstate legislation relies on a value judgement about which legislation is most appropriate. This undermines the codes' power and transfers the governing authority to the engineer. Having a national-based legislative framework would reduce the risks associated with this 'personal choice' approach.

6 Education And Training

Although there is benefit in improving the guidance and legislation governing Australian formwork practice, the suitability of a legislative-based model of control is somewhat limited. Hence, the provision of education and training to support these developments is essential. Professional opinion has provided a general consensus that education of formwork design is an area that needs big improvement, with some concern expressed that it does not happen more often. Education may be provided through a number of different mediums; however it is argued that some are more suitable than others.

At an undergraduate level, there is clearly some benefit to the education of construction technology skills in general. However, current engineering graduates are rarely placed in a role where they are required to design and check formwork specifically. Thus, given the limitations in providing a comprehensive set of learning outcomes at a tertiary level, it is more appropriate to develop skills in other areas. These limitations are addressed through the graduate attributes set by Engineers Australia, which state an accredited tertiary education program must establish an expectation to undertake lifelong learning and a capacity to do so. The industry should not be relying on tertiary education to provide adequate learning in the formwork area, rather there is a prominent need for general industry-based education and training to compliment the skills learnt at an undergraduate level.

At the industry level, there is some degree of education and training available, however it is at a rudimentary level. Formwork engineers practising in large corporations are generally trained using in-house educational packages and on-the-job learning. However, independent practitioners are not so lucky and are largely relying on the dearth of research and literature that is available, as well as supplier information, the Australian Formwork Standard and past experience. 'Engineering Education', as a wholly-owned subsidiary of Engineers Australia, provides professional development courses to engineers practising in the industry. However, the technical content of these courses is limited and they tend to focus more on managerial and leadership type skills which are non-discipline specific. Technical courses are occasionally provided by the 'National Committee on Construction Engineering' (NCCE) as a specialist group formed under the Civil College of Engineers Australia. These courses rarely cover the topic of formwork, at present, however they are less formal and Alexandra Sparvell (Sparvell, 2010), the National Industry Relations Manager for Engineers Australia, has suggested that the NCCE are more approachable with proposals for new educational topics. In addition to education provided by Engineers Australia, there are some private organisations who offer short educational courses. However, there is some quality control issues associated with these programs, as they are not accredited and audited by Engineers Australia. Engineers Australia is therefore a key organisation involved in the development of professional engineers. However, there has been varying opinions presented on whether there would be sufficient industry demand to warrant such courses being run. In any case, there would certainly be some benefit in providing technical courses. Beyond technical understanding, it has also been suggested that implementing a formal education process would play an important role in the communication of lessons learned, as discussed earlier.

7 Conclusions and Recommendations

7.1 The Australian Formwork Standard, AS3610

To overcome the issues inherent in AS3610's development, it is recommended that the 'Formwork Design Handbook' continue to be developed and published as an 'informal' standard. Given the Handbook has a high focus on providing practical guidance; it is more suited to industry demands for a more 'user friendly' national design standard than what would be achieved through a revision of AS3610. Although this would not be published with the same distinction as the Australian Standard, it is a means to communicate recent research and developments. Nevertheless, this recommendation does not come with the premise that AS3610 can remain unchanged without limiting the virtue of the guidance governing formwork practice in Australia. Rather, it presents a fast-tracked and cost-effective solution to overcome the apparent issues. The Handbook

was already substantially completed by active members of the Formwork Development Committee and its development is stagnant, waiting on a suitable contract to determine the publishing rights. Standards Australia and the Concrete Institute of Australia have previously expressed interest in publishing the Handbook. To this end, it is recommended that both entities pursue the opportunity to publish the Handbook in consideration of the benefits of its development. This will allow the successful organisation to be at the forefront of improvements in contemporary formwork practice across Australia.

7.2 Western Australian Legislative Framework

Given substantial concerns with the current Western Australian legislative framework, it is recommended that the Australian Formwork Standard should not be adopted as a code of practice. Although referencing AS3610 as a code of practice under State legislation is better than the choice to provide no code of practice, its adoption falls considerably short of 'best industry practice'. Thus, it is recommended that the Australian Government consider the implementation of national-based occupational health and safety legislation. This will ensure consistent practice throughout Australia and remove the need for industry professionals to make value judgements on which legislation provides the most adequate and rigorous standards. It is recognised this investigation into formwork practice is insufficient to determine the full viability of this solution. It is therefore suggested that future research should aim to provide a suitable 'cost: benefit analysis' of such a progression taking place.

7.3 Education and Training

To support the developments in guidance and legislation suggested above, it is recommended that formwork design education and training needs to be provided at an industry level. Given Engineers Australia has an established role in providing opportunities for professional development; it is argued that it is the most appropriate entity to do so. Furthermore, this will allow for the provision of suitably accredited courses that are subject to quality auditing. Engineering Education courses are rarely targeted on technical aspects of discipline-specific topics. Therefore, it will be more suited to foster the development of education on formwork design through the National Committee on Construction Engineering (NCCE). Provided that Engineers Australia is a 'not-for-profit' organisation, this would require a visible industry demand. In addition, it would also be necessary to source industry professionals willing to present at such seminars. To address the former need, it is argued that the most appropriate way forward would be for Engineers Australia to recognise the need for such education, demonstrated through the findings of this study, and conduct a national survey amongst its database of members to assess the industry demand. If found suitable to warrant the development of education courses on formwork design, industry presenters could then be sourced through industry bodies like the Standards Australia Formwork Development Committee or, more generally, the National Register of Chartered Professional Engineers. In addition to the provision of education and training courses generally, it is also recommended that the NCCE should supplement this process with the communication of new research and developments. It is suggested this service could be made available through an online database linked to the Engineers Australia website. To assist this process, it is recommended that the NCCE could subcontract out the collection of modern research to members of the Formwork Development Committee, who are already actively involved in sourcing new information.

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Factors in personal health and safety (H&S) of women in the South African construction industry explored from the perspectives of both genders

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Abstract:
The construction industry in South Africa is short of skills. Legislation tasks the industry with increasing the profile of women in traditionally male workplaces. Using empirical data regarding the environments in which women work in the construction industry, the relationship between women, the working environment and their susceptibility to HIV infection is explored. Data were gathered using a combination of questionnaire surveys and detailed face-to-face interviews to gain perceptions of employers and site-based employees. The findings are discussed in terms of personal on-site health and health and safety (H&S) and transport to and from site. Female employees desire greater staff supervision and security on sites for their health and H&S. H&S in women working together – at least five in a group - on site is seen as a prerequisite for minority groups of women to perform successfully. Women are perceived by men more than women to be at greater risk of sexual harassment on site. Age of respondents plays a factor in that younger females are less concerned about male gender defined attitudes than are older women, and young women employees, more than any other group, perceived an advantage in adopting macho behaviour as a potential barrier to male gender attitudes. Further advantages in women workers on site was that female workers are less likely to accept unsafe site conditions than are men. However, whilst personal H&S of women on site was considered to be less than optimal, transport to and from sites was not considered problematic. The findings illustrate the risk of exposure of women working on construction sites to contracting HIV and AIDS.

Keywords:
construction sites, HIV and AIDS, South Africa, women's health and safety (H&S)

1 Introduction

This paper considers the risks that women entering and working in the South African construction industry would be exposed to, particularly H&S, and HIV and AIDS. The topic is explored first through a background to women employed in the construction industry in South Africa; secondly, through factors which may inhibit or increase the spread and effects of HIV/AIDS on the workforce; and thirdly, through the empirical study.

The Construction Industry Development Board (CIDB) is mandated to involve women at all levels of the construction industry, yet both unskilled and skilled labour are in high risk HIV/AIDS categories (Development Works, 2002; Ahwireng-Obeng and Akussah, 2003; CIDB, 2006; Bowen *et al*., 2008a). The issues facing South Africa in this drive for inclusion have been looked at internationally and over time (Sommerville *et al*., 1993; Gilbert and Walker, 2001; Gurjao, 2006). Motivation for increasing the presence and profile of women in construction, perceptions of the industry by female school-leavers, male attitudes and dominance and low retention rates of qualified women have all been considered.

In South Africa, where there are many small and micro enterprises which offer ease of entry into the workforce, more than half the workforce is employed informally (Horwitz, 2000; Haupt *et al*., 2005). Early studies in HIV/AIDS relate that the informality of an industry – as in unstructured employment and working practices – has a negative impact on the spread of the disease (Barnett and Whiteside, 2002). H&S and H&S, particularly HIV/AIDS, is an issue for the construction industry. Women are more vulnerable to contracting HIV/AIDS than are men because of their more depressed economic state (Kanabus and Fredriksson-Bass, 2008). Findings from global studies were that there are approximately 12 million women worldwide living with HIV/AIDS compared with approximately 8.3 million men – an indicator of women's more socially-vulnerable position (Tallis, 2008). Whilst the disease has stabilized in Sub-Saharan Africa with about 50% of the population being infected, Africa carries 67% of all the deaths attributed to AIDS globally (UNAIDS, 2008).

Africa is no exception to these conditions and HIV/AIDS has become a pandemic in many African countries, moving from high-risk groups such as sex workers and injection drug users to the general population, largely because of pervasive gender inequality (Women and HIV/AIDS, 2006). Unsurprisingly, South Africa has had alarming statistics for the spread of this disease. By the end of 2005, 1.4 million people had died since the start of the pandemic in South Africa. Out of the population of 48 million, some 5.5 million (11%) were described as HIV positive (Dorrington, 2006). According to research, after mining and transport, the construction industry is considered to be the most affected by the pandemic, while also being the least responsive (Bureau for Economic Research / South African Business Coalition on HIV/AIDS, 2004; Meintjes *et al*., 2007).

Thus, personal risk to women is a factor which must be considered by the South African construction industry as part of their endeavour to encourage women to join the industry. At the end of 2003, that is 10 years after the arrival of democracy in 1994, a 53% unemployment rate among black South African women overall was recorded (South African Institute of Race Relations, 2002/2003). Yet, many of these women are heads of households or *de facto* heads of households where their husbands have moved to the cities or mines as workers - as reflected in the comment by Nelson Mandela: "*Rural people and rural women in particular, bear the largest burden of poverty in South Africa*" (Mandela, Government Gazette, 1995: 5). For all this, many African cultures are extremely patriarchal and, although HIV prevention campaigns usually encourage people to use condoms and have fewer sexual partners, women and girls in Africa are often unable to negotiate safer sex and are frequently involved with men who have several sexual partners (English, 2002a; Kanabus and Fredriksson-Bass, 2008; AIDS South Africa, 2009). The situation becomes severe in cases where women live in poverty and have limited resources, because sex will often be used as a means of survival and thus, gender inequality can become lethal (Ghosh and Kalipeni, 2005).

2 Impact of chauvinism in the workplace

In studies on women who work in the construction industry, it was found that there are numerous references to the constant sexual harassment and innuendoes from male colleagues experienced by tradeswomen, which are subliminal to legislation, and thus cannot be reported (Eisenberg, 1998; Whittock, 2002). Some victims found it wore them down, but many coped and found that they were able to overcome it by refusing to react to the banter. There are more sinister cases described where women have been set up to have accidents (Eisenberg, 1998; Whittock, 2002). Examples of life threatening hostility have been described, such as physical assault, and of women having had heavy tools dropped on them. An account from an apprentice electrician described two occasions on which she was set up to suffer severe electrical shocks. In both instances, she detected the misdemeanour beforehand (Eisenberg, 1998).

In an extensive study undertaken by Grün (2004) in the South African workplace, she commented that discriminatory behaviour contributing to gender gaps occurred at the hiring stage, with African women suffering the most. Women may be given work, but male chauvinism still affects them adversely (Grun, 2004). The Department of Public Works has more recently included a policy of awarding contracts to female firms under the policy of affirmative procurement (CIDB, 2004). In a study on workplace dynamics for women, Bowen *et al*. (2008b) found that whilst incidences of *harassment* do occur, their frequency is comparatively small with females experiencing proportionately more sexual (males: 2%; females: 17%) and gender (males: 2%; females: 30%) harassment at work than their male counterparts.

Factors resulting in women leaving the construction industry in the UK can be classified into two groupings: working environment characteristics and private life demands (Court and Moralee, 1995). Literature over a decade highlighted the issue of retention of female labour within the industry with many women leaving the industry in their early thirties, often to start a family (Court and Moralee, 1995; Gurjaoe, 2006). The perception on the part of many women that they feel obliged to make a choice between a career and a family is also noted by Dainty *et al*. (2000). Sinclair (1998) proposed the existence of a number of masculine subcultures which underlie attitudes and behaviours relating to sex and sports, bullying, and paternalism. On the other hand, Dorsey and Minkarah (1993) found that personal satisfaction with a job well done, recognition, inclusion in decision-making, and fair remuneration are gender-blind in their importance.

Sufficient numbers of female workers in a group on site required for H&S has been viewed as important (Greed, 2000). Denmark offers an example of H&S in numbers having been achieved through women constituting one third of all Danish house painters and a half of apprenticed painters (Pedersen, 2004). This body of women also provides role models for future generations of women. Thus, it would appear from the literature that chauvinist attitudes exist, but can be overcome and changed where there is a will to do so.

3 Distance and transport, and their impact on health risks

The current South African Construction Charter notes that work conditions on some sites are exceptionally poor with extended periods away from home, long hours, an unsafe working environment, and inadequate housing arrangements being particularly negative for women (CIDB, 2006). All these stresses are further compounded by poor communication between employees of different cultural backgrounds (English, 2002b). Furthermore, these factors, though domestic and social, create sexual H&S risks for women (Olufemi, 1999). Research conducted in South Africa (English, 2003) was confirmed by research conducted in the UK (Lyall and Hawkins, 1993; Fielden *et al*., 2001) that the H&S hazards of site work are a barrier to women and that construction sites need to be healthier and safer for workers, particularly women, to feel comfortable.

A part of workplace H&S for women employees is their getting to and from work. The literature describes lack of transport as being a discriminatory factor against women working in construction (Sommerville *et al.,* 1992; English *et al.,* 2005). Another singular feature of construction that affects health and the potential spread of HIV/AIDS is that it is both site-based and transitory, involving travel (Rogerson, 2000). The construction sector also helps develop major transport and infrastructure routes; transport routes are, in themselves, risk areas for the transmission of HIV because of the constant movement of people and the fact that prostitutes utilize trucking routes to ply their trade. Constant movement of people in transport routes is one of the greatest aggravators of risk of HIV transmission, because it aggravates almost all the other HIV transmission probability factors such as lack of social responsibility, lack of stable family, and lack of liability for consequences of behaviour (Rogerson, 2000; ICAD, 2004). Informal work practices also have employees living away from families in temporary accommodation with few recreational facilities, for long stretches of time – the risk of HIV being contracted is increased, thus reducing experienced skilled and supervisory employees essential to the growth of the construction sector. All these factors aggravate the spread of the AIDS virus (Simon-Meyer, 2005).

4 Age of workforce and HIV/AIDS

In Haupt *et al*. (2005), the researchers found that the age of workers has relevance to the spread of the disease. Older workers come from poor backgrounds, have a lifetime of inadequate nutrition and are susceptible to poverty-related diseases, such as TB, hypertension, and ischemic strokes (Haupt *et al.*, 2005). This combination between vulnerability to poverty-related diseases and age means that the time between HIV infection and the onset of AIDS will be much shorter for older workers (Haupt *et al.*, 2005). A study conducted by Bowen *et al.* (2008a) reviewed a large sample of construction employees in terms of their age, nature of employment, occupation status, and region. The material was analysed with a view to determining their correlation with the prevalence of HIV. Their findings were that the high-risk category was employees that are semi-skilled and whose skills are needed on multiple sites. These individuals, such as drivers, are more likely to work away from home a great deal. The age category most at risk thus was older as they had acquired skills, i.e. those between 30-49 years of age. The majority of skilled construction workers are between 30-39 years old, while general unskilled labourers are predominantly 20-29 years old. The researchers concluded that skill level and age are positively correlated with the prevalence of HIV peaking in men between ages 30 and 39 – the age group described above (Bowen *et al*., 2008a).

According to the mortality report from Statistics South Africa (Stats SA, 2006), the death rate for women aged 29 to 39 years more than tripled from 1997 and 2004 compared with men whose rate doubled. Women's death rates are now higher than those of men at a working age (Anderson and Phillips, 2006). The large increases in death rates for women in their 20s and 30s are considered to be primarily due to AIDS (Anderson and Phillips, 2006). Furthermore, women in childbearing years are the fastest-growing segment of the population to be infected, with the probability of pregnant women being HIV positive increasing from 0.7 per cent in 1990 to over 30 per cent in 2005 (Dorrington, 2006).

5 Research method

A study was conducted in South Africa between 2004 and 2007 on the attitudes and perceived barriers to women gaining entry and training in construction. The data were drawn to reflect the following key areas: personal and demographic detail (and, in the case of employers, some information about the company); employment conditions, particularly conditions relating to gender and H&S. The responses were drawn from a sample size of 73 female current and potential employees. The sampling spread was justified by the outcomes of a pilot study. The pilot study had focussed on a sample of 26 women sourced through the South African Women in Construction association. But, following this, it was decided to include men and women as men are traditionally in the position of employers. Questionnaires were disseminated and interviews conducted in the Western Cape, Gauteng and Kwazulu-Natal. Respondents comprised 176 construction respondents comprising 60 owners / managers and 116 employees. Comments from the interview text not attached to the questionnaires were distributed for triangulation of interpretation, tagging with memos and for analysis. Drawing on the work of English (2007), comments were coded via three alternative forms, namely:

(1) *Potentially Positive*: the comment is helping; could help; is needed to help; or is possible; or gives advice on positive change. (2) *Negative*: the comment describes attitudes which block women's progress and will continue to do so. (3) *Currently Positive*: the comment is absolutely and currently true and the answer is yes.

The total number of respondents' comments on the different topics totalled 883, of which the gender breakdown was male (55%) and female (45%). This reflected the approximate balance in gender of the samples. These 883 comments were analysed into 1,670 expressions of opinion on the different topics. Using such codes permitted analysis of every statement made in response to open questions in the questionnaire and given in the interviews (English, 2007).

6 Findings and discussion

6.1 Male chauvinism and attitudes

Responding male employers and employees were slightly more negative (46%) than were women (41%) regarding the topic of male chauvinism, as they either expressed chauvinistic views themselves or stated that they felt women would suffer from chauvinism. Responding female employers (59%), far more than male employers (11%), were potentially positive about the potential to overcome chauvinism. Responding employees had the opposite reaction to women experiencing chauvinism: women employees were more negative than were male employees – presumably from

experience, but as with female employers, were more potentially positive and currently very positive that male chauvinism is not a barrier to female employment on construction sites. Indeed, neither responding gender believed in the need for macho behaviour by women. Nor did they consider that there is greater acceptance of women with feminine traits.

Respondents made numerous references to sexual harassment. Female respondents were not as concerned about sexual harassment as were the male respondents. The greater number of negative responses was from men (83%) compared with women (63%), with the current positive results coming only from women. Thus, more men than women hold the view that women are more at risk of sexual harassment than are men. These findings are similar to those relative to the need for numbers of women to work together for them to feel safe. Women, thus, are inherently more positive than are men that these barriers can be overcome. Furthermore, these results support findings reported in literature that men have more conservative views on women working in construction (Bennet *et al.* 1999; Dainty and Bagilhole, 2000).

H&S at work is an issue for concern given the few currently positive statements and numerous negative statements from both genders among the respondents. Overall, 41% of the survey sample supported the statement that women are less likely to accept unsafe conditions than men, but far more women (35%) than men felt this to be true. An overall majority of 83.8% (and 9% more women than men) of respondents agreed that the work environment on a construction site does not meet the personal hygiene requirements of women (an aspect of personal H&S). The greater proportion of the comments were, however, potentially positive that personal H&S is currently not adequate, but could become so with appropriate intervention.

The number of women for H&S in numbers was claimed by the total sample to be a minimum of five women working in close proximity on a site or, alternatively, 34% of any given number of workforce on site – albeit this could be a far greater number. Female employees (75% currently and potentially positive: 25% negative) were consistently more positive than male employee respondents about women working on site but considered that there should be high numbers on-site and expressed a need for greater supervision and security on sites for their H&S. Thus, given H&S in a group, women were potentially positive about the possibilities for women in construction. Male respondents were more negative (46% positive: 54% negative) about women working on sites. This result may reflect that men feel so negative about women on site that they do not feel any intervention would help, whereas women are potentially positive should appropriate intervention be in place.

6.2 Distances and transport

Another aspect of personal H&S is safe transport between home and workplace. Transport was perceived as a minor problem for women by both genders of owner / managers. However, twice as many women as men made this a priority and were less positive (54% of women compared with 26% men in this number); possibly because of the impact transport can have on H&S and managing children. Both genders of employees by contrast considered it the least of the problems with relatively fewer women than owner / manager women giving it any importance (female employees 71% least problem: female employees 29% greatest problem; male employees 94% least: Male employees 6% greatest problem). This, again, may be related to the job being more valued at employee level.

Amongst employees, it was more problematic for labour and artisans – that is, those on sites - than for purely administrative staff but remained an overall minor issue for the latter. Perhaps expectations are not high in this regard as transport is rarely provided on sites - and yet poor transport can mean women are alone in isolated areas that could put them at risk of sexual attack and possible exposure to HIV/AIDS. This factor was commented on by a male respondent.

6.3 Age

Of the responding employees, younger women believe it more necessary to appear macho than do older women – a reflection of their feeling less safe on sites. For example, 67% in 25-35 year old age bracket compared with 33% in 3 the 5-45 year old age bracket stated that they would feel less vulnerable if appearing macho. Older women might arguably be less likely to attract younger male interest and thus have less need to appear less feminine.

7 Conclusions and further research

The current Construction Charter (CIDB, 2006) notes that working conditions on some construction sites are exceptionally poor. Extended periods away from home, long hours, an unsafe working environment, and inadequate housing arrangements are all particularly negative for women. The literature advances that factors such as male chauvinism, sexist attitudes, ignorance, poor education, poor socio-economic status, informal work practices, the proliferation of labour-only subcontracting, tribal customs, and cultural myths, all contribute towards a negative picture for women employees in the South African construction industry. Female perceptions of feeling personally unsafe on construction sites go beyond accident risk to include lack of personal hygiene facilities, harassment and sexual threat and a sense of risk related to having too small a presence.

Any and all of these factors can lead to a greater risk of sexual harassment for female workers and hence greater exposure to the risk of HIV/AIDS infection, exacerbating what is already a pandemic situation for Southern Africa with its drastic impact on households and families. Male resentment towards women on site could put female workers at risk of sexual harassment or attack (symbolic of male needs for power and control), thus increasing the risk of exposure to HIV/AIDS infection. There were only two comments on HIV/AIDS in relation to women on sites. This possibly is a reflection of the low level of knowledge and level of concern that exists about the disease (Haupt and Smallwood, 2004) with a female employee admitting that whilst employees know that their company has a programme for HIV/AIDS awareness and protection, she did not remember the support to which it entitled them.

The high HIV prevalence among low / semi-skilled employees is attributable to a combination of limited levels of education, low / semi-skilled employment, and mobile labour. Construction firms need to take cognizance of the presence of these risk factors, and undertake targeted interventions such as education, treatment and support programmes - with particular emphasis on areas of high risk. Whilst most of the respondents considered transport a minor problem, the construction industry in South Africa cannot be complacent on this issue and certain findings reflect concern.

Against this negative view, however, the positive perceptions of female respondents in the survey research stand out. For example, female respondents believe that problems of

male chauvinism on construction sites can be overcome, which reflects the positive views of women that have been described in literature reviewed above.

While equal representation in the workforce might be a considerable way off, the achievement of H&S at work for women workers on construction sites would do much to redress and counter the currently negative realities of their employment. This lies squarely in the hands of employers. It should be reflected in recruitment practices, staff orientation, training and development programmes, and in the overt culture and employment policies of every construction company. The opportunity is open for the South African construction industry to be a leader in this regard, to shed its traditional image of male-dominated and conservatism, and be a significant contributor to arresting the pervasive spread of HIV/AIDS on this continent.

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Integrating BIM and Planning Software for Health and Safety Site Induction

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Abstract:
Project management software packages have been around for quite a long time to help managers to run construction projects effectively. Building Information Modelling (BIM) – also known as Object-orientated Modelling technology was used at the beginning in architectural design which has become more widespread in structural and services engineering. The development of BIM modelling has made the tool more users friendly. As a result, BIM became widely used by most construction practitioners in their specialist areas. For health and safety (H&S) practitioners within construction project management, this tool has not been fully explored. BIM technology has the potential to be used in H&S planning procedures, particularly those related to tasks on construction sites.

The section of the research presented in this paper intends to explore and review health and safety issues on construction sites with the sole intention of using better visualisation software to meet the needs of health and safety site practitioners in understanding such health and safety (H&S) problems. A framework of an integrated visual tool is developed for better H&S practice on site that may be used actively by all practitioners, starting with site induction which addresses, *inter alia*, personal hazard perception. The intention is to find a way forward in addressing 'real' health and safety site issues that may not be easy to understand by practitioners without the full aid of visualisation.

Keywords:
health, safety, construction site, BIM, 4D modelling

1 Introduction

The construction industry is well known as one of the most dangerous industries in which to work (Gibb *et al.*, 2010). Despite the fact that the United Kingdom (UK) construction sector only accounts for approximately 4% of UK employees, 27% of all reported occupational fatalities are from the construction industry as reported in Health and Safety Executive (HSE, 2010). The nature of the construction process widely contributes to this relatively high fatality rate. These characteristics include the dynamic work environment, multiplicity of operations, proximity of multiple crews, industry fragmentation, and industry culture (Hallowell, 2010). The recurring problems in the construction industry led to the establishment of a commission by the UK government, which was led by Sir John Egan.

Most of the recommendations proposed by Sir John Egan in '*Rethinking Construction*' in 1998 have not all been implemented by the construction industry. However, most large construction firms have made a tremendous effort to achieve the recommendation of a 20 % reduction in accidents. Although there are still problems with small and medium size construction firms that make up the bulk of the industry (HSE 2010), the awareness is there among practitioners and academics in finding innovative solutions to address most of what was said in the Egan report. HSE, the government controlling body, has also made progress in the areas of H&S regulations, guidelines and approved code of conducts, as well as creating H&S awareness among construction practitioners. H&S management is therefore important on all construction projects.

Although, health and safety management is widely practiced within all manufacturing industries, in construction, site conditions cannot be controlled as 'pure' manufacturing industries in terms of production processes as we know it, as such, health and safety becomes paramount. Planning and management is an essential prerequisite for all construction projects and their practitioners, as without a deep understanding of the issues involved in construction activities, lives will be lost and extraneous costs will be realised due to accidents, in addition to other after effects such as tarnished image of the construction firm.

Many researchers also pointed out that there was a lack of integration between construction process and health and safety issues (Sulankivi *et al.*, 2010). In order to reduce the frequency and severity of construction accidents, firms implement safety programmes and procedures that include written H&S plans and training (Hallowell, 2010). Nevertheless, lack of H&S training and practices were identified as key factors behind many construction accidents (Sulankivi *et al.*, 2010).

On construction sites, operatives change over time due to varying work requirements. Each construction site has its specific hazards, and these differ from one location to another, which in turn cannot be generalized. New employees usually come on board without prior knowledge of possible hazards they may face during their work on the construction site. Existing tools may not be adequate for induction training due to their limitations including lack of providing a wider picture of the site. 4D visualisation has been approved to be a good tool for demonstrating many design and construction problems due to their ability to show many tasks in 3D over specific period of time.

This paper reports on a component of a project exploring new ways of integrating BIM technology for use during the construction of facilities and construction projects to understand hazards and its perception for inductees. The literature review discusses: the site processes that are viewed as real determinants of H&S for construction sites; the current application and usage of BIM in the construction industry, and visualisation as a safe option in opening up new avenues of H&S management, particularly in the area of induction of site personnel and developing better ways for understanding the perception of site hazards.

2 A Kaleidoscope for Construction Site Activities

This section develops and discusses the literature for an integrated approach in the usage of BIM and planning software to optimise better health and safety site operations on construction projects. The planning literature is first investigated and the relevant literature on health and safety management on construction site is also explored. It also

expands on the importance of site induction and tries to put construction site induction in wider personnel induction context, which is a must for any site personnel. This section concludes by reviewing the importance of visualisation as a necessary factor that will address some of the gaps that have been identified within the health and safety literature. It also raises the possibility of using 3D software packages in developing better ways of site induction approach through visualisation of hazards.

2.1 Construction Project Planning

Construction project planning and management is a balancing act of leading and managing people, as well as using and managing resources within given constraints conditions, in an efficient and effective way, to achieve the desired artefact. The constraints include but not limited to time, cost, quality and safety, which are predominant during the realisation of the constructed artefact. Hence construction project management contains both the qualitative aspects as well as the quantitative aspect of management. Most of what is required within the quantitative area has been codified in dedicated project management tools (i.e. planning and scheduling software), like programming in the CPM method, resource levelling and the like. In all projects, the act of specifying, visualising and developing the planning schedule for construction has been done using dedicated work breakdown structures (WBS) within the software environment which is now common in projects. Once such plans are developed they are then followed and implemented to bring about the project. However, until recently, most of the information required in using this planning/programming software usually comes from both the CAD drawings and other related sources (Watson, 2010), that are not really related in terms of the WBS and subsystems used in each platform. However, with the development of BIM, and the life cycle realisation of the project in one holistic environment, most of the H&S information can be done directly in a single environment. There are some advantages that this paper intends to explore in relation to the use and application of the integrated approach within the 4D modelling for the benefits of most site workers.

Construction site planning and operation involves the selection of temporary facilities; equipment and their operations; the selection of competent construction personnel; and the planning, organisation and selection of an effective and efficient site layout design. Construction safety induction involves familiarising construction personnel to site specific safety and health issues that will degrade or impinge on the progress, efficiency and productivity of site personnel during site operations (John, 1999).

2.2 Health and Safety in Construction Industry: Site Induction

The practice of health and safety management in construction can be summarised in the following areas:

Safety legislation, regulation, standards and guidelines

Appointment of CDM coordinator by the client

Designers health and safety considerations upstream in the creation of the artefacts and how it should be implemented during the implementation of the project

Management of health and safety management during construction for site personnel

Not forgetting the development of health and safety plan and the creation of the health and safety file right through the life cycle of the project.

Health and safety management is therefore part of the wider planning and management process of the construction project. Soltani and Fernando (2004) suggested that one way to make this industry better in terms of health and safety is to implement effective H & S regulations during the planning of the project. The failure of planning appropriate support infrastructure affects safety, quality, and productivity adversely (Soltani, 2004). Dolores et. al. (2009) used questionnaire methodology to analyse the H&S regulations and requirements in construction industry. The authors determined that there are 10% lower accident rate in general after the *Health and Safety* policies came into force. Some commentators also suggested that within the site organisations themselves, health and safety should be implemented , not in terms of project, by project bases (Ciribini and Galimberti, 2005; Cameron and Hare, 2008), more in a granular level.

Construction presents significant obstacle to repeated hazard analysis. Construction sites undergo dynamic change in ways that fixed industrial facilities do not; works team (i.e. work gangs) are transient, the physical structure and spaces change, as well as the environmental conditions (i.e. in weather). Another difference is that in construction, workers of one team are frequently exposed to dangers posed by the workers of other, unrelated teams. Performing risk analysis before any activity at any time is essential but difficult, even if the same activity is performed repeatedly, since the site conditions change through time. This demands more effort than most contractors or workers are willing to invest, and therefore safety management in construction sites commonly suffers from low level of efficiency, with effective risk analysis performed rarely (Tang, 1997; Sacks, 2010). In the absence of an efficient and effective way of predicting peak risk levels, safety management on construction sites is performed at constant level of effort, focusing on provision and use of personal safety equipment, training, accident and near-miss investigations, and taking steps to fulfil regulatory requirements (Sacks, 2010). Given the dynamic nature of construction sites, analysis of construction activities and their related hazards is inadequate for reliable risk assessment if it does not explicitly account for the likelihood of exposure of potential victims to hazardous situations. Hence it may be necessary to study safety hazards of sites through realistic simulated site environment.

To achieve safety and health assurance, it is necessary to have to established sound codes and guides which adequately describe what a good safe practice is, how it can be achieved and how it is measured. Without a mention of quality assurance this is nevertheless what we set out to achieve in the field of temporary works (Quinion, 1980). Induction is the first point of contact for the site personnel as well as others that have to come on site. However, within this paper we are limited to the discussion of new site personnel induction.

Most construction site personnel tell you that although health and safety induction should be site specific, but the differences from one site induction to another is marginal. The personnel believed that they know and are familiar with the routine of site safety inductions. However, (as familiarity breeds contempt) personnel need reminders to make them more safety conscious, especially in terms of site hazard perceptions. One way in which this can be achieved is through visualisation.

2.3 Visualisation

Most recent studies on health and safety have been on the way visualisation can be used to integrate some of the problems encountered in managing by regulations and enforcement alone. Among such key commentators are those who proposed a scenario based SIMCOM+ tool to investigate safety on construction sites. It analysed the structural information including some temporary facilities, equipment, workers and materials in order to identify the collision among different entities on construction sites. Kuen-Chen and Shih-Chung (2009) identified conflicts on static or dynamic construction sites and determined the distance between large dynamic objects in virtual construction sites by different scenarios through VC_COLLIDE algorithm. Sacks et al. (2009) proposed algorithm based methodology CHASTE (Construction Hazard Assessment with Spatial and Temporal Exposure) that calculates the probability of a potential victim during loss-of-control events (Chavada, 2010). The following sub-sections discuss visualisation in more detail.

2.3.1 4D CAD

A range of 3D CAD visualisation tools are used in the construction industry to communicate design ideas between all the stakeholders in the design and construction process of a construction project (Ganah et al, 2005). One of 3D CAD techniques limitations is that they do not provide a 3D representation over time whereas 4D CAD does that at any specific time of the project construction process.

4D modelling tools link a project's scope in 3D with the construction schedule to graphically simulate the construction process. Many research efforts have discussed the potential of these tools to significantly improve design coordination and construction execution. Koo & Fischer (2000) argued that 4D models allow reviewing the planned status of a project in the context of a 3D model for any desired time which allows project managers to ensure the integrity of the main schedule, revealing potential time-space conflicts and logistical problems, supporting the communication of product and process knowledge and allowing efficient tracking of the work progress. Furthermore, 4D models facilitate communication with subcontractors and improve the collaboration between the project team.

The use of 4D models may also help in identifying and eliminating many construction related problems before going to site (Aouad & Tanyer, 2005) in understanding site hazards. It displays the progression of construction overtime and sometimes dramatically improves the quality of construction plans and schedules (Rischmoller et al., 2001).

4D CAD proved to be a useful tool in assisting planners to visualise alternative construction sequences based on alternative decisions made (Koo and Fischer 2000 and Dawood et al. 2000) however, it should not be considered as only planning tool as it relies on available information to provide a graphical simulation of the project schedule and the planner uses these tools as means of visualising and comparing, rather than developing and implementing different decision alternatives (Waly, 2001).

Traditional approaches used for representing construction planning information in an abstract textual description of construction activities may lead to the fact that the planners need visually conceptualise the sequence of construction activities and subcontractors may elaborate the construction plan because it lacks necessary detailing

(Rwamamara et al 2010). Such detailing can be provided through graphical visualisation methodology, for example BIM methods.

2.3.2 BIM

Building Information Modelling (BIM) – also known as Object-orientated Modelling technology was used at the beginning in architectural design it has become more widespread in structural and services engineering. The term BIM is not just referring to a category of leading edge software for designing buildings but it goes beyond that to a process view in which the focus lies on the information over the full lifecycle of a building (Watson, 2010). It directly relates to a project team's ability to visualise, understand, communicate and collaborate. Harty et al (2010) described BIM as a set of practices or activities describes the new ways of working that emerged through the implementation process. Succar (2009) gave a deeper description for BIM as he defined it as a set of interacting polices, process and technologies generating a methodology to manage the key building design information in a digital format throughout the building life-cycle.

Nowadays, each construction project is complex and dynamic system, which makes construction planning, design and site and construction management complex and difficult (Zhang & Li 2010). BIM is widely considered to be an enabling technology with potential for improving communication between stakeholders, improving the quality of information available for decision making, improving the quality of services delivered, reducing time and cost at every stage in the life cycle of a building (Smith & Tardif 2009). One of the key advantages of IBM over 2D and 3D CAD is that IBM represents and manages not just the graphics, but also information- information that allows the automatic generation of drawings and reports, design analysis, schedule simulation, facilities management etc-ultimately enabling the building team to make better-informed decisions. The planned work sequence of work is usually part of BIM which can be used later to produce animations of the construction process of a building over time, therefore showing how the work on site should be carried out according to plans of work and contractual responsibilities. In addition to that, BIM has the potential to be used beyond the design stage to include the construction and operation of a building with the concept of a digital virtual building that parallels the real building (Watson, 2010). Thus the technology can prove crucial to the success of a project by effectively controlling the construction schedule, budget, quality and the reducing risks (Ku & Mills, 2010), through time controlled realistic simulation.

BIM technology has the potential to be used in safety planning procedures particularly those related to tasks on construction sites. 4D modelling tools can be used to link a project's scope in 3D with the construction schedule to graphically simulate the construction process. Construction tasks on site can be modelled in a 4D CAD production model, in which the model produced by designers used as the starting point. Previous studies have found that certain sets of movement characteristics for construction facilities such as tower crane arm movement, movement of construction vehicles etc. This may enable the system to simulate the construction more realistically. This may enable a system to simulate the construction more realistically (Zhang and Li (2010).

Harty et al (2010) investigated the use of BIM to assess the access adequacy to install new services and perform health and safety assessment –looking for trip hazards. This project did not investigate how health and safety on site during construction can be

assessed and addressed. The utilisation of 4D-BIM technology may improve occupational safety by connecting the safety issues more closely. However, the uptake of this technology within the construction industry is partial and fragmented (Harty et al 2010).

The literature review shows that, as of now BIM usage is confined mostly to the design and planning stages of the project, with very little of it being used in the construction phase of the project in relation to H&S through hazard perception. However, the construction phase is where the bulk of accidents, H&S occurrences are recorded. Also it is in the construction phase where personnel induction is ongoing due to the high churn rate of personnel in the construction industry. Concentration of contracting firms (i.e. medium and small firms -subcontractors) is predominant within the construction phase. However, planning software packages are not frequently used by these subcontractors to keep track of progress, as most of these subcontracting firms do not actively practice tracking their projects through computerised planningtools. New methods are needed to help alleviate some of these problems that may be contributing factors in appreciating health and safety management proactively.

3 Research Methodology

The focus of the paper is on the use of Building Information Modelling (BIM) H&S for construction sites induction. The methodology for the project is more qualitative in approach than quantitative. As such, the first stage of the project is to assimilate all the relevant literature in understanding our study domain. This entails literature on BIM, visualisation, planning, health, safety and risk on construction projects, as well as other associated works. The research instrument of the data is an eclectic approach of the literature which involves both deductive as well as inductive understanding in acquiring the knowledge for future synthesises of the knowledge gained.

The next stage will be using such knowledge to develop a generic modelling approach that will take into consideration, the object oriented modelling understanding that have been used in BIM technology, as well as planning software. This will incorporate developing new classes, frameworks and building blocks that will be replicated when using the integrated scenario for each construction site. However, for this paper, a section of the different stages will be reported to give the reader an understanding of how the research will develop.

4 Integrated BIM approach for Site Induction

Rather than expose the individual to '*real*' safety and health concerns, the specific site accident 'hot spot' can be simulated and the improvement to the personnel's hazard perception improved considerably, with the aid of BIM and project management software in sync (i.e. 4D modelling). In Figure 1 the architecture is presented.

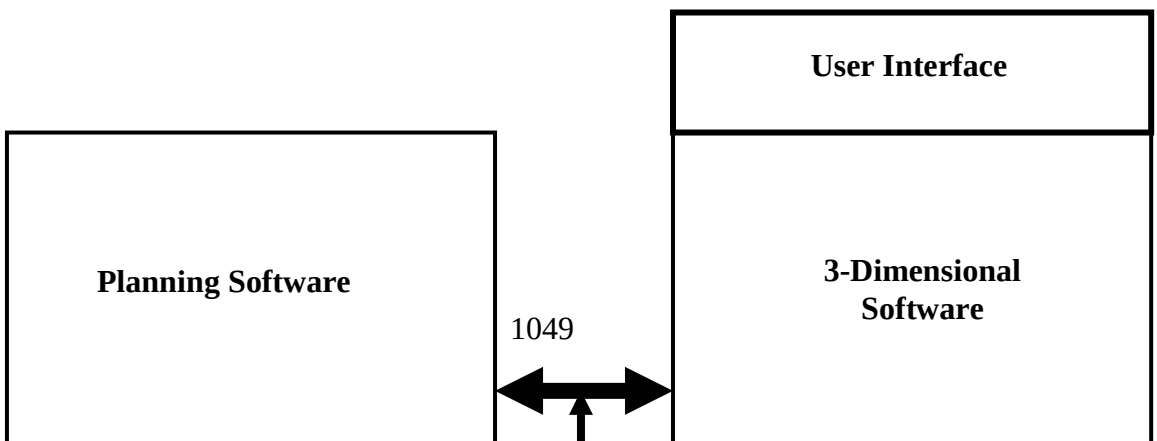

Figure 1: Top Level Site Safety Induction Framework

The site induction hazard perception toolkit architecture is made up of four parts:

The BIM software with its library of information

The project management software with the resources and planning of the desired project

The algorithms making use of information from both packages

The user interface

Before the integration can commence the planning software and the BIM should have a way of integrating the information of a particular object that is to be created, such that recognition of such object is the same. Secondly, the different stages of the object in real time should be stored in such a way that a time sequence scenario can be created in the BIM environment. Thirdly the visualisation of the developing project should be such that safety concerns can be visually seen as the project progresses.

As the construction sequence is developed, the integration should be able to monitor critical safety areas and show in time sequence how certain hazards develop on site, through the expert system that is lying behind the 4D scenario.

Each part of this architecture is being developed using object oriented methodology and SSM. As such each part is considered a high level object in its own right, and will be developed independently.

The BIM environment will be used to develop the ‘new’ construction components, that will be directly related to the WBS used within the scheduling software. Critical safety areas will be developed that will show the site inductees what he should be expecting on site.

The algorithms will be used to control the different construction scenarios that will typify site perceptions in a realistic environment. The new recruit hazard awareness will be tested in the past completed stages of the project, ongoing work and future realistic phases of the project. This will all be made possible by algorithms augmenting the health and safety regulations, codes and guidelines at each stage of the project.

5 Conclusion

Health and safety on construction site can either make or break a contractor, if not properly managed. As such, all personnel need to be properly inducted in managing their health and safety concerns, which are usually done by the current site induction.

Construction personnel are always inducted when they are new to specific site, through prescribed induction manual and training that have been developed through industrial institutions or in-house induction materials. Over time the personnel moving from one site to another become familiar with the induction material, and take the induction for granted. However, accidents are still occurring on sites and hence more proactive methods are required. BIM is now prevalent within the construction industry, especially in design and planning of construction projects. The usage of BIM in this research on construction execution, have the potential to help augment practitioners understanding of their sites, by so doing reduce their probability of accidents. The Building Information Construction Health and Safety (BICHS) project tried to develop a new way for enhancing the personnel understanding of site hazards, especially in real time as site inductions can happen as the project progresses.

6 Future Works

The development of the intelligent algorithms for identifying site hazards will be the next stage of this research project. The system will enable new site operative to identify potential hazards they may face during their work on construction sites as part of their induction training on health and safety. The system will be tested and validated through real life case studies and measurement matrices for site personnel developed as a way of gauging their hazard perception.

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Worker Monitoring Based Decision Support Framework for Construction Field Supervision

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Abstract:
Supervision of construction workers on a site is crucial to ensure construction worker safety, to maintain the quality of work performed and to maintain acceptable levels of productivity. The act of supervision itself requires the site foreman to physically monitor workers in an environment that is constantly changing throughout the construction phase. This is not always an easy task on a medium to large multi-storied building site with several trades working simultaneously on multiple floors. The construction site typically consists of skilled and unskilled workers and crews of workers that are involved in the various crafts. There exists a need for construction foremen to know the location of construction workers within a site. Academicians and industry professionals have demonstrated the use of Radio Frequency Identification (RFID) Tags in construction applications in the past few years. RFID tags have successfully been used to track construction materials, equipment and personnel. Studies indicate that the use of RFID tags in construction improves the overall process of construction. Building information modeling (BIM) technology is emerging as the industry standard in the architecture, engineering and construction (AEC) sector. BIM is being used as a comprehensive design, management, visualization, communication and facility maintenance and management tool. The role of three dimensional (3D) visualization tools in construction has increased steadily with the availability of faster, cheaper and versatile software and hardware computing tools. This paper presents a virtual reality decision support framework by combining RFID technology with BIM technology to monitor construction workers on a construction site to improve the process of site supervision. The proposed framework is based on making pertinent site supervision decisions based on location of construction workers within the site. The location of workers may be obtained by using active RFID tags.

Keywords:
site supervision, worker monitoring, RFID, BIM, sight safety, worker productivity

1 Introduction

The use of information technology applications in the architecture, engineering and construction (AEC) sector has been on the upswing for the past decade. The latest technology that is rapidly changing the landscape within the AEC sector is Building Information Modelling (BIM). This paper explores the possibility of combining radio frequency identification (RFID) technology with BIM and a few associated implications to construction site safety due this combination. It is argued that the use of this combination of technologies can provide a safer work environment for the construction

worker and provide construction site foreman a critical tool in maintain a safe and productive work environment.

Supervision of construction workers on a site is crucial to ensure construction worker safety, to maintain the quality of work performed and to maintain acceptable levels of productivity. The act of supervision itself requires the site foreman to physically monitor workers in an environment that is constantly changing throughout the construction phase. This is not always an easy task on a medium to large multi-storied building site with several trade contractors working simultaneously on multiple floors. The construction site typically consists of skilled and unskilled workers and crews of workers that are involved in the various crafts. There exists a need for construction site foremen to know the location of construction workers within a site.

2 Research Aim

This study aims to develop a framework for decision-making based on construction personnel monitoring in a virtual environment by combining BIM and RFID technologies. It is envisioned that the proposed framework will allow construction site foremen to improve site supervision practices. Consequently, the proposed framework can potentially improve construction site safety and productivity.

3 Research Methodology

A comprehensive literature review for the study has been conducted, leading to the following two phases under which this research is proposed to be conducted:

3.1 Phase 1: Conceptual Framework Development and Validation

A conceptual framework for field supervision using RFID technology along with BIM technology has been developed at this stage. This conceptual model will be further refined by conducting interviews with construction site foremen and again through industry wide questionnaires.

3.2 Phase 2: Development of Prototype and Scenario Simulation

A prototype virtual environment will developed to combine RFID technology with BIM technology. The waterfall model for software development is expected to be adopted in this process. For the purpose of this study, off-the-shelf active RFID tags and readers will be used along with commercially available BIM software. The application programming interface (API) for the BIM software and the RFID hardware will be used to develop the prototype virtual environment. The conceptual framework and the prototype virtual environment will be further validated by conducting scenario based simulations in three separate case studies, in a construction job site.

4 Literature Review

This research aims to create a framework for site supervision based on monitoring construction personnel in a virtual environment using RFID and BIM. Literature review is presented for the role of BIM, visualization, RFID technology and field supervision, as it pertains to the construction industry.

4.1 Building Information Modelling

Two dimensional (2D) drawings to represent buildings were the norm in the AEC industries until a few years ago. Several 2D drawings, predominantly produced using lines, were required to represent an object in 3D, resulting in inconsistencies within the various views. Even before the use of BIM, researchers have been experimenting with object-based models for buildings (Papamichael K. et al., 1997). BIM technology is based on representing a building using intelligent objects. These objects in a BIM model can be real objects with 3D characteristics such as beams, walls, equipment etc., as well as abstract objects such as spaces, rooms and areas. These objects are often referred to as parametric objects, as they are built with certain inherent rules, such as requiring a door to be imbedded in a wall and move with the wall (Eastman C.M. et al., 2008). BIM technology improves the overall quality of design, provides better performing buildings, and requires fewer change orders during construction. BIM allows the contractor to optimize the schedule and cost of the project while also providing for an efficient handover of buildings to owners for operations and maintenance.

Several industry practitioners and academicians that it is more than just a software tool can consider the semantic definition of BIM less important than the acknowledgement. The true impact of BIM is the enabling of comprehensive, digitized and collaborative processes within the AEC industries. The American Institute of Architects (AIA) recognized this seismic shift in the process of designing and constructing facilities and has proposed a new delivery method, namely 'Integrated Project Delivery' (IPD). BIM is the cornerstone of realizing the benefits proposed in this new methodology for project delivery. The use of BIM in the US construction industry has been on the rise and is predicted to continue to increase (McGraw Hill Construction, 2009)

However, formal definitions do exist for BIM and the National Building Information Model Standard (NBIMS) defines (Facility Information Council, 2007) a building information model as "A digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward." For the purpose of this paper BIM is referred as 'BIM technology' since the inherent data model within BIM is used as a vehicle to incorporate RFID technology.

4.2 Role of Visualization in Construction

Visualization in the architecture domain has always been an important element (Brown, 2003). Complex tools for digital visualizations are now increasingly making their way into the construction industry (Koutamanis, 2000). Digital visualization tools are increasingly seen in the construction industry. Researchers Kamat, Martinez, Behzadan (2001, 2005 & 2008) and others have created, improved, demonstrated and validated the use of complex visualization and simulation tools in the construction industry. Their research has led to the creation of augmented reality based visualization tools that can be used in construction (Behzadan & Kamat, 2009). Researchers have used visualization tools to simulate the movement of cranes to prevent collision during construction (Kang et al., 2009; Tantisevi & Akinci, 2009). The role of visualization tools has especially been on the rise in the area of 4D simulation and virtual construction (Cam et al., 2003; Waly & Thabet, 2002). 4D visualizations have been shown to increase the efficiency of planning and scheduling procedures in the construction industry (Chau et al., 2004). Messner and associates (2006) demonstrated that visualization tools can be used in the realm of sustainable construction as well.

4.3 RFID Technology

RFID is a wireless sensor technology that is based on the transmission and decoding of radio waves. This technology has been in popular use at least since the Second World War when British aircrafts used this technology to differentiate between enemy and friendly crafts returning to their base stations (Domdouzis K. et al., 2007). Today RFID technology is used to track objects, livestock and people. It is widely accepted that this technology will replace the use of Bar Codes for tracking purposes (Wu N.C. et al., 2006). The technology consists of an RFID tag that is attached to the object being tracked and an RFID reader, attached to antenna that identifies the tag when it is within the range of the reader. Radio waves of varying frequencies may be used in the process of tracking RFID tags, depending on the type and purpose of the application. A typical assembly of this tracking mechanism is shown in figure 1.

The use of RFID technology in construction processes has been steadily advocated by academicians and researchers for at least the past decade (Jaselskis & El-Misalami, 2003; Lu et al., 2011). The technology has been successfully used in construction for tool tracking (Goodrum et al., 2006), material tracking (Ren et al., 2010), managing construction documents (Elghamrawy & Boukamp, 2010) and supply chain management of construction materials (Wang et al., 2007). Researchers Navon (2005, 2007) and associates have demonstrated the need for automated project performance control on construction sites and suggested the use of RFID as means to achieve the same. Wang (2008) demonstrated that it was possible to enhance the processes of inspections in construction by means of RFID technology.

Figure 1: Typical Active RFID Tags and Reader Configuration

Researchers have shown that RFID systems can be used for building maintenance (Ko, 2009) and facility management systems (Ergen E., 2007). Dziadak et al., (2008, 2009) have demonstrated that RFID technology may be used to track underground utilities to prevent accidental abrasion or rupture during construction. Ergen, Akinci et al. have demonstrated the use of RFID (2008) in multiple instances for life cycle management of equipment and material tracking (Ergen et al., 2007). Similarly researchers Haas, Song, Caladas, Grau and Razavi have done substantial work in validating the use of RFID technology for construction applications. They have demonstrated the use of RFID tags

to track on-site materials and automating the supply chain of fabricated pipe spools (Song et al., 2006).

RFID technology has been demonstrated to assist construction safety. Early warning systems to prevent collision with heavy equipment were developed using RFID technology (Chae & Yoshida, 2010). RFID technology was used to understand near miss accidents in order to prevent potential future accidents (Wu et al., 2010). Full scale emergency response systems for cities in the event of extreme events are being developed and tested using RFID in combination with other technologies (Peña-Mora et al., 2010). It has also been used to demonstrate its applications to real-time information for safety applications in the construction industry (Teizer et al., 2010; Riaz Z., 2006).

The use of visualization tools along with RFID technology has been proposed by researchers (Sorensen et al., 2009). Pilot studies to show the combination of 4D CAD with RFID technologies have been conducted to demonstrate its use in material tracking (Wenfa, 2008). In one study Chin et al (2008) demonstrated that the combination of passive RFID tags with 4D CAD technology saved 17% time in material tracking operations.

4.4 Field Supervision in Construction

It is globally accepted that safety risk to construction workers is very high. Over 2800 deaths have occurred in the U.K, over the past 25 years, as a result of construction activities (Health and Safety in Construction Industry, 2009). The role of monitoring is an important aspect of maintaining a safe work environment (Loosemore M., 1998). The role of the foreman in monitoring workers on a construction site is important to ensure a safe work environment (Flin R. & Yule S., 2004).

Productivity of construction workers is directly related to the profitability of a construction project (Motwani et al., 1995). Construction worker supervision plays an important role in improving construction productivity and quality. The longitudinal study done by Kines et al. (2010) demonstrated that construction foremen were coached to improve site safety conditions by 9.5%. Similarly importance for the role of the site foreman has not changed over the years, as shown by Fung et al. (2005), Saliminen & Saari (1994) and Lemna et al. (1986). Studies have also revealed that jobsite supervision was rated as the most important, among a list of issues to improve productivity on the construction site (Arditi, 1985). Studies have also been conducted to monitor construction workers using video cameras using identification technologies (Teizer & Vela, 2009). However these studies also indicate several problems with tracking construction workers using video camera technologies, partly since it is based on line of sight technology and also since algorithms for automatic recognition of personnel are not fully developed yet (Yang et al., 2010).

In conclusion, three things have become evident from the literature review:

The site foreman plays an important role in maintaining a safe work environment on a construction site (Loosemore M., 1998; Kines P. et al., 2010; Fung et al., 2005). Similarly the site foreman's role is crucial to maintain quality control and acceptable levels of productivity (Salminen & Saari, 1994; Lemna et al., 1986). Also, studies to monitor construction workers using video surveillance technology have shown limitations in worker identification and more so, it is based on 'line-of-sight' based technology (Teizer & Vela, 2009).

The use of digital visualizations in the construction industry is on the rise and not merely in the form of creating BIMs but to schedule and plan construction work (Chau et al., 2004), prevent crane collisions (Kang & Miranda, 2006), for sustainable construction (Messner et al., 2006) and other uses (Kamat & Martinez, 2005).

The use of RFID technology in construction has been validated to manage materials (Grau & Caldas, 2009) and tools (Goodrum et al., 2006) on the jobsite, improve the supply chain of material delivery (Song et al., 2006) and for facility management (Ergen E., 2007). In fact new digital visual tools were created using RFID for the creation of 4D schedules (Chin et al., 2008). Studies to use RFID technology to track construction workers on a jobsite have not been found.

The literature review supports the need to combine RFID technology with BIM technology to create a visualisation tool to assist site foremen in monitoring the movement of construction workers.

5 Conceptual Framework

A conceptual decision support framework, based on location monitoring of site workers using the combination of RFID with BIM will be developed to enhance the site supervision practices on US construction sites.

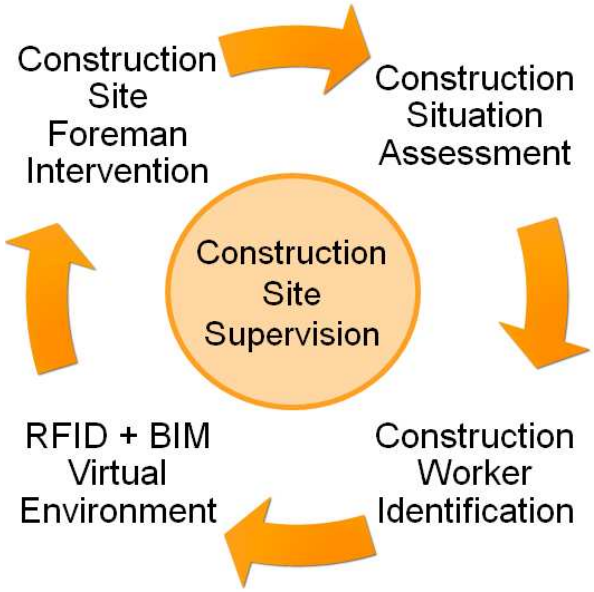

Figure 2. RFID + BIM Construction Site Supervision Decision Support Framework

A framework to implement the decision support system is presented in figure 2. A software solution is being developed to implement the decision support framework. The site foreman can intervene in a potentially hazardous situation on the construction site by using the software solution. The software solution currently under development is expected to show the site foreman an image, as demonstrated in figure 3. The image in figure 3 can alert the foreman can, who immediately ensure that the visitors are not in the way of debris falling, as a result of the work done by the demolition crew. The conceptual decision support framework for site supervision based on RFID and BIM technologies is presented in figure 3. The site supervisor is expected to assess the construction site on a day-to-day basis and assign levels of safety risk to various physical zones within the site along with specific workers that are allowed to operate within each zone. The RFID tag and reader combination along with the BIM model will

provide a virtual environment for the site supervisor alerting the supervisor of possible site safety issues, thus allowing the supervisor to intervene in appropriate circumstances.

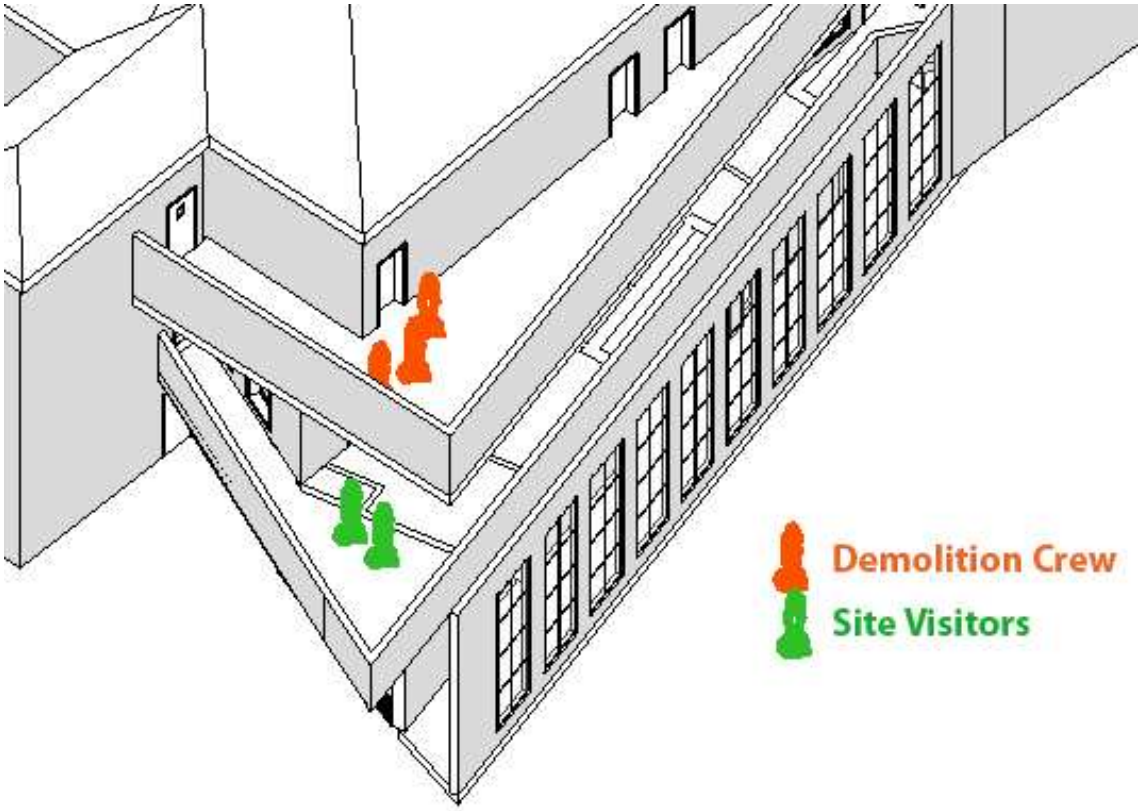

Figure 3. RFID + BIM Virtual Prototype Environment Development Strategy

As part of this framework, a software solution to integrate RFID and BIM will be developed, as shown in Figure 4. Active RFID tags are used in this study along with RFID readers, which are installed at pre-determined locations on the jobsite. Each signal from RFID tags will need to be stored in a database. The Application Programming Interface (API) for the RFID hardware will be used to transfer information about the tags into a database. The information will include the tag identification number, time the signal was received and the Received Signal Strength Indication (RSSI). The information will be further processed using established methods (Grau et al., 2009; Razavi & Haas, 2010; Ergen et al., 2007; Song et al., 2007) for locating RFID tags to determine the approximate location for each tag.

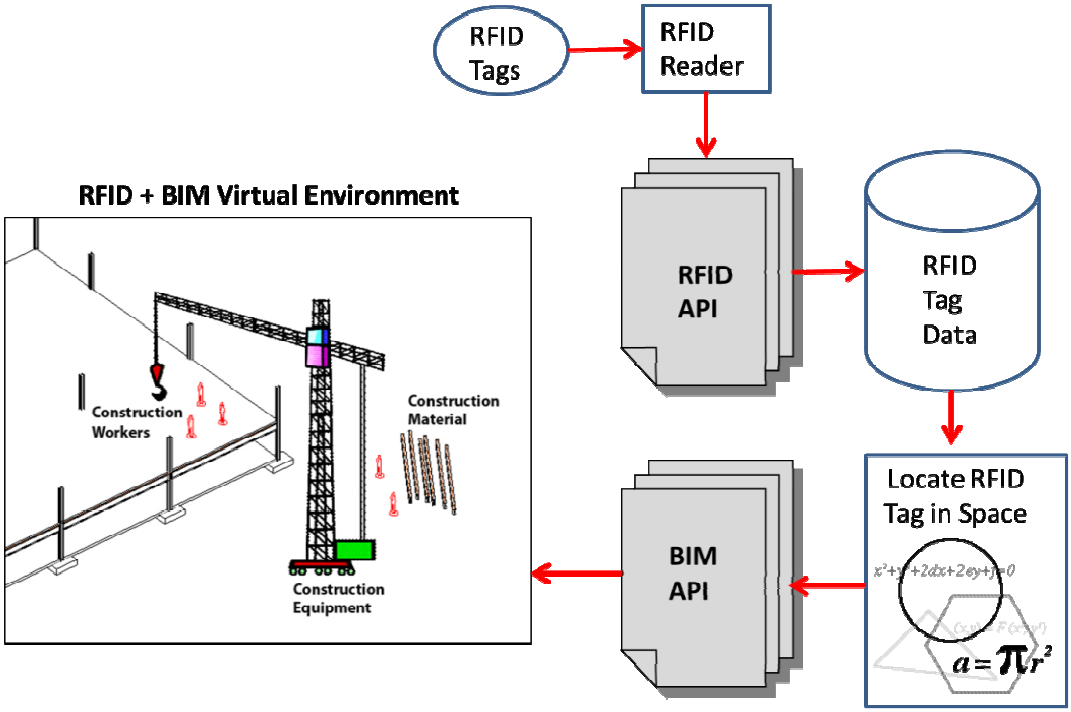

Figure 4. RFID + BIM Virtual Prototype Environment Development Strategy

It must be noted that the precise location of an RFID tag cannot be determined within a physical space. However, a high level of accuracy can be attained by employing an extensive network of readers and using triangulation algorithms. The research done by Khoury and Kamat (2009) shows that the precise location of people or objects in an indoor environment requires line of sight based systems. However the work done by Ko (2010) shows that RFID tags can be located with increasing efficiency in a 3D space using multiple localization methods. Several methods (Song & Haas, 2007) (Razavi & Haas, 2010) for locating RFID tags were proposed by them, some of which might have some potential uses for the purpose of this study. Another method for locating RFID tags, called the 'Centroid' method, was proposed on an industrial project by Grau and Caldas, which seemed to improve the precision of locating RFID, compared to the proximity method developed by Song & Haas (2007). Location tracking using RFID has been successfully developed and utilized in an outdoor environment (Behzadan et al., 2008; Lu et al., 2007), however location tracking in an indoor environment while construction is taking place can be difficult. For the purpose of this study, an approximate location of each tag will be used. The tag location information will then be incorporated into the BIM using the API for BIM software and a prototype virtual environment would be created.

6 Further Research

A comprehensive literature review has provided the research team with a possible application for combining RFID technology with BIM technology by monitoring the movement of construction workers within the site. A preliminary conceptual framework has been established to create a decision support framework for the site supervisor by creating a prototype virtual environment. The conceptual framework will be further developed by conducting interviews and questionnaires of site foremen. Feedback from the validation process will be used in developing the prototype. This prototype will be further tested in a construction environment to validate the framework of site supervision based location monitoring of construction workers.

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Housing policy, markets and finance

Enhancing Access to Agricultural Credit in the Developing World through Land Registration

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Abstract:
The role of land in economic growth and poverty reduction globally is well known. Land provides the main source of livelihood for many in the developing world where agriculture is the main economic activity. It is, thus, not surprising that land accounts for 50% to 75% of the national wealth in many developing countries. Land registration has been regarded as the way forward in enhancing access to agricultural credit required to improve productivity, economic growth and poverty reduction. However, various empirical studies conducted in Africa and other developing countries have not been able to establish a discernible link between land registration and enhanced access to credit, agricultural investment and productivity. The aim of this paper is to critically examine the model linking land registration to credit access and to provide theoretical as well as practical reasons as to why such a linkage may be non-existent in the developing countries. It is argued in this paper that land registration per se cannot guarantee access to agricultural credit due to: (a) the presence of highly correlated risks in the agricultural sector; (b) the failure of registration to guarantee land ownership security and (c) the lack of an alternative and more reliable source of income for small scale rural farmers. Government intervention through state-led insurance or guarantees schemes for agricultural credit, agro-processing and provision of socio-economic infrastructural facilities like irrigation; storage and improved transport system are recommended as the way forward.

Key Words:
agricultural credit, developing world, land registration

1 Introduction

The critical role that land plays in the economies of countries all over the world is well recognised. Land provides the space for every human and economic activity. It is, thus, not surprising that land accounts for 50% to 75% of the national wealth in many developing countries (Bell, 2006). Land and buildings in the UK contributed about 57% of the national wealth in 1997, while the value of real estate represented 45% of Bangkok's GDP in 1997 (MacGee, 2006). In the advanced world, economic historians like North and Thomas (1973) and Rosenberg and Birdzell (1986) have documented the role played by, particularly, private real estate in the economic development of such countries. A large percentage of the average household's asset portfolio especially in the developing countries is said to be made up of land (Davies and Shorrocks, 2005). It is estimated that housing constituted 48.7% of household wealth of Indonesia in 1997, that of India in 1991 was 40.3% and china in 1995 was 36.2%; In the advanced economies,

about 33% to 50% of the median household assets are said to be made up of made up of land (MacGee, 2006).

The importance of land in terms of agriculture is also well known especially in the developing countries where agriculture is the backbone of their economies. The contribution of agriculture to the socioeconomic development of such economies includes the fact that agriculture remains the major contributor to GDP, employment, foreign exchange and food supply; In addition, agriculture is commonly regarded as an essential basis for industrial growth by feeding industry with the required raw material, providing the market for industrial output and freeing up excess labour to work in industry (Enoma, 2010).

Despite its major contributions the agricultural sector is beset with several problems in Africa and other developing countries. It is a well known fact that agriculture is characterised by small-size family-held farms which are operated on non mechanised and non commercial basis. For instance, 80% of farms in India are less than two acres and 95% are less than five acres; agriculture is also mostly rural based where about 70% of the population resides (Rahji and Adeoti, 2010). In the developing world, farmers are usually resource poor and though the government sometimes intervenes to provide financial support it falls short of the amount required and the processes involved are quiet complicated (Akram et al., 2008). One problem that most farmers (especially small scale rural farmers) by virtue of their poverty status encounter is the constraint on credit access; Limited credit access has been identified as a major constraint to agricultural growth as it prevents or delays the adoption of modern technologies (Yaron, 1992). It is thus not surprising that the reduction in the contribution of agriculture to the Nigerian economy has been attributed to the non-existence of a national credit policy as well as the absence of financial institutions that can provide farmers with credit (Rahji and Adeoti, 2010).

The problem that small scale farmers encounter in accessing credit has been hugely attributed to the insecure nature of land rights and lack of collateral; the situation is made worst by the weak legal framework for reinforcing contracts which make collateral foreclosure difficult (Yaron, 1992; Besley, 1995). There is thus the need for a mechanism that will guarantee land ownership security, ease the collateral constraint and make their foreclosure much easier. It is in this light that many authors have recommended land registration as the tool to enhance access to credit. While some studies have established a significant positive relation between land registration and credit access (Feder et al., 1988) several other studies found that either no relation at all exist between the two or the established impact on credit access was found to be insignificant (Angel et al., 2006; Carter and Olinto, 2003; Galeana, 2004; Gilbert, 2000; Place and Migot-Adholla, 1998; Mighot-Adholla et al., 1991; Broegaard et al., 2002; Pender and Kerr, 1999; Petracco and Pender, 2009).

The aim of this paper is to attempt to provide theoretical and practical explanations as to why land registration per se cannot be a panacea to the credit constraint problem faced by small scale farmers in the developing countries. This is achieved through a critical review of the relevant literature. The rest of this study is organised as follows; section two will look at land registration. In section three, the link between Access to agro-credit and land registration will be discussed. Section four outlines the limitations of the credit effect argument. Finally, section five is devoted to the conclusion.

2 Land Registration

Land registration is the process of recording all land ownership data into a national or central database that can easily be accessed by the general public as well as the continuous update of such data to render the database a mirror image of the actual land ownership. There are basically two forms of land registration – deed and title registration (Deininger, 2003; Larson, 1991). According to Deininger (2003) deed registration simply involves legally recording land transfers during the time the transaction is being carried out. This may usually require the seal of a judge to give the transaction document a legal status. One is said to attain legally recognized rights to land upon conclusion of a transaction agreement or contract. However, the fact of registration carries with it no implication of title prior to registration and there are no guarantees for the accuracy of such information (Larson, 1991). Unlike deed registration, however, in title registration, it is the recording of land rights into the register that renders such rights legally valid and qualifies the proprietors for statutory guarantee (Deininger, 2003). Though the two are difficult to differentiate it is often argued that the presence of a statutory warranty of title under the title registration system is the main distinguishing factor. It should however, be noted that in practice, title registration in some countries such as Germany, Sweden and Denmark involves no State guarantees and protection for registrants is only derived from 'public faith' (Zevenbergen, 2002).

3 Access to Agro-credit and Land Registration

It has often been argued that land registration has the potential to promote economic growth and poverty reduction in the developing world (Bromley, 2005; de Soto, 2000; Feder et al., 1988; World Bank, 1975). This appears to depend strongly on the extent to which land registration can perform the following primary functions of: (a) improving land tenure security; (b) reducing or eliminating land ownership uncertainty and related disputes and litigations; (c) facilitating the operation of land markets or land transactions; (d) reducing the time and cost of verifying ownership; (d) reducing information asymmetries (e) raising land values and (f) enhancing access to investment credit.

Land registration is seen as a tool for facilitating land market transactions because it works to reduce information asymmetries in all land related transaction by providing all parties in land transactions with the same amount of ownership information (Deininger, 2003). Reducing the level of information asymmetries in land transactions leads to a reduction in transaction costs (in terms of time and other resources spent verifying ownership data) and speeds up land related transactions by eliminating or drastically reducing any uncertainties and disputes surrounding land ownership (Byamugisha, 1999). If registration is capable of reducing land conflicts it will provide a boost to lenders taking land-based collateral. Ownership conflict over land could be very costly to banks. Firstly, it may prevent banks from repossessing the land. Secondly, even where the bank repossesses the land selling it may be difficult. Buyers may be less willing to purchase lands known to be involved in ownership disputes as those who purchase such lands may be exposed to reprisal actions from disputing parties.

Furthermore, land registration allows lenders to check the register to ensure that any land been presented for collateral purposes does not have any encumbrances on it that may turn out to be a hindrance during repossession. Since all registered interest in land

is given priority over all other claims, it presents lenders with the opportunity to publicise their interest in land-based collateral. This ensures that borrowers do not present the same land as collateral for credit from another lender without the notice of the first lender. Even when it happens, prior claim rights are given to the first lender to register a charge on the land. Land registration thus could be seen as a system for establishing prior claims among lenders. Having said that, it should be clearly stated that collateral registries where they are in operation can equally perform some of these functions.

After pledging their land as collateral for credit some landowners also have the tendency to sell the land without the notice of the lender. With land registration this will not be possible. Under the title registration system where there are statutory guarantees, lenders are able to enter a charge against land which is then guaranteed by the state. This effectively becomes a form of insurance for lenders.

As stated earlier, land registration is seen as the key to improving investments and economic development in the LDCs. One of two channels through which this is achieved is the supply-side effect. The argument here is that through the functions performed by land registration (stated above), land is converted into a secure and better form of collateral that can guarantee access to investment credit for increased economic growth and poverty reduction – this is the de Soto effect. According to de Soto (2000) the poor usually posses landed property which could be key to eradication of poverty but unfortunately, these assets are defective and cannot be used to generate wealth mainly because of the absence registered property titles and therefore does not permit their use as collateral for loans to finance business or investment activities.

This lack of formal registration creates mistrust among lenders with regards to the validity of ownership rights as well as increasing cost of verification to prohibitive levels (Field and Torero, 2004). Land registration supposedly therefore solves these problems and facilitates credit markets by making land a highly desirable asset for collateral purposes. Deininger (2003) argues that the provision of registered land titles is often a precondition for access to formal credit for the medium to long term making collateral an integral part of all credit markets. This is a suggestion that collateral and registered titles on land-based collateral are always a necessary requirement in granting credit. This may not be entirely true as lenders may tend to be amount conscious when taking collateral. Where the loan amount is substantially small relative to the collateral cost, this argument will not hold unless the lender is capable of shifting this cost to the borrower.

There are a numbers of factors that may trigger the need for collateral. The most important amongst these factors is probably the perceived risk of the borrower. If the lender if confident a loan will be repaid without any problems, there may be no need for collateral given the cost of processing and foreclosure involved. Collateral therefore, may only be necessary in instances where the risk of default is significant. It is thus an insurance against default and a last resort to loan recovery. Taking collateral does not necessary imply that it will be foreclosed during default. Lengthy court procedures and litigations not caused by disputes over ownership may make foreclosure virtually impossible especially in the developing countries. This may happen irrespective of whether or not a land is registered. In granting credit, banks may usually focus more on factors such as cash flow, profitability and credit history to ensure that any amount advanced will be repaid without recourse to collateral foreclosure. What this implies is that even where collateral is provided lenders may still want to avoid foreclosure as

much as possible because of the uncertainties that may be associated with it. Collateral could thus be considered a secondary as opposed to a primary requirement in granting credit. The possession of collateral will not guarantee access to credit. It may only enhance one's chance of obtaining credit where collateral becomes a necessary requirement triggered by substantial borrower risk of default. With a significant risk of default, a borrower may not be able to secure credit without offering collateral. However, where the lender is almost 100% sure that the borrower will default, offering collateral may still not be able to enhance the chances of securing credit. To summarise the above discussion, collateral could sometimes be a necessary requirement but can never be sufficient requirement for accessing credit.

With regards to land registration, it may only be useful to formal lenders in as far as it provides documentary proof of land ownership that is easily verifiable. On the issue of ensuring landownership security in the LDCs, land registration may be less relevant to lenders as land disputes have persisted after several years of introducing land registration. If the most important role of registration to lenders is the provision of documentary proof of ownership, such proof could be obtained from unregistered documents such as land deeds. It is not inconceivable to argue that banks will accept unregistered land as collateral where the borrower can provide sufficient documentary proof of ownership such as deeds and other informal documents. In the situation described earlier where borrowers may be required to provide land-based collateral before a loan is approved the issue of whether or not the land is registered may be inconsequential.

The argument here is that when taking land based collateral lenders may have other concerns that are more important than whether or not the land is registered. These include the location and market value of the land, as well as ability to provide documentary proof of ownership (which can be met without registration). The peculiar properties of land such as its immovability, relatively low maintenance requirement as well as the fact that it is difficult to be permanently damaged (virtually indestructible) make it a very suitable collateral asset (Binswanger and Rosenzweig, 1986 in Byamugisha, 1999 and Deininger, 2004). A good collateral asset among other things must be one that is easily marketable or realisable. The extent to which land registration can reduce land disputes might influence the ease with which land can be sold as well as its desirability for collateral purposes.

4 Limitations of the Credit Effect Argument

The argument that access to credit can be guaranteed through land registration is mostly based on the assumption or somewhat incorrect assertion that land registration is the panacea to land disputes. This assertion has no empirical basis in the developing nations. According to Atwood (1990) land registration could actually reduce security and lead to more conflicts in instances where overlapping customary and residual right of women, uneducated, nomadic and other marginalised groups were not recognised and recorded in the process. In countries like India, Mexico, Peru, South Africa, Tanzania, Senegal and Egypt, Payne et al (2009) observe that de facto security of land ownership already existed before the introduction of land registration programs; Indeed in Afghanistan and India for instance, it is reported that registration actually led to an increase in land disputes. If land registration has failed to solve the problem of insecurity, the basis of the argument linking registration to credit access is flawed and must be discarded.

The inability of small scale farmers to secure formal credit is not a function of the lack of registered land titles but other more important factors. For instance, in Peru, Angel et al (2006) report that no study found a direct causal link between land registration and credit access. In Bogotá, Gilbert (2000) establishes that the possession of registered land title made no difference to formal credit availability; indeed, the most serious problem faced by formal lenders is not the absence of registered land title but the nature of the assets which such poor people often offer as collateral. Savings and loans corporations in Colombia for instance are said to have strict rules about which kinds of building and their location are to be considered in advancing loans (Gilbert, 2000).

Furthermore, borrowers' ability to repay loans is a critical factor considered in granting credit. Failure of a borrower to demonstrate beyond reasonable doubt that they are capable of repaying a loan will most likely result in their failure to attract credit irrespective of whether or not they possess registered land titles which they are willing to offer as collateral. This is confirmed in a study by Angel et al (2003) which found that the main reason why people were denied credit was the low borrower repayment capacity and not the absence of registered titles. For farmers in the developing world to attract formal credit to expand their businesses, they must be able to demonstrate that such businesses are profitable and can generate sufficient amount of cash regularly and reliably to repay any advanced credit. This is where the challenge lies. Agriculture appears to remain largely in the hands rural based peasants who can barely have enough to feed themselves. To make matters worse they appear not to have alternative regular sources of income that could be used to secure credit.

Lending involves a fixed cost irrespective of the loan amount. Such costs include the cost of screening and monitoring, processing collateral and cost of enforcing payment or loan contracts. With the relatively small loan amounts that small scale farmers appear to demand, such fixed cost may render the cost of borrowing unaffordable to farmers and thereby restrict their access to credit.

Probably, the most important credit constraint factor for the agricultural sector in the developing world is the inherent risk. The sectors could still be said to depend largely on nature and is thus exposed to risk of unfavourable climatic conditions which could create other risks such as price and output risks. The consequences of price and output risk are well documented for Uganda and Mali. In Uganda, the experience of very good maize harvest from 2001 to 2002 caused drastic fall in prices and farmer incomes and subsequently affected some banks as loan repayments were affected; in the case of Mali the proportion of the credit portfolio considered at risk for a number of credit unions increased from just 3% in 1998 to 12% in 1999 as a result of a significant decline in cotton prices (Llanto, 2007).

Climatic conditions coupled with price fluctuations expose farmers' incomes to risk at a level above that experienced by people in other sectors and this affect loan repayment by farmers (Yaron, 1992). Such systemic risk as adverse weather changes and global price fluctuations are said to be responsible for the unwillingness of commercial banks to finance the sector (Llanto, 2007). There is no need stressing that unfavourable fluctuation in climate, output and prices usually make it virtually impossible to recoup investments made by these farmers and those who finance such investments by credit will find it difficult to repay. The associated volatile revenues may reduce lenders' confidence in the repayment capability farmers. With farmers perceived as highly risky borrowers who are almost certainly going to default, even the possession of registered titles to land will not enhance their chances of obtaining credit.

Without any deliberate comprehensive intervention by government, the price and output fluctuations will continue and the seemingly rising poverty amongst farmers may never come to halt. Reducing these risks will require investment in infrastructure. The provision of irrigation facilities will reduce overdependence on rainfall. The provision of storage facilities will also help control supply, reduce post harvest losses and provide some price stability. Alternatively promoting agro-processing will create a ready market for agricultural products as a solution to the problem of lack of market and price depression. Without good transport network linking farm lands to market centres, cost of transport will not only increase but also post harvest losses. In a rain-fed agricultural regime where the necessary agro-infrastructural base is weak, where inputs are difficult to access and where ready markets for agricultural products are not there, agricultural investment will remain unprofitable and unattractive. The banks are not likely to be willing to fund such unprofitable investments and the farmers themselves are likely to divert any funds made available to them into financing their consumption expenditures instead of investing.

5 Conclusion

The literature has been inundated with arguments that land registration is the key to unlocking the problem of agricultural credit constraint in the developing world. This argument is often made against the backdrop of the wrong assertion that registration will guarantee land ownership security and thus enhance the collateral properties of land. An examination of this argument has shown that in most instances in the developing world land registration has failed to promote security but has rather increased insecurity. Registration only provides legal recognition of ownership and in some instances guarantees for ownership of registered lands. However, security involves more than just legal recognition and that's why land disputes continue to exist in the developing world despite the implementation of various land registration programs. If registration fails to ensure security then it cannot be linked with improvement the collateral value of land and access to credit as seen in the literature.

Furthermore, the land registration and access to credit argument assumes that collateral is always a necessary requirement in applying for credit. In reality however, this may not be the case. Having said that, even if collateral were required to trigger credit supply, in the case of land based collateral, the land must not necessarily be registered to make it acceptable if only the borrower can provide other documentary proof of ownership. Land registration cannot guarantee access to credit for small scale farmers in developing countries because it is not a necessary requirement in taking land-based collateral.

The main factor responsible for the credit constraint among small scale farmers is the peculiar nature of risks the sector is exposed to. It appears formal lenders in developing countries are unable to manage these risks and therefore avoid lending to the sector as much as possible. Any risk that cannot be managed for whatever reason is not worth taking. Small scale farmers who are mostly rural dwellers usually do not have reliable alternative sources of income to offset the negative impact of agricultural risk. The recommendation here is for the state to stop providing direct financial support to farmers as such schemes have failed in the past. All such monies could however be put into an insurance fund that can be used to guarantee loans for farmers. The state could also facilitate the development of warehouse receipt systems and commodity exchanges which could be critical mechanisms for managing agricultural sector risk and enhancing

access to credit. The diversification of the rural economy could be significant towards providing farmers with more stable non agricultural related incomes to enhance their chances of obtaining formal credit. There are therefore more important factors that formal lenders look out for in granting credit other than just the possession of registered land-based collateral. Concentrating all efforts at providing farmers with secure land rights is most likely going to fail in guaranteeing credit access to such farmers in the developing countries.

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Abandoned mines, homes for the people: case study of Jos Tin mining region

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Abstract:
This paper will assess the impact of the tin mining activities and its effects on the built environment and, specifically, housing in Jos Region. Utilising secondary data, which maps out ten (10) different locations in the region the paper highlights the level of radioactive substances (X-ray, beta –ray and gamma rays), and presence of heavy metals in the environment. Subsequent analysis shows that the radioactive substances exceed the international standards and therefore have a serious impact on the health of the local population who reside in the affected area. This is particularly significant as people use the contaminated soil as a basic material for their homes as well as farming and food production. With overpopulation of neighbouring city and rising house prices, an increasing number of people have moved to the tin-mining areas often without any knowledge about the perils of contaminated soil. At the same time, the planning authority has no presence in the affected area as it falls outside its jurisdiction. However, there is an urgent need to address this problem and prevent people from moving to this area otherwise this would become a serious long term human catastrophe. Drawing from international experience the paper argues that it is possible to develop housing in former tin mining areas but require careful remediation and engagement by the public and private sector.

Keywords:
abandon mines, contaminated land, development, housing, home,

1 Introduction

Housing is a major component of the built environment, and it is affected by other components of the environment such as social services utilities and infrastructure associated with it. Humans' social, economic and political activities have profound impact on the natural environment. The production of the built environment has a major impact on the environment including climate change and environmental change that create health problems (Bruntland Report, 1987; Onibukun, 1990; NHP, 2006; Obateru, 2004; Agbola and Kassim, 2007; IPCC, 2007; Wapwera, 2008; Rydin, 2011).

In Nigeria, the national housing policy was formulated with the ultimate goal of ensuring that all Nigerians own or have access to decent accommodation at an affordable cost. Despite the level of progress being made in industry, education and services, the simple refuge in affording privacy and protection against the forces of nature is still beyond the reach of many, especially the poor and the disadvantaged (Mabogunje, 1978; Onibukun, 1990). Jinadu (2004) in his study highlighted qualities of a good house to meet the needs of the occupant, thus a good house should have a quiet environment, privacy, cleanliness , living and outdoor space, safety and aesthetic satisfaction. A house must also have good quality building materials which meet the needs and aspirations of the occupants as well as contributing to this physical, mental and social well-being of the individuals. It should also be served with the basic community facilities like roads, electricity, water, recreational facilities and sewage/ refuse disposal (Anderson, 2000; Obateru, 2004; Wapwera, 2008, 2009).

The quality of housing remains an issue of concern to developers, builders, policy makers as well as planners. Studies have shown that majority of low income earners and the poor in the developing countries live in substandard housing and poor quality neighbourhoods. This is more prevalent in the rural areas, mainly because the houses are constructed using low quality building materials. The situation is worse, in environments characterised by environmental degradation, derelict lands, environment with serious economic decadence and culture among others giving rise to a poor environmental quality, which in turn has influence on housing quality being a component of the environment(Jinadu, 2004; Agbola, Egunjobi & Olatubara, 2007;Wapwera, 2008; Ayanbimpe,Wapwera and Kuchin, 2010). See figures 1 and 2.

Figure 1 Location of housing close to mining ponds

Figure 2 Location of Dragline to form mining ponds

(Source: Reconnaissance survey, 2009)

Mining as a process of extraction of raw materials for industrial use can leave behind a legacy of environmental pollution for generations to come (Benevento *et al.,* 1997; RIC Report, 2006). In many developing countries due to lack or/weak policies and regulative measures, mining has caused severe environmental pollution that are hazardous to the local population. Mining activities took place in Jos Plateau, Nigeria, over a century ago leaving behind ponds posing a danger, and constraining the movement of people, goods and animals; hence, the zone is tagged 'disaster' area (Howard, 1975; Wapwera, 2009; Mendie, 2009).

The processes and methods of mining have varying degrees of environmental impacts/effects on the landscape. The spoil hills that resulted from these activities by estimate occupy 325 sq km (about 41%) of the Jos Plateau, while the area destroyed which is about 267sq km is characterized by mining paddocks and tin tailings (Howard, 1975; Aguigwo, 1997 in Gyang and Ashano, 2010). This accounts for about 30% of the land being unproductive either due to gullies with depths and width of gullies up to 12.2m and 2.4m respectively and to about 7,240 km. This is manifested in the presence of the moulds and ponds that are potential danger to human lives and the physical environment. See figures 3 and 4.

Figure 3: Burrow pits results of Pre-Tin mining activities. Figure 4: Mine Ponds results of Pre-Tin mining activities

(Source: Greater Jos Master Plan 2007)

The effects/impacts of Tin mining activities are observed from different perspectives, including from industrial uses like food preservation, paint, plastic and pesticides (positive). It also has consequences of poisoning, affecting the soil water and the environment. Contamination by heavy metals (Pb, As, Cu,Cr, and Ni) and radioactive substances(X-ray, beta –ray and gamma rays) are major factors that affect the health of the people and quality of their housing in the Tin mining region (Douglas, 1996; (Leblanc *et al.*, 2000; Lee *et al.*, 2001; Marques et al, 2001; Ibeanu, Akpa and Mallam, 2004; Ajayi ,2008; Alshaebi *et al.*, 2009; Gyang and Ashano, 2010).

The overall aim of the paper is to assess the impact and effects of tin mining activities on the built environment and specifically housing in the Jos Plateau Tin Mining Region (JPTMR) of Nigeria. Firstly, identify and determine the level and availability of heavy metals and radioactive substances. Secondly, analyse the level and availability of heavy metals and radioactive substances. Thirdly, assess the impact of the heavy metals and radioactive substances on housing in the tin mining areas and observe how this area could be transformed.

2 Research Methodology

The methodology is quantitative in nature, with secondary base evidence obtained from previous works on Jos plateau tin mining region (geological, geophysical and chemophysical field surveys). Extracts from Toro sheet 148 north central Nigeria, it shows where samples of water and soil with tailings were taken to check for equivalent dose of the natural gamma- emitting radionuclides (^{238} U ^{232}Th and ^{40}K), as well as mineral and chemical composition. Same sample was also used to determine the hardness in water as a result of the presence of the substances in the water (Gyang and Ashano, 2010). The instruments used include; scintillator (NaI (TI) photomultiplier to detect and take count of gamma and alpha radiation count per second and measurement of soil natural radioactive were made using a multi- channel pulse-height analyser (Canberra Series 10 plus) coupled to a 76mmX76mm Nal (TI) scintillation detector (Ajayi, 2008). While the instrument use for water is Esticks EC500 for conductivity and Jenway 3150-pH/ for temperature (thermometer) amongst others.

A total of 20 surface samples (soil) of natural origin were collected from a number of locations spread across the region. These were at depth levels of 0 to 6 cm, as adopted by Ajayi, 2008; Ibeanu, Akpa and Mallam, 2004 to determine the equivalent dose in human body and in building construction materials to the natural gamma- emitting radionuclides (^{238} U ^{232}Th and ^{40}K) (Beretka and Mathew, 1985). Gross gamma and alpha radiations counts data obtained in counts per second (c/s) were converted to exposure in reagent/hour and these were exposure rates again converted to absorbed dose rate in rad/hour using the relation between absorbed dose rates (Da0 and exposure (E) as given by Grasty et al (1984). A PUG-7 radiation meter combined with a T/A

probe was used to measure the radiation levels in the soil samples. This generally allows for appropriate measurement depending on the strength of the radiation. Measurements of the soil's natural radioactivity were made using a multi- channel pulse-height analyser (Ajayi, 2008). For water the instruments used to test different parameters were for conductivity, pH, and temperature the Esticks EC500 conductivity meter and Jenway 3150-pH/temperature (thermometer) meter, respectively. Total hardness was determined using titrimetric method, while turbidity was measured using Secchi's Disk. Other instruments used were litmus paper for pH, spectrophotometer for anion analysis (Gyang and Ashano, 2010).

2.1 The Study Area

The Jos area of Nigeria is located on a granite plateau, 1900m above sea level in the north central part of the country (See fig.II). The geological formation of this area lends itself to the lithological formations composed of the basement complex, biotite granite and new basalts (Ajayi, 2008). Tin and columbite ore are associated with greisenized, Biotite granites. The Jos Tin industry started around 1904. The primary purpose of the industry is to mine Tin Ore and mill the same for Tin and some by-products (especially columbite) for exportation. The rock materials are used extensively for slabs, aggregates, rockfills and other forms in building construction in and around Jos; and this continued to increase as more and more people built houses to cater for the increasing need for accommodation.

Jos Tin Mining region is located in the northern and central parts of Jos Plateau State, north central geo-political region of Nigeria. It is bounded approximately by latitudes 8' 0'55''N and 10 0''N, and longitude 8 ^{0}'S 22'' E and 9 ^{0}' 30''E and the locations of the samples collected according to Gyang and Ashano, (2010) were latitude 9^{o} 30'N and 9^{o} 33'N and longitude 8^{o}53'E and 8^{o}59'E. It is one of the many geographical (physiographic) regions recognized in Nigeria. See figures 5 and 6.

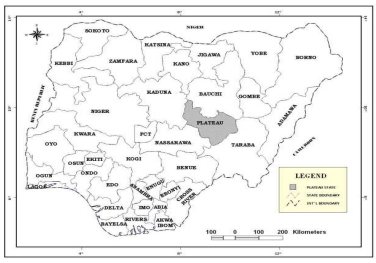

Figure 5: Location of Plateau State

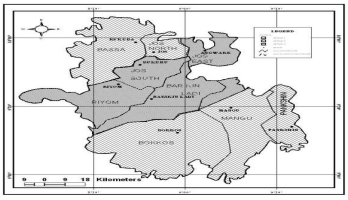

Figure 6: Tin Mining Region

Source: GIS Lab, University of Jos, Nigeria 2008

It is a distinct physiographic region, with altitude of about 1,200m above sea level. It is about 800m above the surrounding plains to which it descends through several steep, stepped escarpments at some points, and rises to about 1,500m above sea level at its highest point (Eziashi, 2000).

2.2 The Jos Plateau Tin Mining Region (JPTMR)

Jos Tin Mining region derived its name from the geological landscape known for tin mining activities that was carved out of the present day Plateau State. Fig. (II). The region covers nine local government areas in plateau state. These include: Jos North, Jos South, Jos East, Bokkos, Bassa, Riyom, and Barkin Ladi, Mangu, and Pankshin. It covers about 43% of the total land area of the Jos Plateau amounting approximately to

3,670 km sq. It consists mainly of the undulating areas of Plateau state (Ajaegbu 1986; Eziashi 2000).

2.3 Description of Sample Locations

Samples were collected from areas around Rock Heaven, Zaria road, Jos, Kufang village off Miango road, Jos, Mills extracting columbite as a main objective and from the banks of a stream in Anglo-Jos. Cassiteriate is washed directly in the stream and tailings heaped beside the stream (Adiuku-Brown and Ogezi, 2004). Materials analysed were soils, water and Tailing sample collected from various locations in Nigeria. The samples were reported as being used for roasting and frying of groundnut, plastering and construction materials, such as for residential buildings. These samples were oven dried for soils, ground to powder and used. A weighted quantity of sample sufficient to fill a 230 cm^3 cylindrical plastic cup was used for the gamma ray counting. The samples were triply sealed and stored for a minimum of 24hours under a temperature of 105^0C in an oven to dry. Other studies examining similar environmental pollution as a result of Tin mining have also employed the same method of sampling and instruments for analysis in Malaysia (Mohsen, Pauzi and Azizah Jaafar, 2007).

This condition was checked by allowing radium to reach equilibrium. Water sample was collected from the mine ponds, well water and boreholes within the study area. The water was collected in polyethylene 250ml screw cap bottles. All the vessels used for the collection of the water were sterilized. Cation analysis vessels were soaked in 2% HNO_3 (Nitric acid) while for anion were soaked in 6% HCL (Hydrochloric acid) except for Cl analysis. Tests were made for conductivity using Esticks EC500 conductivity Jenway meter and pH scale and thermometer. The total hardness of water was determined using titrimetric method, while turbidity was measured using Secchi's Disk (Gyang and Ashano, 2010).

3 Findings and Discussion

The Results of ionizing radiation carried out on the sample of soils from the locations in different parts of the areas with basalts on the plateau show that the gamma radiation dose rates vary from 0.03-0.058 rem/yr (0.32-058mSv/yr), while dose rate due to alpha and beta radiations is from 0.16- 0.32 rem/yr. The total dose rate from both alpha/beta and gamma radiation from the basalts within the Jos Plateau therefore is between 0.19-0.36 rem/yr. The implication of the results explains that the natural radiation levels in basalts around the Jos area are low, generally below the maximum permissible exposure for general public. This makes the basalts radiologically safe for use for instance in building construction with little likelihood that safe radiation levels in such buildings will be exceeded. The alpha and beta gamma radiation particles been exposure are dangerous radioactive materials that produce can be taken into the body via food (WHO, 1993;UNSCEAR, 1992). Hence, prior to this study Arena(1971) and Shapiro, (1972) had argued that ionizing radiation may cause injuries to the brain, damage of eye lens resulting in cataracts; damage to the ovaries or testes which may cause sterility; damage to the bone marrow which affects the body's ability to fight infection. The extent of radiation injury will however depend on the period of exposure, distance to source and shielding between source and target (Solomon, et al 2002). This is a corroboration with the work by Mohsen, Pauzi and Azizah Jaafar, 2007; Hamzah *et al.*, 2008 all in Malaysia. Other studies by Adiuku-Brown and Ogezi, 2004 reveals that there is a gross significance as it relates to Thorium (Th) and Uranium (U) as radioactive by any given route , a decay of say , uranium -238 series , for example ,

consist of fourteen steps , eight involving alpha decay and six involving Beta decay. Radium (Ra), radon (Rn) and thorium (Th) are among the radionuclides emitted in the process. See table 1

Table 1. Radioactive substances and radiation/ionization level in study area
(Source: Adopted from Adiuku-Brown & Ogezi, 2004)

Hazardous pollutants	**Health impact**	**Dose rates (rem/yr)**	**Implication**	**Substances emitted (radionuclides) steps(x)**
Gamma Radiation	Injury to brain, damage eye leading to cataract, ovaries,testes (sterility), bone marrow and inability of the body to fight infection.	0.03-0.058 rem/yr	Low(permissible exposure)	Radium (Ra) Thorium (Th)
alpha Radiation (δ)	Injury to brain, damage eye leading to cataract, ovaries,testes (sterility), bone marrow and inability of the body to fight infection.	0.16- 0.32 rem/yr	low(permissible exposure)	Radium (Ra) (-226 series) Thorium (Th) Uranuim(U)x 8
beta Radiation (β)	Injury to brain, damage eye leading to cataract, ovaries,testes (sterility), bone marrow and inability of the body to fight infection.	0.16- 0.32 rem/yr	Low (permissible exposure)	Radium (Ra) Thorium (Th) Uranuim(U)x 6 (-238 series)

The following effects of the decay and emission of radionuclide exemplified in the use of tailings in building construction can trigger off radioactivity in building. Thus, radon is able to accumulate to hazardous levels in buildings constructed or resting on tailing. Furthermore, the use of Tailings in roasting of groundnuts can lead to ingestion of radionuclide such as radon. Radon produces other - products which lodge in the lungs and eventually produce lung cancer. The use of tailings in children's play ground can lead to a direct ingestion of radioactive elements or their radionuclides. The general indiscriminate disposal of tailings can pose a threat to human health which is a negation of one of the 1999 national policy on environment as road fills. Tailings have no cementing, material. Therefore the radioactive elements and their radiogenic products can easily be washed into neighbouring streams. Radium – 226 is particularly toxic if ingested through stream waters (United States DOE, 1986).

In addition to the radioactive elements identified in the tailings, manganese, iron, lead, cadmium and zinc were also detected during chemical analysis (Adiuku-Brown and Ogezi, 2000b). As a result of these findings the following effects are possible; lead is very toxic at lower concentration (Bryce-Smith, 1971). Lead poisoning damages the kidney, liver, reproductive organs, central nervous system and the brain. This was observed recently in Nigeria where over 400 children were killed from lead poisoning in Zamfara state, northern Nigeria, which spread over 7 villages in less than six months (Mason, 2010). Cadmium and lead are formed from particularly stable bonds to some active sites of some proteins (enzymes) and can be associated with the protein replacing the carboxyl hydrogen, or disrupt the disulphide bridge , or replace the hydrogen of the sulphydryl group , denaturing the protein and impairing its normal metabolic activities (KrausKopf, 1979). Some heavy metals (zinc, iron and manganese) which in normal concentrations are essential components of biochemical systems are toxic when present in the body in higher concentrations (Forstner and Wittmann, 1983). See table 2

Table 2: Health impact of Hazardous pollutants (Heavy metals and radioactive substances)
(Source: Adopted from Adiuku-Brown & Ogezi, 2004)

Hazardous pollutants (Heavy metals)	Health impact	Dose rates (ppm) and Implication	Constituent elements
Monozite			Ce, La,Sn, Th, U in traces.
Zircon			Zr, Y,Sn, Fe, U.
Zinc	Toxic in high concentration	(430)	Zn
Lead	Damages kidney, liver, reproductive organs, central nervous system and brain.	Disrupt disulphide bridge, denature protein and impaired normal metabolic activities in the body. (413)	Pb
Manganese	Toxic in high concentation	(800)	Mn
Cadmium	Form a stable bond to protein enzymes and denaturing it.	Disrupt disulphide bridge, denature protein and impaired normal metabolic activities in the body (2.0)	cd
Columbite	Eye, brain, skin and blood related diseases	Damage of cells of organs listed.	Nb, Fe, Mn, Ta, Sn
Cassiterite	Eye, brain, skin and blood related diseases	Damage of cells of organs listed.	Sn, Nb
Fe_2O_3 (%)	Toxic in high concentration	(16.14)	
Sn O_2(%)		(0.32)	

The conclusion drawn by Adiuku-Brown and Ogezi, 2004, was that it is unsafe to use the mill tailings scattered in major locations in residential areas and streams channel to build houses or roast groundnut as they contain radioactive materials and toxic elements. Tailings should be properly disposed of in a carefully sited location earmarked strictly for the purpose. There is the need to carry out extensive public enlightenment on the possible hazards that can accompany the indiscriminate disposal and utilization of tailings, and monitor compliance.

3.1 Analysis: Microscopic, X-Ray Fluorescence and Chemical

The microscopic analysis was to identify the minerals in tailings. The crystal of zircon (Uranium incorporated due to similarity in size and charge) And Thorium in monazite as well as Uranium. The *X-Ray Fluorescence was* essential for the identification of the presence of Uranium and thorium in the Tailings obtained. The elements are manganese, iron, cadmium, zinc and lead the samples were digested using HNO_3, HCL and $HCIO_4$ mixture. Fusion with NA_2CO_3 and Na_2O_2 was used in the digestion of samples, for SnO_2, determinations. Reagents blanks were also prepared and standards were digested and analysed along with samples to be apply some correction factor. UNICAM atomic absorption spectrophotometer was used for the analysis (Adiuku-Brown and Ogezi, 2004). See table 3.

Table 3: Minerals and Mean concentration of constituent elements
(Source: Adiuku-Brown & Ogezi, 2004)

Minerals	Constituent elements	Analysis	Mean concentration by heavy metals
Columbite	Nb, Fe, Mn, Ta, Sn	Cd (ppm)	2.0
Cassiterite	Sn, Nb	Mn (ppm)	800
Zircon	Zr, Y,Sn, Fe, U.	Zn (ppm) , Pb (ppm)	430, 413
Monozite	Ce, La,Sn, Th, U in traces.	Fe_2O_3 (%), Sn O_2(%)	16.14 , 0.32

3.2 Water Analysis

Results for water analysis show that the tin mining activities carried out on the project did not affect the quality of the water, though there are traces of Manganese, iron, and chromium observed in some samples cannot be said to be significant enough to warrant

panic, except for fear of bioaccumulation (Gyang & Ashano, 2010; Adiuku-Brown and Ogezi, 2004).

3.3 Housing Analysis

For the purpose of analysis on housing conditions five level scales were used to determine the level of quality. Depending on the conditions of the various parts of the building viz; very good, good, fair, poor or derelict; using variables that determine the functionality and satisfaction of the housing facilities, such basic amenities, materials use for the construction of the buildings all contribute to the conditions and quality (Onibokun, 1990; Anderson, 2000; Obateru, 2004; Wapwera, 2008; 2010) (see Table 4)

Table 4: Conditions and characteristics of Buildings in the study area
(Source: Wapwera, 2008; 2010; Ayanbimpe,Wapwera and Kuchin, 2010)

Condition of Buildings	Characteristics	Implication
Very good	No need for repairs, have the needed basic amenities such as water, electricity, kitchen, toilets, good refuse/sewage disposal and in a good environmental quality	The building is physically and structurally sound.
Good	Requires minimum level of repairs. It must have sound foundation and walls, with little or no cracks or leakages on the roof. With the needed basic amenities	It is structurally sound
Fair	Have cracks on the walls, leaking roofs, and broken windows to enhance its physical condition and bring it back to its original state. It may be lacking in some basic amenities	The buildings structurally require some level of repairs.
Poor	Devoid of basic amenities, and when available are not adequate. Some parts of the buildings have collapsed and are not habitable. Such houses require immediate reconstruction they may not have possess any facilities at all.	The physical structure of the building requires major/minor repairs or renovation and may require urgent attention in order to upgrade the building and make it habitable (derelict state).

From the research conducted, houses/structures were built on polluted lands; soils with contaminants were used as building materials while water containing such contaminants is used for consumption for domestic purpose and sanitation. The air in most of the houses has dust that contains these contaminants. More than 75% of respondents had complaints of respiratory systems, frequent headache, eye irritation and skin rash. 61 % of the homes showed dampness of the indoor environment, with more than 50% of the settlements not within the planned areas. 60% of the houses lack proper drainages, toilets and waste disposal facilities and 43% of the houses were old and some dilapidated. See table 5

Table 5: Occurrence of Fungi in Relation to Responses to Features of Questionnaire
(Source : Ayanbimpe, Wapwera and Kuchin, 2010)

Features of questionnaire	Number of positive responses	Number of fungal isolates (%)
Unplanned settlement	72	55 (14.7)
Age of building (Old)	61	43 (11.3)
Lack of toilet/drainage facility	87	24 (6.3)
Lack of waste disposal facility	87	45 (11.8)
Dampness of building	87	87 (22.9)
Mold growth in the home	17	42 (11.1)
Symptoms (respiratory, eye)	106	24 (6.3)
Arthropod infestation	126	60 (15.8)

The above analysis has shown the extent of environmental pollution and its impact on the health of local residence. It is important to assert that half of the households

surveyed fall outside what is termed as planned area. This has further implication as it demonstrate the ineffectiveness of the planning system and lack of environmental protection. The Jos metropolis and local government authorities seems unable to do anything about this environmental hazard. This could be attributed to lack of resources including finance, legislative and institutional capacity in terms of planning and control. In the area of planning, the local governments in the metropolis should have urban and regional planning departments, create and monitor developments, as well as make funds available for development control at that level.

This next section examines alternative solution to development of contaminated land. This is achieved through examination of the case study Mines in Malaysia where private developer has transformed former tin mining area into a thriving and safe and quality area.

3.4 Alternative Solution to Development of Contaminated Land

Drawing from international experience, a case study of how a former tin mining area has been used to develop mixed use housing, business and recreation centre through careful remediation of the engagement of public, private partnership is presented. A typical example is the Bukit Buruntung, Kuala Lumpur Malaysia called the 'Mine City' (Kaur, 2009).

Mine city (formerly known as Mines Resort City) is an area Located 40 kilometres north of Kuala Lumpur, Malaysia, that has experienced Tin mining activities some years back. This area is about 840 ha of land with all the features of a derelict environment, just as the Jos Plateau Tin Mining region. A private developer Mines Excellence Golf Resort Bhd built three five-star hotels within its RM3 billion, another developer Mines Golf City development in Bukit Beruntung, Selangor also developed on that same piece land.They developed and set up a boutique hotel, a wellness hotel with golden standards and a hotel for golfers for more than RM300 million (Kaur, 2009). See figure 7.

Figure 7: Bukit Buruntung, Kuala Lumpur Malaysia
Source: Kaur, 2009)

The developer intends to establish a university designed for golfers and a health clinic and spa. And to turn Mines City into a world-class destination for golfing and for health tourism, set up a few golf and wellness hotels in Malaysia and it would be ideal to have two in Mines City, also involve other boutique hotel and spa operators to be involved to set up shops at the golf resort. The 840ha Mines City is being developed by Mines Golf City (MGC) Sdn Bhd. There are 70:30 joint ventures (partnership) between Mines Excellence and Country Heights Holdings Bhd. MGC is launching the development of

a 63-hole golf course on 320ha, which would be Malaysia's largest. The development includes townhouses, 500 bungalow lots, an equestrian and driving academy, schools, sports facilities, food outlets and parks on the remaining land (Kaur, 2009). Table 6 outlines the history of Mines City from its inception.

Table 6: Chronology of development of Mines Resort
(Source:http://www.countryheights.com.my/mrc.php http://en.wikipedia.org/wiki/Mines_Wellness_City)

YEAR	DEVELOPMENT
1888	The story started a hundred years ago, when a Chinese immigrant Chan Wing came to Malaysia and discovered tin ore in a site abandoned by Europeans earlier. This became the largest tin mine in the world. Mining in the area left a gaping hole 2 kilometres long and a kilometre wide, and 200 meters deep.
1988	Malaysian Government alienated the land to Country Heights Holdings Bhd (CHHB) on 30 March 1988 for the development of recreational and tourism.
1990	From a scarred and derelict wasteland, the world's largest open cast tin mine was transformed into The Mines Resort City. The Mines Resort City was carved out beginning with the construction of Mines Wonderland.
1997	Launch of *Mines Waterfront Business Park, *Palace Beach & Spa, Mines Shopping Fair, *Palace of the Golden Horses and Malaysia International Exhibition & Convention Center. *The Mines Resort City played host to several international events.
1999	Mines Golf Club hosted World Cup Golf and Women's World Cup Golf where Tiger Woods. The Mines Resort City hosted the World Formula One.
2004	**Golden Horses Health Screening** Under the expansion of Golden Horses Health Screening Services
2006	**Palace Beach & Spa** Re-branding exercise for Mines Beach Resort & Spa, now known as "Palace Beach & Spa", Country Heights Vacation Club, now known as "Palace Vacation Club" and Country Heights Health Sanctuary and now known as "Palace Health Sanctuary" to creating a unified branding with PGH.
2007	Purchase of Mines Shopping Fair for cash by Capitaland of Singapore for RM432 million (first international investment in the scheme)
2008	**Golden Horses Health Screening** Country Heights officially launched the Traditional Chinese & Complimentary Healthcare Centre (TCM) together with the Ministry of Health Malaysia. Despite the real estate bubble burst and sinking subprime issues in the financial industry, Country Heights have successfully introduced Mines Golf City, a 63 hole luxurious golf course and homes.
2010	CapitaMalls Asia has re-branded Mines Shopping Fair to a contemporary neighborhood shopping mall with a major upgrading work, including additional retail space, revamping the carpark system, changing new wash rooms, creating additional link bridges and new sets of escalators inside the mall
2011	**Mines Wellness City** (formerly known as Mines Resort City) is an integrated Health and Wellness resort city in Malaysia. It is both an expansion and transformation of the current Mines Resort City.

The expansion of the city is part of the Malaysian Government's Economic Transformation Plan (ETP) which is spearheaded by PEMANDU (Performance Management and Delivery Unit), under the Prime Minister's Department. The development of Mines Wellness City will lead and contribute to increased economic activity, job opportunities and GNI. By the year 2020, the City is envisioned to be a RM 5.5 billion development, playing a central role in tourism and becoming the foremost wellness destination in the country and in the south east of Asia.

Mines Wellness City showcases the company's legendary transformation of a derelict tin mine, devoid of economic and social value, to an internationally-acclaimed venue that showcases superior wellness facilities and practices. See figure 8.

Figure 8: Mines Resort City in Malaysia (Kuala lumpur) Figure 8 shows the development of the derelict area into a tourist haven, before and after.

Figures 9-12 show the transformation of the derelict area into multiple land use for revenue generation and source of employment for Malaysians over the years.

4 Conclusion and Further Research

This paper has analysed the impact of tin mining on the Jos area. The analysis conducted in the region shows the impact of the economic activities (exploration and exploitation of tin) that has rendered the area derelict. Furthermore, tin mining has left a legacy of hazardous impact on the inhabitants of the area taking away their fortunes (socio economic potential) which determine to a large extent their provision of basic infrastructure in the house. The devastation from the mining activity has affected the physical landscape of the area making it difficult for the provision of urban facilities, utilities and services. Other impacts are felt on the soils, water and air which have culminated into different life experience for the inhabitants. This is partly due to unchecked and unregulated building activity in the absence of planning authority in the study area. It is not within the jurisdiction of the planning authorities, in both the state and local government level. There is an urgent need to address the problem and prevent people from moving to this area, as development of housing in the tin mine area requires careful remediation and engagement by the public and private sector.

The paper has demonstrated that tin mining activities has not favoured local construction of housing by the peasants or low income earners, who use locally sourced construction materials due to the presences of heavy metals and radioactive substances within their immediate vicinity. Subsequently, the environmental impact of tin mining on the Jos Plateau in Nigeria in terms of pollution of land, water sources and housing has been particularly significant. In this context the research has identified high level impact of hazardous heavy metals on the health of the inhabitants of the area and impact of the radioactive substances with dose rates that appears low but with long term effects on the inhabitants (for fear of bioaccumulation) living within the zone as it affects the quality of the physical (water, soil, air) and the built environment (Housing). Furthermore, abandoned mine ponds and heaps of mine spoils etc are found to cause

particular environmental damage. Other damage includes the geographical impact on the natural and the scenic beauty of the area due to presence of lotto and prospecting pits that abound and impacts of both hazardous heavy metals as well as the radioactive substances on housing in the study area. The paper also highlights the long term economic and social impact of abandoned mining in the region and drawing from international experience it demonstrates how it is possible to transfer such affected areas into prosperous and safe residential and recreational areas. An important issue highlighted is the need for a radical approach to funding the transformation of such areas through partnership between private and public sector. This has been demonstrated by examining the development of the Mines City in Malaysia where partnership between the government and private developers has enabled the successful transformation of a former tin mining area.

5 Recommendations

The following recommendations are made to address the housing and environmental hazards posed by the mining activities through;

1. Planning and regulative control in the Jos tin mining region (JPTMR): ensure effective planning to discourage development but facilitate the improvement of the affected areas through; appropriate land use planning to restrict the use of contaminated sites. To prepare and adopt a regional plan to identify areas of contamination and implementation of appropriate measures to clean the pollutants to turn the area into a safe and habitable environment.

2. Legislative framework to regulate mining activities to prevent similar occurrence in other areas. Reclamation after mining should be encouraged and to increase awareness of people to the dangers of contamination and hazardous impact of tin mining on their health and well being.

3. Establishing pilot projects such as self-help housing schemes to demonstrate remediation of contaminated sites and use of safe building materials for housing with funding by the government and donor agencies to the inhabitants to build their houses.
4. Public–private partnership can be an effective way in transformation of blighted areas such as Jos region. The experience of Mines City has demonstrated the effectiveness of public-private partnership and long term strategic government policy.

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Risk involved in Design and Build Procurement in Nigeria

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Abstract:
Clients changing demands with regards to cost and time efficiency of projects promotes the adoption of alternative procurement paths. The peculiarity of risks within such procurement options are different from those risks found in traditional procurement methods. Clients adoption of design and build procurement method arises from its perceived ability to integrate the design and construction processes thereby saving time. In design and build contracts, the contractor is responsible for both the integrity of the design as well as the quality of the final construction product. The perceived time saving from the integration of the design and construction process exposes the project to other risks. There is tendency of increased cost as a result of the fact that cost planning may not be adequately concretized. Majority of the construction risk is transferred to the contractors as a result of contractors' involvement as designer and builder. This study examines the risks associated with design and build procurement system in Nigeria. The research also evaluates the impact of the risk on design and build projects. A structured questionnaire was used in collecting data from respondents. Sixty questionnaires were distributed among contracting and consulting organizations involved in design and build projects in Lagos state. Forty questionnaires were returned representing a 67% response rate. Frequency, percentage and mean item score were used in analyzing primary data collected for the study. The study shows that rainfall, increased material cost, bribery and corruption, uncertain contract provisions, inadequate construction planning, incompetent planning, environment damage/pollution and delayed payment are the most frequent risks associated with design and build procurement systems in Nigeria. The impact of risk factors on design and build procurement are mostly evident on project cost overrun, dissatisfaction on quality of work, time overrun, claims, and accumulation of interest on loan facilities. The study recommends that when considering tenders for design and build projects, contractors should pay attention to client's financial status and other economic dynamics of the construction industry. Contractors should adopt the most effective risk response strategy in handling risks associated with design and build projects with a view to achieving project objectives.

Keywords:
design and build, Nigeria, procurement methods, project objectives, risk

1 Introduction

The Nigerian construction industry continues to occupy an important position in the nation's economy even though it contributes less than the manufacturing or other service industries (Aibinu and Jagboro; 2002). The construction sector has contributed a great deal to the country's resources through its output and employment opportunities.

This positive effect on the economy comes with some form of uncertainties. This view is supported by Chan and Chan (2004) who reckon that the construction industry is a dynamic entity due to the level of uncertainties involved in technologies, budgets and development processes. Different researchers have joined in the ongoing debate on the appropriate construction project delivery method suitable to ensure project objectives are met.

Construction performance over the last three decades has been broadly criticized due to increasing problems cut across many areas in construction. Some of the problems related to the separation of design from construction, lack of integration and effective communication, high levels of uncertainty, changing environments and increases in project complexity (Naoum; 1995) and risk inherent. Construction piece are unique and built only once, thereby leading to increased risk on construction projects (Zavadskas, Turskis and Tamosaitiene; 2010) and most notably, the design and build procurement method.

According to Adnan, Jussof and Salim (2008), the increasingly complex and varying demands placed upon the construction industry by the clients do not only stem from the need to provide more sophisticated commercial and industrial working environments at minimum cost and maximum speed, but also from the fact that the organizations of the clients are also complex in nature with different categories of consumers requiring discrete solutions to their procurement needs. This has made choosing a procurement method for construction work, one of the many important decisions that construction clients have to make.

Construction clients have been searching for effective project delivery methods to maximize project performance in recent decades. There is the traditional project delivery method; also known as design bid build (DBB) and alternative project delivery methods such as design and build (DB), package deal, turnkey and management contracting. Currently, no particular project delivery system is most appropriate for any kind of construction project.

Traditional procurement method is commonly used to undertake construction projects. This project delivery method has a number of disadvantages associated with its use. Clients changing demands with regards to cost and time efficiency of projects promotes the adoption of alternative procurement paths. The peculiarity of risks within such procurement options are different from those risks found in traditional procurement methods.

Design and build is an arrangement where contracting organization takes sole responsibility, normally on a lump sum fixed price basis, for the bespoke design and construction of a client’s project (Masterman, 1992). Design and build is a procurement method where one entity or consortium is contractually responsible for both the design and construction of a project (Murdoch & Hughes, 2000). The perceived time saving from the integration of the design and construction process exposes the project to other risks. There is a tendency of increased cost as a result of the fact that cost planning may not be adequately concretized. Majority of the construction risk is transferred to the contractors as a result of contractors' involvement as designer and builder.

Accordingly, the objectives of this study are:

1. To identify and assess risk involved in design and build method of procurement system.
2. To evaluate the effect of risk on design and build projects.

Against this background, an examination into the various risk associated with the design and build procurement method will provide an interesting and challenging field of study.

2 Literature Review

2.1 Risk and project delivery methods

Hibberd and Basden (1996) suggest that risk is the prominent criterion that will determine the selection of a delivery system. As suggested by literatures of previous studies such as Liou and Wang (1992), considerations should be given to the issue of risk transferring and/or sharing in a bid to achieving the project objectives, prior to the decision on project delivery system. This gives rise to the selection of the best project delivery method appropriate for a particular construction project from risk management position, which require evaluating large amount of risk data, carry out subsequent risk analysis and to effectively manage project risks in order for the project goal to be achieved (Aklnel and Flsher; 1998). Therefore, choosing an appropriate system of project delivery can lower the risk for clients and improve the possibility of success for the projects.

2.2 Design and Build

Design-Bid-Build (DBB) is a conventional way that is widely used in different countries and has been applied in different building projects (Tsai and Yang; 2010), while design and build is the oldest approach that is regarded as a new and alternative delivery method (Ibbs, Kwak, Ng and Odabasi; 2003). The separation of design and construction functions which was not the case with traditional system is brought closer together for the client's benefit. In the design and build system, detailed design and construction are both undertaken by a single contractor in return for a lump sum price. The contractor's responsibility is to integrate the design together with the erection of the construction facility. The process allows for factors such as time, quality, and innovation to be considered in choosing a contractor as against price.

Design-build is not an entirely new project delivery method. In centuries past, it was the only procurement method available (Design-Build Institute of America, 1994). Its roots originate in the ancient "Master Builder" concept where responsibility for both design and construction resided with one person (Twomey 1989). However, during the 1900s, project procurement systems have primarily utilized the process of design-bid-build (Ndekugri and Turner 1994).

Current project delivery markets are experiencing resurgence in the use of design-build procurement (Yates 1995). The effect of this rapid growth is twofold. First, there is an increased entry into the market by both contractors and architect-engineers (AEs) possessing little or no design-build experience. This is evident from the increase in volume of design-build contracts.

One key advantage of using D&B is the opportunity to integrate the design and construction components, and Saxon (2000) argues that integration of design and construction offers better performance in time and cost and results in lesser defects.

Adams (1999) has shown that majority of clients regard D&B as the optimum route to obtain value for money. Smith (1995) suggests that the popularity of D&B arises from its perceived ability to bring design and construction processes closer together culturally, while Hughes (1992) argues that D&B offers a high degree of cost certainty, encourages economical solutions, and enables value to be considered as well as price. McDermott (1999) has argued that benefits of design and build include closer integration of design and construction teams as well as increased level of synergy of the team.

D&B procurement is not a panacea, and it is not without limitation. The apparent drawbacks of this method as stated by Masterman (1992) are:

- Relatively fewer firms are truly specialized in health care facilities, and therefore less real competition, and in-house design and build firm is an entity (so compensation for weak parts of the firm is not possible)
- Higher tender price due to less competition (higher risk imposed on the contractor and two separate design teams with some duplicating efforts)
- Bids are difficult to compare since each design, programme and cost will vary
- Client driven changes (unfortunately essential for most hospital projects) can be more expensive both indirect cost and in disruption costs if the contractor's building sequence is affected
- Client brief must be adequate, and the opportunity for disputes would be increased due to incomplete documentation
- Client is at risk where the contractor does not fully appreciate the full risk associated with design. Similarly, the client is at risk if the contractor does not have full indemnity insurance cover.
- Limitation for client in choice of design team
- Design quality is inferior to those produced under traditional procurement method (although well-designed and aesthetically pleasing buildings can be obtained with D&B, the client's control over this aspect is less and difficult)
- With consultant novation, the consultants may experience a conflict of interest owing to the change of employer
- Client's project management is by no means easy in comparison with traditional procurement method

3 Research methodology

A literature review was conducted for the purpose of identifying risk factors associated with design and build procurement. The variables identified represent a list of factors upon which D&B project delivery method was assessed. Cross sectional research design was adopted for the study. 60 Structured questionnaires were administered, with 40 returned, free from error, omission and inconsistencies; representing about 67% response rate. The study focused on the contractors and construction professionals with a considerably stable organizational structure, and those organizations who have been operating in the Nigerian construction industry for more than five years. The respondents were asked to indicate their opinions by ticking the appropriate responses required for each question. The "mean score" method was adopted to establish the relative importance of the risk factors and the effect of risks. A four point likert scale was used, the numerical value 4 represents frequent occurrence while 1 represents no

occurrence, this was used to calculate the mean score for each variable, which was then used to determine the relative ranking of different variables by assigning ranks to the mean scores, with low mean scores assigned low ranks and high scores allocated high ranks.

4 Findings and Discussion

Descriptive statistics about the respondents' organisation are shown in Table 1.

Table 1. Demographic data of organization

	Frequency	Percent (%)	Cumulative Percent
Type of organization			
Contracting organisation	14	35	35
Consulting organisation	22	55	90
Contracting and consulting	4	10	100
Type of contracting organization			
Building contracting	3	16.7	16.7
General contracting	8	44.4	61.1
Building and civil engineering contracting	7	38.9	100
Type of consulting organization			
Architectural	3	11.5	11.5
Building	6	23.1	34.6
Quantity surveying	8	30.8	65.4
Structural	6	23.1	88.5
Architectural and quantity surveying	3	11.5	100

Table 1 indicates that out of the 40 responding organizations, 14 are contracting organisations representing 35% of the population, with 4 of them (10%) operating as both contracting and consulting organisation. Majority of the responding organization (55%) fall into the consulting category of type of organisation. But of the contracting organization, 44.4% carry out general contracting as their construction activity, while 38.9% are involved in both building and civil engineering construction activities. A small percentage of the respondents embarked on building works as their main source of income. Consulting organizations that make up the population comprise of quantity surveying consultants, structural, building consultants and architectural firms having representation in the survey.

Table 2 shows the demographic data of the respondents with the following information; years of experience, academic background, academic qualification, profession affiliation and level of membership amongst other things.

Table 2 Demographic data of Respondent

	Frequency	Percent (%)	Cumulative Percent
Academic qualification			

HND	20	50.0	50.0
BSc	15	37.5	87.5
MSc/MBA	5	12.2	100
Professional qualification			
NIA	4	10.8	10.8
NSE	7	18.9	29.7
NIOB	10	27.0	56.8
NIQS	14	37.8	94.6
Others	2	5.4	100
Level of membership			
Graduate	23	65.71	65.71
Corporate	10	28.57	94.29
Fellow	2	5.71	100
Construction experience			
Less than 5years	22	55.0	55.0
6-10years	11	27.5	82.5
11-15years	3	7.5	90.0
16-20years	2	5.0	95.0
Above 20years	2	5.0	100
Professional Background			
Architect	3	7.9	7.9
Quantity Surveyor	7	18.4	26.3
Builder	11	28.9	55.3
Civil Engineer	14	36.8	92.1
Others	3	7.9	100

As shown in Table 2, majority of the respondents are have formal educational qualification and are registered with relevant professional bodies. This implies that all the respondent have the formal knowledge to provide primary data for the research. The table also reveals that 45% of the population have construction experience above 5years. 55% of the respondents have experience in the construction industry between 1 and 5years. This informs that the respondents are sufficiently knowledgeable in construction matters to know the risk factors involved in design and build procurement. Civil engineers constitute 36.8% of the respondents- the highest proportion, closely followed are builders and quantity surveyors with 28.9% and 18.4% representation.

Based on the responsibility of performing risk management functions in organization, 29.7% of the respondents express that the Director/partner has the responsibility of performing risk management functions in their organization, 17.1% of them refer to other management level employee, 7.3% of them refer to person specially employed as risk analyst while 37.8% of them agree that chartered quantity surveyor. Majority of the respondents agree that chartered quantity surveyors are the best, saddled with the responsibility of performing risk management functions in their organization.

Table 3: Responsibility of performing risk management functions

Risk Management	No of Response	Percentage	Rank
Chartered Quantity Surveyor	14	37.8	1
Director/partner	11	29.7	2
Other management level employee	7	17.1	3
Person especially employed as risk analyst	3	7.3	4
Others	2	4.9	5

Table 4: Incidences of risk factors and Types

	Frequency	Percent (%)	Cumulative Percent
Are there incidences of risk factors on your construction projects (N=40)			
Yes	34	85.0	85.0
No	6	15.0	100
If yes, please identify (N=34)			
Design risk	6	17.6	17.6
Financial risk	11	32.4	50.0
Design and financial risk	5	14.7	64.7
Financial and construction risk	8	23.5	88.2
Design, financial and construction risk	4	11.8	100

Table 4 shows that 85% of the respondents have observed incidences of risk factors on any of their construction projects, with the remaining 15% reporting that they have not at any time observed any of the highlighted risk factors on any of the organisation's construction projects.

Out of the 85% of the sample who have reported incidences of the risk factors on their projects, 32.4% of them stress that financial risk has occurred significantly on construction projects. 23.5% of the population opine that both financial and construction risk has been observed on construction projects undertaken by their organisation; the lowest of the lot in Table 4.5 is the presence of all three (design, financial and construction) risks at the same time on construction project(s).

4.1 Risk identification

In Tables below, the risk factors affecting the design and build procurement system are highlighted under different heading. The mean scores of the risk factors that are associated with this type of procurement system are shown in the tables below. The mean limit is 3.00, any factor equal and above 3.00 is considered as somewhat frequent in design and build procurement while factors below the mean limit is regarded as rarely frequent or do not occur at all.

4.1.1 Group 1: Natural phenomenon

Table 5 indicates that rainfall with a mean score of 3.41 is the most frequent factor observed in design and build procurement system under natural phenomenon.

Table 5: Risk identification in design and build

Natural phenomenon	N	Mean	Rank
Rainfall	37	3.41	1
High gale	38	2.13	2
Fire	40	1.58	3
Earthquake	40	1.18	4

Other equally less frequent risk factors under this category include high gale (windstorm), fire and the least frequent; earthquake with mean score of 2.13, 1.58 and 1.18 respectively.

4.1.2 Group 2: Economic/finance

As shown in Table 6, increased material cost is regarded by respondents as the most frequent risk factors associated with design and build procurement system. This is evident with a mean score of 3.35, which falls under somewhat frequent, as against the other risk factors. Difficulty of financing the construction project and strong competitors in the construction market closely follows increased material cost during the construction projects.

Table 6: Risk identification in design and build

Economic/finance	N	Mean	Rank
Increased material cost	40	3.35	1
Difficulty of financing	40	3.30	2
Strong competitor	40	2.73	3
Low market demand	37	2.54	4

The risk factor which rarely occurs during construction project under economic/finance heading is low market demand with a mean of 2.54.

4.1.3 Group 3: Politics/society

Bribery/corruption occurs the most on construction projects when considering risk factors under politics/society as shown in the Table 4.8 below. High powered lobby is also a common occurrence in the Nigerian construction industry and most especially during design and build procurement system.

Table 7: Risk identification in design and build

Politics/society	N	Mean	Rank
Bribery/corruption	40	3.65	1
Lobby	40	3.05	2
Rigid bureaucracy	37	2.62	3
Language/cultural barrier	40	2.23	4
Change of law	40	2.10	5
War/revolution/riot	40	1.72	6

There exist rigid bureaucracy in design and build procurement, which is placed third with a mean score of 2.62. Change of law and war/revolution/riot are risk factors which rarely occur during design and build procurement system with 2.10 and 1.72 respectively

4.1.4 Group 4: Industrialized characteristics

The survey only highlighted two risk factors under the industrialized characteristics heading, namely; monopolized bidding and labour union.

Table 8: Risk identification in design and build

(D) Industrialized characteristics	N	Mean	Rank
Monopolized bidding	40	2.98	1
Labour union	40	2.27	2

Monopolized bidding, as depicted in Table 8 above, comes first in order of occurrence, while labour union comes in distant second with 2.98 and 2.27 mean score respectively.

4.1.5 Group 5: Contract

Unequal contract provision has the highest level of occurrence in design and build procurement system with a mean score of 3.11. Other risk factors which seldom occur under this category include misjudged cost estimation, dispute among entities and defect warranty.

Table 9: Risk identification in design and build

Contract	N	Mean	Rank
Unequal contractual provision	37	3.11	1
Misjudged cost estimation	37	2.92	2
Dispute among entities	40	2.58	3
Defect warranty	37	2.41	4
Inadequate insurance	37	1.92	5
Unjust arbitrator	40	1.65	6

Inadequate insurance and unjust arbitrator are the least factors in terms of occurrence in design and build procurement system in Lagos state.

4.1.6 Group 6: Construction

Table 10 depicts that inadequate construction planning with mean score of 3.22, new technology implementation with 3.15 and too high quality standard with 3.11(in that order) are the three most frequent risk factors under the heading which occur during design and build projects. The risk factors which occur rarely include faulty job field survey mobilization due to clashes of several projects and inadequate procurement planning with 2.70 and 2.68 re

Table 10: Risk identification in design and build

Construction	N	Mean	Rank
Inadequate construction planning	37	3.22	1
New technology implementation	40	3.15	2
Too high quality standard	37	3.11	3

Faulty job field survey	37	2.70	4
Inadequate procurement planning	37	2.68	5

4.1.7 Group 7: Job site

Incompetent planning, incompetent management and incompetent coordinator make up this category of risk factors. Incompetent planning with a mean score of 2.90 is the most frequent risk factor considering job site heading. Incompetent coordinator and incompetent management have mean scores of 2.88 and 2.78 respectively and hence can be regarded as rarely frequent risk factors as shown in Table 11 below.

Table 11: Risk identification in design and build

Jobsite	N	Mean	Rank
Incompetent planning	40	2.90	1
Incompetent coordinator	40	2.88	2
Incompetent management	40	2.78	3

4.1.8 Group 8: Safety/Environment

Table 4.13 reveals that environment damage and/or pollution occurs the most amongst safety/environment category though it must be said that it seldom occur as compared to other categories.

Table 12: Risk identification in design and build

Safety/Environment	N	Mean	Rank
Environment damage/pollution	40	2.55	1
Traffic or work hour restriction	40	2.30	2
Third party objection	38	2.29	3
Accident related loss	40	2.25	4

Traffic or work hour restrictions, third party objections and accident related loss in that order occur rarely during design and build procurement system. Their mean score reads 2.30, 2.29 and 2.25 respectively.

4.1.9 Group 9: Client

Late payment, unreasonable demand, feasibility study, reliance on architect/consultant, financial problems/bankruptcy are one of the few risk factors which can be regarded as occurring somewhat frequent under client related category with mean score above 3.00

Table 13: Risk identification in design and build

Client	N	Mean	Rank
Late payment	40	3.25	1
Unreasonable demand	40	3.15	2
Feasibility study	40	3.12	3
Reliance on architect/consultant	40	3.07	4

Financial problems/bankruptcy	37	3.05	5
Jobsite superintendent being incompetent	40	2.73	6
Reference by subcontractors	40	2.73	6
Relation with the third party	38	2.63	8
Difficulty in choosing business dealer	40	2.50	9

Relation with the third party and difficulty in choosing business dealer with mean score of 2.63 and 2.50 respectively makes the above mentioned risk factors to be labelled as less frequent factors during design and build projects under client related category of risk factors.

4.1.10 Group 10: Designer

The most notable problem associated with construction projects is the frequent design change which affects the outcome of projects in more ways than one. Frequent design change is considered to occur the most as a risk factor associated with the design related factor (designer). Another risk factor worthy of note is vague drawing and specification which is ranked second with a mean score of 3.03.

Table 14: Risk identification in design and build

Designer	N	Mean	Rank
Frequent design change	40	3.25	1
Vague drawing and specification	37	3.03	2
Constructability	37	2.76	3
Incomplete construction area	38	2.61	4
Incompetent supervision skills	40	2.60	5
Lack of fair stance	40	2.35	6

Incompetent supervision skills and lack of fair stance comes rear in the risk factors associated with designers with mean score of 2.60 and 2.35

4.1.11 Group 11: Contractor

The list highlighted in Table 15 below shows contractor related risk factors associated with design and build procurement systems. The tendency of having higher construction cost compared with the bid taking is the most frequent risk factor that the contractor is exposed to with this form of procurement system. Other frequent risk factors are the stringent contractual terms and low working morale of staffs and site workers of the contractor; this is confirmed in Table 4.16, with the mean score of 3.05 each

Table 15: Risk identification in design and build

(I) Contractor	N	Mean	Rank
Higher cost than bid taking	40	3.33	1
Stringent contractual terms	37	3.05	2
Low working morale	40	3.05	3
High personnel mobilization	40	2.80	4
Lack of trustworthy support by subcontractor	37	2.78	5
Short of capital/equipment	40	2.75	6
Shortage in machine tools and workers	40	2.73	6
Shortage of manpower or experience	40	2.70	8
Low safety awareness	40	2.67	9

Erroneous allocation of human resources	40	2.60	10
Deficit contracting	40	2.35	11
Local jobsite particularity	40	2.15	12

There are also risk factors such as erroneous allocation of human resources, deficit contracting and local jobsite particularity which form part of contractor related risk factors which occur the least during design and build projects.

4.2 Effects of risk on design and build procurement systems

In Table 16, the effects of risk on design and build procurement are highlighted. The mean scores of the effects that affect design and build procurement are shown in table. The mean limit is 4.00, any factor equal and above 4.00 is considered as critical to this form of procurement system while effects below the mean limit is regarded as less critical.

Table 16: Effects of risk on design and build procurement system

Effects of risk	N	Mean	Rank
Cost overrun	38	4.45	1
Dissatisfaction of work	40	4.03	2
Poor financial management	32	3.88	3
Time overrun	38	3.79	4
Claims	38	3.76	5
Accumulation of interest on loan facilities	38	3.71	6
Delayed payment	38	3.63	7
Insolvency	32	3.53	8
Inability to resolve claims and disputes	37	3.49	9
Low users' satisfaction	40	3.48	10
Delay in completion	38	3.45	11
Inefficient service delivery	34	3.44	12
Low quality	40	3.40	13
Abandonment of projects	40	3.40	13
Bankruptcy	40	3.38	15
Shoddy work	40	3.37	16
Dangerous safety condition	38	3.37	16
Cash flow problems	38	3.34	18
Unhealthy relationship with the client	40	3.30	19
Extension of time	40	3.27	20
Poor management of project	40	3.22	21
Poor communication	40	3.22	21
Unethical practices	38	3.16	23
Delay in certification	40	3.08	24
Rework	40	3.03	25
Contract bias to one party	40	3.03	25
Determination of contract	35	2.97	27
Poor environmental impact	38	2.91	28

Table 16 indicates that cost overrun with a mean score of 4.45 is the most critical effect associated with risk in design and build procurement systems used on a construction project. Other critical effects include dissatisfaction of work, poor financial management, time overrun and claims with mean scores of 4.03, 3.88, 3.79, and 3.76 respectively. Rework, contract bias to one party and determination of contract are shown in the table to have less critical effects on design and build procurement; while poor environmental impact with a mean score of 2.91 is said to exert least critical effect on design and build projects.

5 Conclusion and further research

Financial risk is one of the most significant risks experienced by organisations during construction projects in the industry. Such risk include the inability of client to pay as at when due and difficulty in financing. Earthquake has not at any time been recorded within the shores of the country and hence undoubtedly received the least frequent risk factor under the natural phenomenon heading. Bribery/corruption and lobby in the

highest places have become part and parcel of the construction industry. This is evident in the research, where it was considered somewhat frequent with a high level of occurrence within the industry. Misjudged cost estimation on the part of quantity surveyors gives rise to more problems than one. Amongst which include claims, dispute and some instances litigation.

Environment damage/pollution is one of the risk factors associated with design and build projects as it is with any other project. The public and the environment at large are exposed to hazardous atmospheric pollution which arises from construction related activities. Poor environmental impact is not considered to be a critical effect as a result of risk factors on design and build projects. The most critical effects, risk has exposed the project participants on design and build projects include cost overrun, dissatisfaction of works, poor financial management and time overrun. The effects which exert the least influence on D&B projects are as follows: contract bias to one party, determination of contractor which could be as a result of insolvency of the contractor and poor environmental impact of the construction projects on the environment.

This study recommends that contractors should adequately assess design and build projects in order to identify the risk elements associated with such projects, and then decide on appropriate risk management techniques to adopt in handling such risks to ensure overall project success.

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Asset Management Processes in Scottish Councils: Property Management Information Systems and Capacity Building

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Abstract:
It has now become increasingly noticeable that there has been an increasing trend towards the adoption of asset management by public bodies including local authorities. Since 2003 Scottish councils have been legally obliged to adopt asset management as the strategic framework for managing their property assets. The trend for increased adoption of asset management has come as a result of evidence of inefficiencies associated with the manner in which local authorities managed their property assets and the realisation of potential benefits that are likely to arise if asset management approach is followed. The purpose of this paper is to assess the extent to which Scottish councils have effectively implemented aspects of the processes associated with asset management practice. There are about four commonly identified asset management processes including: strategic planning processes, corporate property management arrangements, property information management system, and capacity building. The focus of this paper is on the latter two. The paper is a research based on a survey investigation of all thirty two Scottish councils. A questionnaire based survey and interview of a select number of key stakeholders was carried out. The research findings suggest that councils have had limited success in developing appropriate strategies for capturing and managing information to aid decision making. Local authorities have been equally unsuccessful in building property management capacities. In particular they have had limited success in developing effective organisation of their property management services as the basis for implementing a more corporate and strategic approach to capital and asset planning. As no similar study has been carried out on asset management in Scottish councils, the findings of this research are of interest to Scottish councils and other public sector organisations in Scotland and beyond.

Key Words:
asset management processes, best value, effective implementation, improved service delivery, Scottish councils

1 Introduction

In recent years councils, like many other public bodies, have had to respond to changes that have affected public services in the wake of rising public expectation. The

evolution of public services in the context of rising public expectation has led to the pressures for substantive changes in the funding and delivery of public services. Such changes are intended to increase efficiency, effectiveness and responsiveness of service delivery to users (Crawford, 2003; Baldry, 1998; Hood, 1991). The initiatives to improve efficiency and effectiveness of service delivery have also affected property management (Boyne, 2002; Kalganova and McKellar, 2006). In response government entities, both national and sub-national, have been advocating that property assets be managed in a strategic way similar to other assets such as human and finance. Asset management is the strategic framework that governments advocate as the means by which property assets could effectively support efficient and effective service delivery (CIPFA, 2008). Various initiatives have been employed in recent years to encourage the adoption of asset management and its associated processes.

In Scotland the initiatives to encourage local authorities to take on board a strategic approach to property asset management could be traced back to the late 1990s. The 1998 Local Government White Paper contained proposals for modernisation of the capital finance framework for local authorities (Department of the Environment, Transport and the Regions (DETR), 1998). The paper proposed allowing councils to take more responsibility for making decisions about their internal distribution of resources including introducing a strategy framework for managing property assets.

The Scottish government responded by introducing the Local Government in Scotland Act (2003) to improve accountability for the use of public assets and public funds within a legislative framework that secures Best Value (CIPFA, 2005).The Act has imposed a legal duty on councils to adopt *Asset Management* as a framework for managing public property assets. The adoption of Asset Management to public property asset management has also been advocated by the Royal Institution of Chartered Surveyors (RICS) (2004).

Most recently in Scotland, the Scottish Government's "Efficient Government" agenda has Asset management as one of the five work streams (CIPFA, 2008). The initiative cites the better management of assets by all parts of government as a key element in the drive for efficiency gains and recommends that Councils have an asset management plan in place.

There have been other initiatives designed to promote the adoption of asset management by Scottish Councils. These have included the publication of asset management guidelines for education property assets by the Scottish Executive and UK audit bodies (CIPFA, 2008; Scottish Executive, 2003), Audit Scotland giving time to councils to prepare asset management plans, movement by councils away from annual to three yearly budgeting, researchers and commentators emphasising the benefits of strategic asset management (Male, 2006; Jolicouer and Barrett, 2004) and through budgetary pressures (RICS, 2004).
According to the Chartered Institute for Public Finance and Accounts (CIPFA) (2008) in the past councils, in common with most other organisations in the public sector, have not in any systematic way considered how their assets have been used and deployed to effectively support service delivery. A number of academic studies and professional reports, going back to the 1980s, have been carried out evaluating corporate property management in the public sector. The studies and reports have highlighted shortcomings associated with public sector property management. The principal reports on the subject have been those by the Audit Commission (1988); Ceri Davies Report on the National Health Service (1982); Audit Commission reports on Local Authorities (1988); the

National Audit reports on the Crown Estates (1988), the National Health Service (1988); the civil estates (1988); and the Metropolitan Police estate (1989).

The main criticism of these reports was that there had been lack of a strategic approach to management of public property property (Gibson, 1994; Avis et al., 1989; Bon, 1992; Bon et al., 1994; Gibson, 1994; Joroff, 1992; Veale, 1989. The lack of a strategic approach to property management led to inefficient utilisation of assets. Inefficiencies were as a result of the commonly practised reactive management arrangements, nonexistent property performance monitoring, not developing property information systems needed to produce essential property information to aid decision making, inadequate valuation standards and practices (Bond and Dent, 1998), fragmented management, physical and economic underutilisation of properties, insufficient maintenance and repair, and failure to account for the real cost of holding an asset including the opportunity cost (Gibson, 1994; Kaganova, Nayyar-Stone, and G. Peterson, 2000; Kalganova and McKellar, 2006).

Public sector organisations were therefore not achieving Best Value in the way they managed their operational property assets. This is because they lacked effective strategic asset management processes. In response, public bodies including councils, have responded by adopting strategic asset management as a framework for managing land and buildings. Asset management is defined by Edwards (2010) as "the systematic and coordinated activities and practices through which an organisation optimally manages its physical assets, and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organisational strategic objectives". The definition emphasises the necessity of a formal approach to the management of assets. The formalised approach is characterised by certain identifiable elements or processes associated with asset management.

The study sought to evaluate the extent to which Scottish councils have effectively implemented aspects of the processes associated with asset management practice following the adoption of asset management. In order to deal with this aim, two objectives aligned to asset management processes were set. First, the study evaluated the extent to which councils successfully built property management capacities by developing an effective organisation of their property management services. The second objective related to assessing the extent to which councils have successfully developed and are maintaining property information systems with fully adequate and appropriate data to support asset management life cycle decisions.

2 Literature Review

The focus of the research was on asset management processes rather than on the outcomes. Outcomes are the impacts of the actions and activities associated with asset management processes (CLG, 2007). The necessity to focus on asset management processes rather than outcomes or performance is due to the inherent difficulties of explicitly identifying successful performance with regard to good practice processes in operational properties. As McDonagh (2002), puts it: "… *identifying successful performance in a corporate property asset management setting is much more difficult than for traditional "investment" real estate or for corporate organisations as a whole. In the latter two situations overall quantitative output measures such as the internal rate of return, return on equity, or return on assets, or qualitative assessments such as comparison to core business objectives or industry benchmarks are relatively easy to*

apply. In contrast, corporate real estate, including operational property, outputs are usually the internal inputs to another part of an overall process. As such they are likely to be closely tied to the nature of the organisation, may have no market in which pricing or performance comparisons can be made and therefore be very difficult to measure across a range of differently structured and focused organisations".

Citing Gibson (1995), asset management performance is therefore focused on the process of real estate decision making. It is hypothesised that, if there are better processes to deal with real estate, then better decisions more in line with the organisation's overall goals will result. McDonagh (2002) cites a number of studies that have been carried out on corporate property asset management processes and their impact on property management performance. A number of processes have been found to be most effective in improving property performance. Amongst these processes is the need to provide the necessary leadership to help build property management capacity and having in place effective property management information systems. For instance, McDonaugh (2002) cites the studies done by Zeckhauser and Silverman (1982), Hite, Owers and Rodgers (1987), Sanford and Hook (1987), Rutherford and Stone (1989), Avis, Gibson and Watts (1989), and Teoh (1992) on the existence and structure of corporate property management groups and the necessity of developing effective organisation of property management services. Similarly, property management information system is an important armoury of the asset management process. Prudent decision making requires monitoring data and that it is extremely difficult, if not impossible, to make informed real estate decisions without a property management information system (Hentschel and Utter, 2006).

In a recent work by York Consulting and the Department for Communities and Local Government (CLG) (2007) reviewing asset management processes in English councils they reached similar conclusions. The study abstracted the asset management processes found to be effective in affecting asset management performance into certain key process groups and subgroups. The key process groups include the development of corporate property management groups; effective organisation of property management services as the basis for implementing a more corporate and strategic approach to capital and asset planning; capacity building in order to have a corporate approach to project management; and the existence of a property information system with relevant information (Department for Communities and Local Government and York Consulting, 2007).

3 Research Methodology

Asset management processes are an important precursor to effective asset management performance. Councils were therefore evaluated for the success of their asset management arrangements by examining how effectively they had deployed and executed some of these asset management processes.

3.1 Key Issues That Were Investigated

The research evidence (CLG, 2007) had identified a number of good practice processes. However the focus of this paper is on two of these namely the ongoing collection of property data and their use in managing assets more effectively; and developing property management capacity (Table 1).

Table: 1 Good Practice Processes or Critical Success Factors for effective property asset management

Item No.	Capacity building process elements	
1	Setting out clear property management responsibilities at a corporate and service level	
2	The council should make available adequate resources at a corporate level, to review property assets and running costs	
3	Existence of a corporate approach to project management based on the PRINCE 2 gateway process or similar	
4	Development of internal project management capacity by establishing specialist teams with appropriate project management training	
5	Roles and responsibilities in relation to project management are clarified	
6	Development of project management protocols and guidelines	
Item No.	**Property management information system process elements**	
1	Having an adequate property information system for gathering, storing, maintaining and updating information to support property management functions	
2	Populating the property information system with adequate information about Core / Basic data (size, value, lease details etc) on operational property	
3	Populating the property information system with adequate information on:	
	a)	the condition of the properties
	b)	the suitability of the properties
	c)	the capacity (sufficiency) of the properties
	d)	property usage (hours used)
	e)	environmental performance of buildings e.g. CO2 emissions
	f)	accessibility issues e.g. DDA compliance
	g)	asbestos content of buildings
	h)	health & safety surveys
	i)	energy performance certificates
	j)	required maintenance i.e. backlog in priority banding
	k)	maintenance spending patterns e.g. planned to reactive ratio
4	The asset management service should maintain an effective performance management framework comprising a suite of performance indicators, to help to continuously review and improve performance	
5	Have in place a Benchmark Framework so that the unit costs are benchmarked against other councils and other similar organisations	
6	The Council should have in place annual performance plans, agreed by council members, setting out targets for improvement	
7	The council should ensure that annual performance plans are included in public performance reporting	
8	The Council should develop processes through which to consult with partners / stakeholders, service users, the general public and staff regarding capital programme and property-related issues	

Source: Department for Communities and Local Government and York Consulting (2007)

Therefore, two good practice processes identified in Table 1 formed the criteria for evaluating Scottish Councils' success in implementing asset management processes.

3.2 Scope of the Study and Methodology

The study was limited to evaluating asset management as it relates to operational properties. These are properties which are used direct service delivery or support service delivery such as administrative offices. With these property types data protection and confidentiality is less of an issue as there are no landlord and tenant contractual arrangements. All thirty two Scottish councils were investigated with eighteen of them responding which represents a response rate of 56%.

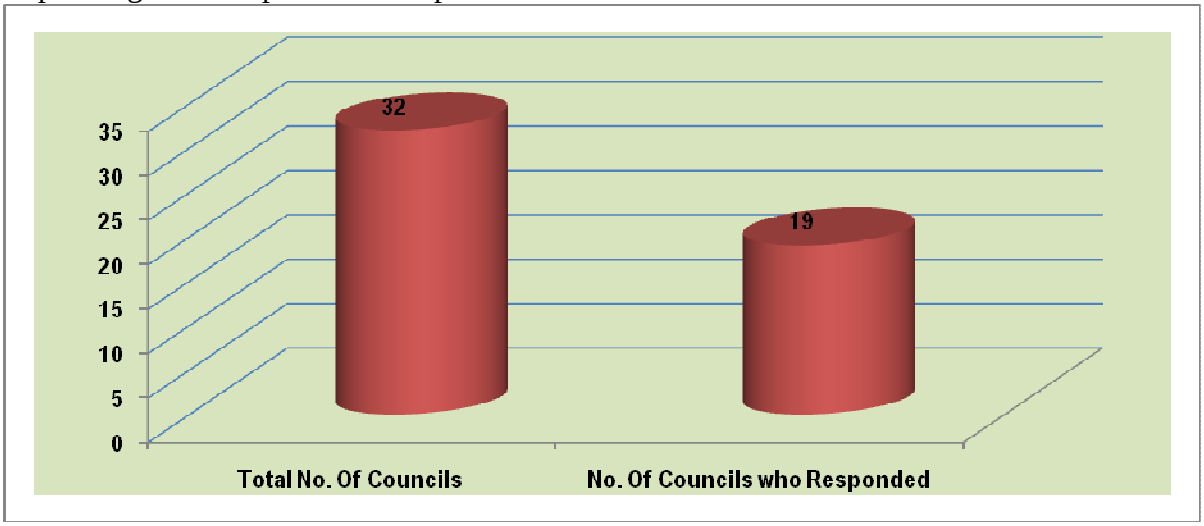

Figure 1: Survey Response Rate (59%)

Data was collated from targeted departments and personnel. For instance data was sourced from property and facilities departments, service users and service departments as well as finance departments. However, only property departments namely asset managers, estates surveyors, and valuers responded. In terms of response rates these were 44% from asset managers, estate surveyors / valuers the return rate was 56%, with no responses received from facilities managers and service users.

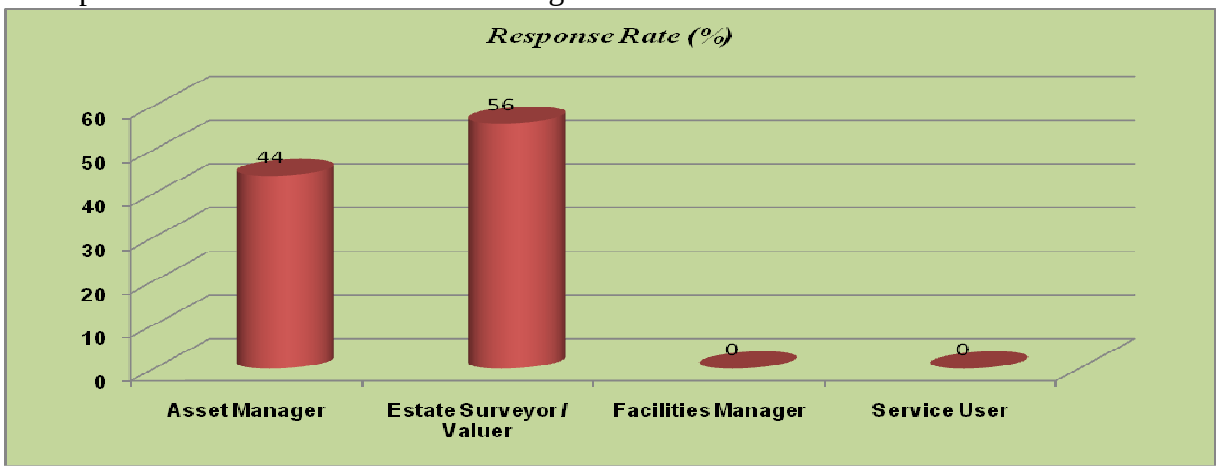

Figure 2: Response Rates by Profession and Service Users

The Association of Chief Estates Surveyors (ACES) in Scotland, which is an umbrella body for all heads of property departments in Scotland, assisted by distributing the questionnaires to its members for completion.

The data was gathered using a structured questionnaire as well as face to face interviews with a select number of subjects. Questionnaires were sent to all thirty two councils' Chief Estates Surveyors who distributed these to relevant personnel. In addition interviews were conducted with three asset management personnel in three different

councils. The interviews were intended to gather rich data to supplement the evidence obtained using questionnaires. The decision to use these techniques was because the investigation sought to find out what those involved in the subject of investigation thought, felt or believed about the impact of asset management on best value (Robson, 1996). The questionnaire as a research instrument was chosen for this study because it is a cheap method of data collection, reduces bias error, allows for greater anonymity and easy coding (Nachimias and Nachimias, 1982; Bailey, 1987; Fink and Kosecoff, 1985; Bryman, 1989; and Robson, 1996).

The Likert scale was used to measure the participant's attitudes., It was chosen in preference to other scale measures because it is very widely used, is relatively easy to develop, is robust and it has internal consistency (Robson, 1996). The data was scaled by categorising it from strongly agree, agree, neutral, disagree and strongly disagree (scaled 1,2,3,4 and respectively). The categorisation enabled the transformation of the collected qualitative data into a form which was capable of quantification, where necessary.

4 Results and Discussion

As already stated at 4, good practice processes formed the criteria for evaluating the effectiveness of Scottish Councils' asset management processes. The results and research findings for each of these broad areas are discussed below.

4.1 Capacity-building process

Councils' asset management processes were also evaluated in terms of the extent to which asset management processes contributed to capacity building (CLG, 2007). Effective capacity building process is evidenced by clear delineation and allocation of asset management responsibilities; adequate resourcing of asset management activities; the existence of a corporate and formal approach to project management; establishment of specialist project management teams; as well as development of project management protocols and guidelines.

There was modest success evidenced by the fact that in just over six in ten councils there are clearly delineated property management responsibilities at a corporate and service level. However, asset management responsibilities are very poorly resources. Less than two in ten councils indicated that they had adequate resources to review property assets and running costs.

The research findings are that councils have been very unsuccessful in developing corporate and formal approaches to project management and putting in place specialist project management teams. In all of these areas only one in four indicated that they had developed capacities in these areas. Councils did not fair any better when it came to clarification of project responsibilities or with regard to putting in place project management protocols and guidelines. In councils where project management practices were in places, just under half (45%) of them indicated that there is clarification of roles and responsibilities in relation to project management. Similarly, just over three in ten (36%) of councils stated that they had developed project management protocols for and guidelines.

4.2 Information and evidence processes

The development and maintenance of a property information system with fully adequate and appropriate data is central in reviewing property portfolios before management decisions about acquisition, operation, maintenance and disposal of properties can be made (Loyd, 2010; Male, 2010). A number of factors were evaluated in order to establish the extent to which councils' arrangements with regard to information and evidence processes had been successful. The factors evaluated included considering the existence of a property information system with relevant information on the current property portfolio; the availability of property performance indicators; and the existence of processes for consulting partners or stakeholders, service users, the general public and staff regarding property-related issues.

The evidence suggests that councils had been very successful in collecting information but ineffective in making effective use of such data. For instance about seven out of ten councils stated that they had adequate basic core data and property information systems for gathering, storing, maintaining and updating information to support property management functions. In terms of the nature of information, just over 80% of councils considered that they had adequate information on property condition and suitability. However, less than half of local authorities indicated that they had sufficient data on property sufficiency and usage.

About half of the councils stated that they did not gather sufficient data on the sustainability of properties nor on other indicators. In particular, the property system conveyed inadequate information about the environmental performance of buildings in terms of CO_2 emissions; health and safety surveys; energy performance; required maintenance; maintenance spending patterns; benchmarking; agreed performance targets; and processes for consulting with partners. The exceptions were in terms of information on accessibility issues such as the DDA compliance and asbestos content of buildings where more than seven in ten councils considered that they had captured sufficient data.

It is clear that councils still have a long way to go in developing their information systems to capture relevant data on the sustainability of buildings, to help deal with maintenance arrangements, for reporting purposes and consultation with stakeholders. These findings are consistent with those reached by the Audit Commission (2009), which though only focused on education assets nonetheless reached similar conclusions. The Audit Commission study found that "the majority of Scottish councils report good arrangements for collecting property data, but good operational data is not always used to support decision making".

The successes with regard to information on asbestos content and accessibility issues could be attributable to the legal requirement to capture these data sets.

5 Conclusion and Further Research

The study sought to assess the extent to which Scottish councils have effectively implemented aspects of the processes associated with asset management practice. Two asset management process areas were evaluated for evidence of success. These included processes associated with capacity-building and development of appropriate property management information system**.** A number of study findings emerged from the study.

he research evidence, with regard to capacity building process, suggests that councils have largely failed to build capacities in order to effectively manage property assets and deal with major capital projects. The modest success has been in having clearly delineated property management responsibilities. However, councils have largely been unable to adequately resource asset management arrangements.
With regard to Information and Evidence the study found that councils, while successful in having property information systems for capturing data, they have largely failed to populate them with appropriate and adequate data needed for management decision making purposes.

The research findings have implications for a number of organisations and most especially public sector bodies. The findings are of significance to a range of public organisations such as local authorities, the National Health Service, Central Government Departments, Universities, executive agencies and many other public bodies. These bodies can use the research findings to improve the way they manage their property assets. With improved management of property resources local authorities and these other public bodies are likely to realise huge savings from their property assets, provide service users with properties that are fit for purpose as well as being able to rationalise property assets to release capital. As public bodies are in the business of providing services, by improving their operational property asset management arrangements this would be beneficial to councils and other public organisations in terms of realising efficient service delivery and achieving best value.

The research only looked at aspects of asset management processes. The research theme is further being developed as part of doctoral studies. The doctoral research is evaluating the effectiveness of asset management but investigating all the processes involved asset management as well as evaluating asset management performance. In terms of the study subjects, the study is extended to include English and Scottish Councils.

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Human and organisational aspects

The effects of workplace stress upon construction professionals in South Africa: a survey

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Abstract:
Workplace-induced stress has ramifications in terms of its side effects. Besides the threat risks these pose to the health and well-being of individual workers, more general issues arise in terms of performance and occupational health and safety. Negative coping mechanisms give rise to similar risks. As part of a larger opinion survey-based investigation into workplace stress, the perceived effects upon professional architects, engineers, quantity surveyors, and project and construction managers working in the construction industry in South Africa were explored, together with the coping mechanisms used to deal with them. A web-based online survey yielded 676 responses. Few survey respondents find it easy to relax after hours. More than a quarter claim that stress at work puts a strain on family life, and constrains social relationships and activities. Consumption of alcohol is widespread, with 40% of respondents consuming 3-9 units per week. Cigarette smoking is reportedly moderate overall but heavy among a minority. Appropriate stress management measures should be implemented within the construction industry, and the nature of professional work explored in greater depth with a view of ameliorating stress 'hotspots'. The construction professions can play a significant part in this.

Keywords:
construction professionals, coping mechanisms, side effects, workplace stress, South Africa

1 Introduction

The U.S. National Institute for Occupational Safety and Health (NIOSH) defines workplace stress as "the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker" (NIOSH, 1999). Houtman (2005) found that work-related stress was the second most common work-related health problem across 15 European Union countries. Physical and mental health impairment relating to stress are also associated with longer periods of work absence and higher direct costs per health claim than other injury/illness categories. Work-related stress is associated with cardiovascular diseases (Kivimäki et al., 2002), musculoskeletal disorders (Hoogendoorn et al., 2000), and repetitive strain injuries (Ariëns et al., 2001).

While an array of information about workplace stress, its effects and implications is emerging, little is known about its prevalence and impact in the South African construction industry, particularly among construction professionals.

A web-based, online opinion survey has been conducted to explore the nature and extent of workplace stress experienced by professionals working in the construction industry in South Africa. Data were collected from responses to questionnaires administered to South African registered architects, civil engineers, quantity surveyors, and project and construction managers. This paper reports on the findings of part of the larger survey, namely, the side 'effects' of workplace stress and mechanisms used to cope with it.

2 The effects of workplace stress

According to the Job Demand-Control (JDC) model of workplace stress, work that is simultaneously high in demands and low in control produces the most stressful responses and is most damaging to health (Belkic *et al*., 2004; De Lange *et al*., 2004). The JDC model of work stress is reported to reliably predict workers' psychological well-being, job-related well-being and burnout (Hausser *et al*., 2010). However, none of these studies attempts to distinguish between different professional occupations involved in the same industry.

The effects of stress may be broadly classified into psychological effects, physical symptoms, and effects on home life (Houtman, 2005). Psychological effects encompass tension, anger, frustration, unhappiness, depression, loss of self-confidence, and difficulty in relaxing outside work hours. Physical symptoms typically include disturbed sleeping patterns, unexplained symptoms of nausea and stomach disorders, headaches, and difficulty in concentrating. The effects of stress on home life include strained domestic relations, and constrained social relationships and activities (Leiter and Durup, 1996; Bakker, 2009). While all these effects are known to occur, whether or not different effects can be associated with different professions is less well understood.

There may also be gender issues. Sang *et al*. (2007) report that female architects experienced significantly higher levels of work–family conflict and reported lower levels of job satisfaction and higher turnover intention than their male counterparts. In the South African context, ethnic and cultural factors could also have a bearing on workplace stress and its effects. To date, this question is uninformed by evidence from any other country on continental Africa, nor is it contextually explored by the authors cited in this section.

3 Research design

A multi-part opinion survey questionnaire was designed, incorporating closed, dichotomous, declarative, rating and multiple-choice questions. The questions cover a catalogue of issues drawn from the work of Sutherland and Davidson (1989), Haynes and Love (2004), Ng *et al*. (2005), Leung *et al*. (2007, 2008a, 2008b, 2010) and Love *et al*. (2010). In addition to gathering self-assessments of the levels of workplace stress experienced by construction industry professionals in South Africa, the questionnaire explored the physiological, psychological and sociological effects of stress and the coping mechanisms used in mitigation.

A web-based, online method was adopted to administer the survey to the construction professions. The statutory and non-statutory bodies that regulate the registration and professional activities of construction professionals in South Africa were contacted for assistance in communicating details for the online link. The statutory bodies include: the South African Council for the Architectural Profession (SACAP), the Engineering Council of South Africa (ECSA), the South African Council for the Quantity Surveying Profession (SACQSP), and the South African Council for the Project and Construction Management Professions (SACPCMP). The non-statutory professional associations include: Consulting Engineers SA (CESA), the SA Institute of Civil Engineers (SAICE), and the Association of SA Quantity Surveyors (ASAQS). A pilot study (also web-based) was used to confirm the adequacy of the survey instrument and its administration, and the full survey was launched in late September 2010, remaining open online until mid-November 2010. Precise response rates to online surveys, where URL links are distributed by third-party organisations, are difficult to ascertain. Table 1 gives the indicative responses to this survey.

Table 1. Responses to online stress survey by South African construction professionals

	Architects (SACAP)	Engineers (CESA, SAICE)	Quantity Surveyors (ASAQS)	Project and Construction Managers (SACPCMP)	Total
Distribution (N)	3025	1842 (+ 457)	1449	3359	9675
Response (*n*)	269	168	179	60	626
Response %	8.9%	9.1%	12.4%	1.8%	6.5%

ECSA is unable to provide registration figures for the different engineer sub-groups. The voluntary associations, namely, CESA and the SAICE, emailed their professional civil engineers (*N*=1842) and civil engineering practices (*N*=457), respectively, but assuming that the practices will each have partners/directors who are members of CESA, the survey response rate for civil engineers is calculated as 9.1%. The response rate for project and construction managers is likely to be higher than 1.8% since many professionals registered with the SACPCMP will be qualified architects, engineers and quantity surveyors.

Arguably, the survey response rate is not critical to this type of research. The survey is intended to provide a 'snapshot' of workplace stress among construction professionals in South Africa, and to confirm the existence of stress-related issues. Further case-based research is intended to validate the survey findings and to explore them at greater depth.

4 Survey findings

4.1 Analysis of the data

The data have been analysed using the Statistical Package for the Social Sciences (SPSS V18.0 for Mac) software application. Where appropriate, cross-tabulation has been used to establish degrees of association between categorical variables; using the Pearson's

Chi-square test (or the Fisher's Exact Test where appropriate) at the 5% (p=0.05) level of significance.

4.2 Survey respondent profile

The survey demographics are not presented here in detail. In general, the survey respondents are experienced practitioners in private professional practice in South Africa, mostly white, male, English-speaking, and in a stable work environment. Almost two thirds of the respondents are aged 40+. The response sample shows some bias towards the perspective of smaller firms for quantity surveyors and architects.

4.3 Side effects of workplace stress

Survey participants were asked about the impact of stress upon their lives in terms of psychological, physiological and sociological effects. Five-point Likert scales (1 = most of the time; 2 = frequently; 3 = sometimes; 4 = seldom; 5 = very seldom) were used to elicit responses relating to frequency of the perceived experience. The results are shown in Table 2.

For all but three of the catalogued side 'effects' of workplace stress, significant differences between the professional groups are found in the reported frequency perceptions. The average frequency rating value for professional architects was consistently lower (i.e. the side effect is experienced more frequently) than all other groups across all three types of stress effect. Professional quantity surveying respondents ranked second in all but four catalogue items (feeling tense at work; difficulty in relaxing after hours; sleep disturbances; and strain on family life), and engineers generally third. The least affected group appear to be project and construction managers. Only two side effects generated an average frequency rating response of >4.0 (effect seldom – very seldom experienced): loss of confidence in oneself; and unexplained symptoms of nausea/stomach disorder. The side effect generating the lowest average scores across the groups (range 2.02–2.34 = most of the time/frequently) was the perception of a lack of appreciation from others for a job well done. For this side effect, no significant differences between the groups are found, suggesting that being valued at work is psychologically important to all construction professionals, regardless of discipline. While the average rating values suggest that no acutely intense side effects are consistently experienced by any of the construction professional respondents (Table 2: no mean rating score value <2.0), the finding that most of the mean rating values lie between 2.0 and 3.5 (frequently/sometimes experienced) suggests that employers and professional associations in the construction industry should give attention to ameliorating these effects in the workplace. Further research should focus more specifically on the type of workplace activities/environments that professionals engage in; since it is unrealistic to assume that different tasks each give rise to similar levels of stress.

Age is significantly related ($p \leq 0.009$) to all the side effects catalogued in Table 2, with proportionately more younger respondents reporting higher frequency of work stress 'effects.' Gender is also significantly related ($p \leq 0.048$) to all but being satisfied with one's own work, disturbances to regular sleeping patterns, and strain on family life and social activities. For the remaining factors proportionately more female than male respondents report higher frequency.

Table 2. Perceived frequency of the 'effects' of workplace stress

'Effects' of stress	Architects Mean rating value	Engineers Mean rating value	QS Mean rating value	PM & CM Mean rating value	All Mean rating value	*P*-value
Psychological effects:	(*n*=240)	(*n*=148)	(*n*=163)	(*n*=53)	(*n*=604)	
Feeling tense at work	2.11	2.41	2.49	2.57	2.33	*p*=0.001
Feeling angry at work	2.47	2.97	2.85	3.11	2.76	*p*<0.001
Feeling frustrated or misunderstood at work	3.44	3.79	3.70	3.96	3.65	*p*=0.003
Unhappy / depressed at work due to job issues	2.58	3.20	3.01	3.38	2.93	*p*<0.001
Unhappy / depressed at work due to work circumstances	2.70	3.52	3.29	3.58	3.14	*p*<0.001
Dissatisfied with your own performance at work	2.84	3.06	2.97	3.06	2.95	*p*=0.032
Loss of confidence in oneself	3.18	3.80	3.71	4.08	3.56	*p*<0.001
Not feeling that you play a useful role at work	3.14	3.46	3.16	3.45	3.25	*p*=0.057
Lack of appreciation from others for a job well done	2.02	2.17	2.09	2.34	2.10	*p*=0.191
Difficulty in relaxing after hours	2.92	3.13	3.33	3.48	3.14	*p*=0.006
Physical symptoms:	(*n*=232)	(*n*=146)	(*n*=161)	(*n*=52)	(*n*=591)	
Disturbances to usual sleeping habits or patterns	2.84	3.14	3.20	3.12	3.04	*p*=0.164
Unexplained symptoms of nausea or stomach disorders	3.53	4.00	3.93	4.06	3.81	*p*<0.001
Headaches	3.21	3.55	3.40	3.84	3.41	*p*=0.011
Difficulty in concentrating	3.14	3.52	3.52	3.54	3.37	*p*=0.001
Sociological effects:	(*n*=232)	(*n*=147)	(*n*=161)	(*n*=52)	(*n*=592)	
Strain on family life (e.g. relationships with family members)	2.60	2.85	2.93	2.92	2.78	*p*=0.018
Strain on social activities	2.90	3.24	3.17	3.21	3.09	*p*=0.092
Strain on social relationships (e.g.	2.87	3.28	3.25	3.29	3.12	*p*=0.028

friendships)						

Notes: Scale values: 1 = most of the time; 2 = frequently; 3 = sometimes; 4 = seldom; 5 = very seldom.
The *p*-values are from the Pearson Chi-Square test.

4.4 Coping mechanisms

A wide range of coping mechanisms in the form of leisure activities are reported by survey respondents. These include: fitness/gym sessions, spending time with family/friends, travelling, watching TV/ movies, surfing and other water sports, jogging, archery, mediation/prayer, yoga, cycling, shooting, fishing, hiking and camping, golf, gardening, squash, cooking, reading, model building, wining and dining, photography, woodwork, gaming, listening to music, martial arts, motorbike riding and 4x4 driving. It is not known if any of these are used primarily to mitigate stress, or if they are simply undertaken as part and parcel of normal, healthy life and well-being. Further in-depth investigation is needed to explore this.

With respect to the use of tobacco and alcohol, Table 3 shows that 84% of respondents report not smoking. However, the remaining 16% indicate smoking up to 40 cigarettes per day. Of those that smoke, age and race are significant factors ($p<0.001$ for both) with smoking reported by proportionately more young and black construction professionals.

Table 3 shows that all professional groups report the consumption of alcohol, mostly in the range of 3-9 units per week. In South Africa, 1 unit is equivalent to 12g of pure alcohol; and the upper limit of alcohol consumption advised by the SA National Council on Alcohol and Drug Dependence is 21 units per week for males and 14 for females. In the survey, project and construction managers report consuming significantly ($p=0.025$) more alcohol per week than other groups, with nearly 30% of respondents drinking 10 or more units per week. An explanation for this finding must await more extensive research.

Table 3. Survey respondents' self assessment of tobacco and alcohol consumption

Number of cigarettes per day (rating scale intervals)	Architects (*n*=242) (%)	Engineers (*n*=152) (%)	QS (*n*=164) (%)	PM & CM (*n*=54) (%)	All (*n*=612) (%)
None (1)	82%	88%	85%	78%	84%
1-10 (2)	6%	4%	7%	7.5%	6%
11-20 (3)	7%	3%	5%	7.5%	6%
21-30 (4)	2.5%	5%	2.4%	7%	3%
31-40 (5)	2%	0%	0.6%	0%	1%
41-50 (6)	0%	0%	0%	0%	0%
51-60 (7)	0%	0%	0%	0%	0%
Exceeding 60 (8)	0.5%	0%	0%	0%	0%
Mean score	1.39	1.24	1.26	1.44	1.32
Units of alcohol per week (rating scale intervals)	Architects (*n*=242) (%)	Engineers (*n*=152) (%)	QS (*n*=163) (%)	PM & CM (*n*=53) (%)	All (*n*=610) (%)
None (1)	14%	14%	21%	8%	15%
1-2 units (2)	35%	26%	27%	17%	29%
3-9 units (3)	36%	43%	35%	47%	39%
10-19 units (4)	12%	11%	13%	25%	13%
20 or more units (5)	3%	6%	4%	4%	4%
Mean score	2.55	2.70	2.52	3.00	2.62

Note: Pearson's Chi-Square test *p*-value = 0.025 for between groups alcohol consumption. In South Africa, 1 unit is taken as 12g (net mass) of pure alcohol. The relationship between professional groups and tobacco usage is not significant.

5 Discussion of the findings

5.1 Occupational / professional differences in stress experiences

It is noteworthy that the average frequency rating value for stress 'effects' measured in the survey was consistently lower (i.e. the side effect is experienced more frequently) for professional architects than all other occupational groups, while professional quantity surveyors ranked second in all but four catalogue items. It is possible that the nature of work undertaken by professional architects and quantity surveyors is substantively different (and more stressful) to work undertaken by other construction professionals.

However, it should also be noted that, in the present sample, architects and quantity surveyors tended to work for smaller firms than other professionals. MacDermid *et al*. (1999) argue that work is experienced differently in small compared to large firms. Work in small businesses is less subject to routine and specialisation and is often characterised by greater autonomy than in larger organizations. However, the opportunities for career development and advancement may be fewer and formal

mechanisms for the resolution of disputes are often lacking. The informal nature of human resource management in smaller organizations may also reduce workers' protections against discrimination. Smaller organizations generally pay less than larger ones and workers in small organizations have less access to benefits, such as dependent care assistance. However, workers in small organizations generally have greater control over their work schedules (MacDermid *et al.*, 1999). Also, recent research identifies 'portfolio' workers as being at particular risk of work-related stress (Totterdell *et al*., 2006). Portfolio workers work for a range of clients over time in exchange for fees. They experience considerable variation in job demands, control and support over time and can experience periods of 'peak stress' when projects overlap (Totterdell *et al*., 2006). While portfolio work is a characteristic of the work of many construction professionals, future research will examine whether these stressors are more prevalent in the work of architects and quantity surveyors, particularly those working for smaller firms.

5.2 Differences in stress experiences by age

The finding that younger workers are more likely to experience stress 'effects' is consistent with the findings of previous research which shows that older managerial workers report fewer sources of stress and higher levels of mental well-being than younger workers (Siu *et al*., 2001). This may be explained by theories relating to aging which purport that work adjustment improves as workers age. This improvement manifests as a stronger internal locus of control in relation to work resulting in the adoption of more effective coping mechanisms (Aldwin, 1996). Arguably, older workers with greater experience are better equipped to appraise situations as less stressful (Siu *et al*., 2001). However, there is also evidence to suggest that workers in different age categories experience the demands-control model of work stress differently (Shultz *et al*., 2009). Older workers who reported having enough time to complete their work and who enjoyed high levels of autonomy were less likely to report stress even with high deadline demands, whereas schedule flexibility helped in reducing the likelihood of reporting stress associated with high problem-solving demands. Job control did not provide a similar protective buffer for younger workers. Shultz *et al.* (2009) conclude that, for older workers who may experience age-related reductions in both cognitive and physical resources are particularly in need of job control to mitigate stressful 'effects' of demanding work. Further case-based research in the construction professions will explore age-related experiences of work stress in greater depth.

5.3 Coping mechanisms and health-related behavioural responses

The results indicate that professional groups differ in terms of the way in which they cope with work stress, with construction and project managers tending to consume more alcohol when they experience work stress than other occupational groups.

Various taxonomies of coping with work stress have been developed in the literature. Coping styles are generally divided into two broad categories, sometimes termed direct action/active/problem-focused and palliative/passive/emotion-focused (Gonzalez-Morales *et al*., 2006). The former refers to actions intended to eliminate or reduce a stressful situation while the latter describe attempts to reduce the discomfort associated with work stress. One stress response that would fall within the latter range of coping behaviours is the consumption of alcohol for 'escapist' reasons (Grunberg *et al*., 1999).

Theories of job stress have posited that employees may consume alcohol in order to regulate negative affect and thoughts arising from aversive or stressful work conditions

(i.e., they drink for escapist or coping reasons). However, the empirical evidence for a direct or main effect relationship between work stressors and alcohol abuse is limited (see, for example, Frone, 2003). The research suggests that the relationship between alcohol consumption and work stress may be a complex one. For example, Grunberg *et al*. (1999) report that stress is only related to higher alcohol consumption for workers who believe that it will help them to cope. Wiesner *et al.* (2005) also report that the relationship between job stressors and alcohol consumption is moderated by gender, with men resorting to alcohol consumption as a coping mechanism more readily than women. This is consistent with previous research that suggests that women and men utilise different coping mechanisms to deal with work stress (Gonzales-Morales *et al*., 2006; Watson *et al.*, 2011). However, in a mixed male and female sample of US workers, Frone (2008) reports evidence that both alcohol and illicit drugs are used during and after work to reduce tension resulting from work stress (conceptualised as overload and job insecurity), while illicit drugs are sometimes used before work to dampen stress responses workers expect to experience during work hours. Given the differences between professionals' consumption of alcohol observed in the construction research, it is possible that socialisation and normative behaviours of construction professions may shape drinking behaviours. Further, case-based research will specifically examine coping mechanisms utilised by both male and female construction professionals to better understand the nature and source of differences.

6 Conclusions

The findings of this research give rise to sufficient concern to warrant the further investigation of some issues at greater depth. Case-based ‘long interview’ methods are planned for this, subject to gaining appropriate ethical clearance and the acquisition of funds commensurate with the greater expense of this research method.

Further research is justified because the negative ramifications of workplace stress (including excessive use of alcohol, nicotine and other drugs; and increasing pressure on public and private health resources) have an inevitable ripple effect, spreading from individuals through families and extended families to communities and thus to society as a whole. The issues they represent are too important to ignore. Lowered professional work performance, as a result of stress and its negative consequences and coping mechanisms, has the potential to markedly affect the efficiency and productivity of the construction industry as a whole.

More information is needed about the nature of the work undertaken by each construction profession; how they go about it; which aspects are unique to each group and which are common; and what might make some tasks more stressful than others.

The construction industry itself, and the professional associations that service it, owe a duty of care to mitigate the conditions that give rise to workplace stress, wherever possible, and to promote and support measures that will enable construction professionals to not only cope with stress but also encourage them to maintain a healthy and balanced work/family life. Many of these measures do not have to await the outcomes of further, more detailed investigation. Professional associations in the construction industry, for example, could promote national and local seminars presenting generic early-warning stress detection methods for companies and individuals to use. Models for this already exist in the approach already taken in South Africa and other countries to the adoption and implementation of occupational health

and safety procedures. Healthy coping mechanisms for stress can be similarly promoted, following the healthier life-style approaches already used for illnesses such as heart disease, diabetes and alcoholism. Refinement of all these models can follow later, to incorporate the relevant findings of further research. The important thing is to start addressing and dealing with the issues of workplace stress in the construction industry now.

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Trust as a Competitive Parameter in the Construction Industry

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Abstract:
The construction industry has in many years been criticized for a limited increase in labor productivity and efficiency, which every year is estimated to cost the industry billion of pounds. A survey conducted point out trust as one of the main reasons for the ineffectiveness in the construction industry. Therefore, this research aims to define the concept of trust in a construction context, and investigates how it is possible to create trustful environments in the construction industry.

Based on different theories, a definition of trust in the construction industry is defined as an expectation of others in collaboration not to take advantage of others to cheat, because the norms say so, and that the moste value is achieved through a trustworthy cooperation.

This research concludes that trustful environments in the construction industry is created through incentive models and by applying trust as a competitive tool in the tendering process. This tool could be an addition to already existing key performance indicator systems used to evaluated consultants, architects and contractors in tender situations. The research also presents a proposal for evaluating questions for the assessment of a trust indicator.

Keywords:
trust, incentive model, key performance indicator

1 Introduction

Since 1960 the labour productivity in the Danish construction industry has not increased remarkably compared to other industries (Anlægsteknikforeningen, 2005; Danmarks Statistik, 2010). This lack of increase in productivity is estimated to cost the Danish society about 3,5 bn. pounds yearly. The last 15 years of intense construction activity combined with low interest rates made it possible to finance ineffective building that could be sold at a high cost. The worldwide financial crisis has now changed that premise.

During the last decade the Danish construction industry has been criticized for being very tradition-bound, conservative and adversarial (EBST, 2000; Dansk Byggeri, 2006; ATV, 2009). The same tendency has been seen in other countries like UK (Akintola *et al.*, 2000), Sweden (Kadefors, 2004) and China (Cheung *et al.*, 2009).

The industry does not innovate and renew itself, hence old and ineffective construction process principles are used (Vind, 2009). The different state of the market in the construction industry could be the reason for the lack of innovation in the industry, cf. figure 1.

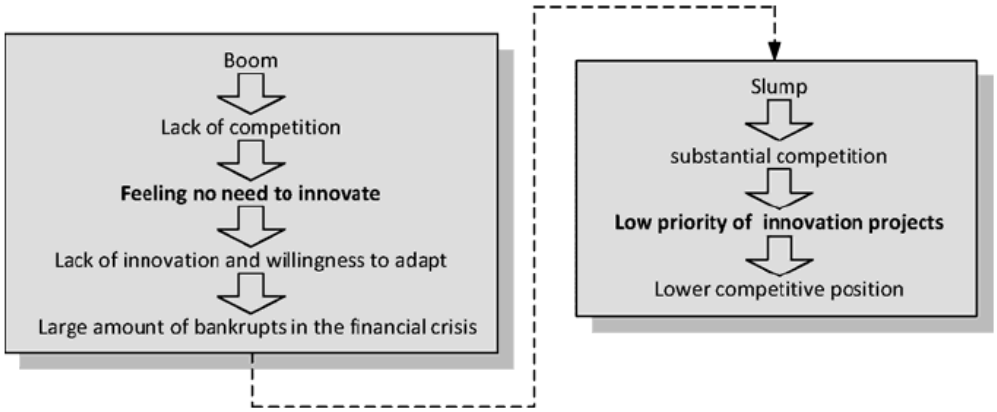


Figure 1. Innovation during boom and slump in the construction industry.

This is probably part of the reason why the productivity in the construction industry is so low. However, many improvement initiatives have been formed to increase effectiveness and efficiency in construction projects, but without positive outcome. (EBST, 2000; Regeringen, 2003; Dansk Byggeri, 2006; OEM, 2007)

In a typical construction project the client and architect often have a lower perception of value versus price than the contractor. This can lead to conflicts when the client does not feel his goals and demands are fulfilled. (Wandahl, 2005) Furthermore, the traditional mentality between client and contractor has long been identified as the major source of construction problems. (Cheung *et al.*, 2003)

Alternative forms of collaboration are rare in the construction industry, where partnering (trust based collaboration), only makes up for 11 % of all projects. (Kuben, 2008) The rest of the projects follow a traditional collaboration model, even though it in several occasions has been stated that alternative forms of collaborations, such as partnering, generates more value for all parts and can achieve savings up to about 10 % of total costs (Cheung *et al.*, 2003).

Core competences are needed if a company wants to differentiate itself from other companies (Johnson *et al.*, 2005; Lynch, 2006). If companies do not differentiate from other companies the possibility of getting "*caught in the middle*" occurs, which prompt competition based on price (Walters, 1999). In the construction industry many project tender are based on lowest price. Therefore, it is reasonable to think that the construction industry is lacking core competences.

Denmark is in general one of the most trustful nations in the world; about two out of three trust other citizens (Svendsen and Svendsen, 2006), but the Danish construction industry is characterized by a very mistrusting culture (Ingeniøren, 1999; Mieke, 2007). Could the lack of trust in the industry be one of the reasons for ineffectiveness in the construction industry?

This research seeks to define the main reason for the ineffectiveness in the construction industry indicated by the industry itself and to give ideas on how to change this. This papers research question is:

How can trust become a competitive parameter in the construction industry?

2 Research Methodology

This part of the paper is designed to examine the methods used in the current paper, in order to establish valid result. This is a scientific paper, where a hypothetical deductive method is being used to answer the research question; however, an inductive method is used in the survey. (Føllesdal, 2005)

2.1 Survey

The choice was made to use an online electronic survey in order to evaluate the currency of the issues earlier described. The construction industry is composed of many different parts, in which it is not possible to get a qualitative interview with everyone. Therefore, it became essential to make sure, that a representative set of respondents were selected. Hence, Google Maps was applied to ensure that companies were scattered throughout the country.

Besides finding respondents on the internet, all former and present students from the M.Sc. in Construction Management education from Aalborg University were contacted. This had an influence on the average age of the respondents, which was lower than industry average. This was not considered a problem, as a former student still could have 10 years of experience, so his or her statements were assumed trustworthy.

When conducting a survey it is very important to make sure that the questions are given in such a way that they cannot be misinterpreted (Floyd and Fower, 2009). To ensure that the questions in the survey were appropriate the survey was pretested among colleges.

In most of the questions, a 5 point Likert scale was applied. By using this scale the distance between the possible answers are equal. By having the same distance, it gives the possibility to calculate the average of the responses.

Some of the questions could not follow a Likert scale, i.e. the questions were more open. In the cases where questions could be answered openly, we tried to categorize the answers in groups of similar answers, in order to make statistics on the result.

2.2 Interviews

During the research of trust in the building industry two different interviews were made. Common for both of these interviews was the fact that they were conducted in a semi-structured manner, in order to make room for open dialogs. Both interviews were recorded and afterwards partly transcribed. Besides recording the interviews notes were taken, in order to make sure that all of the visual aspects (nodding etc.) of the interviews were captured.

3 Findings and Discussion

Before concluding anything from the survey approach, it is necessary to validate how well the sample size mirrors the population. The response rate of this survey is approximately 72 % with a dropout rate of 39 %. This is significantly higher than the typical response rate within the construction industry of only 20-55 %. (Wandahl, 2005) The variation in the respondents' years of working experience and professions such as contractor, client, architect, construction worker, consulting engineer and others is illustrated on figure 2 and table 1.

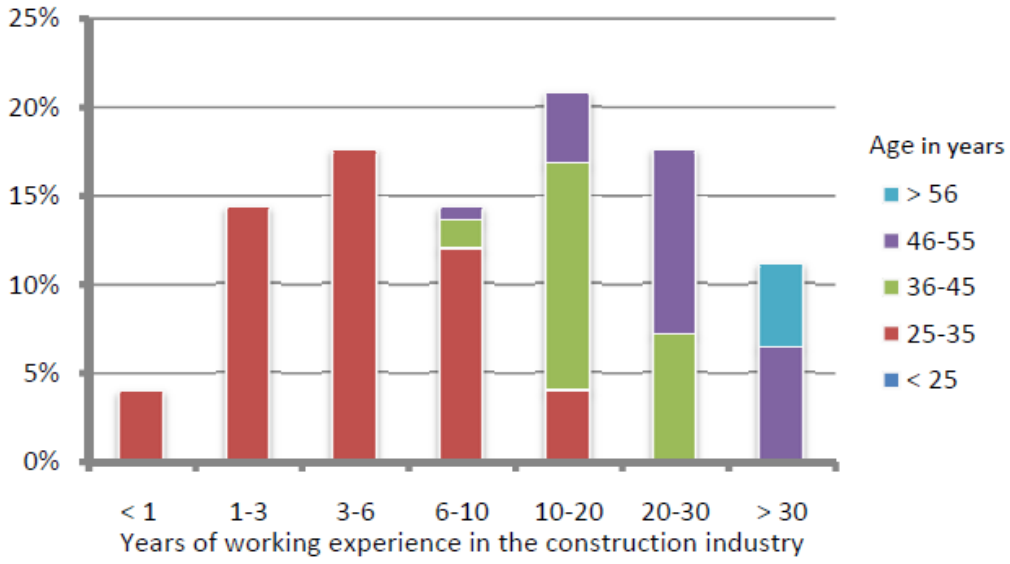


Figure 2. Respondents' age compared with their years of working experience in the construction industry. (Sample size 125)

The distribution among respondents' profession is not evenly distributed, cf. table 1.

Table 1. Professions of the respondents. (Sample size 125)

	Client	Consulting engineer	Architect	Contractor	Sub contractor	Other
Relative sample size	6%	31%	6%	34%	11%	12%

There is a lack of responses from clients and architects. This means that these have a substantially higher uncertainty than the remaining professions, so it may be inaccurate to base the industry's position on these results. However, it is shown that these two professions generally have a lower response rate (Wong *et al.*, 2008). Overall it is estimated, that the responses can be used to answer the issues earlier described.

The main purpose og the survey is to validate or invalidate the hypotheses and thereby identify some of the main reasons for the ineffectiveness in the construction industry indicated by the industry itself.

About 74 % of the respondents agreed or partly agreed with the statement that the working methods in the construction industry are difficult to change. Also about 74 %

agreed or partly agreed that the client in many projects emphasis the final product rather than the way to it, i.e. the construction process.

Generally the respondents describe the construction industry as not being innovative, but the companies in which the respondents work are however assessed to be innovative. Respondents also believe that they actively work to promote innovation in the companies.

Nearly every company in the construction industry is "*caught in the middle*" (Walters, 1999), if the definition of a core competence is used (Lynch, 2006; Johnson *et al.*, 2005). Many of the companies in the industry do not have a core competence which results in competition only on lowest price. The companies however know what they are good at, which is a step in the right direction.

In the Danish construction industry a traditional cooperation between client, contractor and consulting engineer is based on some common conditions (in Danish called: Almindelige Betingelser, AB92, ABR89, ABT93). The respondents are generally convinced that this kind of cooperation often creates issues concerning economics and responsibility that ultimately will decrease the value of the project. However, it is necessary for the parties in a construction project to insure themselves with contracts, rules and restrictions. The consequence of this is that open communications and honesty is uncommon (Cheung *et al.*, 2003).

The trust based cooperation type, partnering, is by the respondents assessed to be very functional and ensure the client most value for money, through budgetary and schedule compliance. The construction parties furthermore prefer greater openness in a construction project, because they assess that it will contribute higher earning possibilities for all parties involved.

The main reason for the ineffectiveness in the building industry, indicated by the industry itself, is the lack of trust. In table 2, some of the statements concerning how trust influence on the projects are listed.

Statement 1: A high amount of trust between parties in a construction project increases the value of the final product.

Statement 2: A high amount of trust between parties in a construction project provides overall a higher earning for all parties involved.

Statement 3: Increased openness between the parties promotes the company's ability to earn money.

Table 2. Answers to statement 1, 2, and 3.

option	Contention 1	Contention 2	Contention 3
Agree	66,9 %	40,7 %	34,7 %
Partly agree	27,1 %	41,6 %	39,0 %
Neutral	2,5 %	10,2 %	16,1 %
Partly disagree	0,0 %	0,8 %	3,4 %
Disagree	1,7 %	1,7 %	1,7 %
Don't know	1,7 %	5,1 %	5,1 %

Based on the survey it can be seen that the clients in a greater degree prefer alternative cooperation types rather than the traditional one's; typically based on the common conditions. This indicates that clients are starting to realize that the way to higher more value for fewer costs goes through selection criteria different than lowest cost.

4 Discussion

Before discussing how to create trust in the Danish construction industry, trust is defined. Also the trust index on national, construction and company level is described. The discussion leads to, what can be done, to ensure a more productive and trustful team effort concerning the construction period, all which should create more value for money.

There are three kinds of trust – concrete, general and institutional trust, where the general trust can be assigned to the construction industry. The general trust is defined as trust between two persons without any prior knowledge to each other. (Svendesen & Svendsen, 2006)

It can be argued that trust is a good indicator of social capital, and this term can be used to determine what trust is and what elements it consists of. Pierre Bourdieu (Svendesen & Svendsen, 2006) does not see any connection between social capital and trust and believes instead that social capital is the product of kinship relationships and other social networks. James S. Colemann (Svendesen & Svendsen, 2006) shares the same viewpoint on the networks but thinks that the social relationships are based on fundamental principles such as trust and respect. Robert D. Putnam (Svendesen & Svendsen, 2006) adds that common norms and values between people make the bond even stronger.

Trust can also be seen through game theory – *prisoners' dilemma* (Gintis, 2009; Fisher, 2009), where two prisoners are caught and asked to betray the other in order to go free or lower there sentence. In connection to this dilemma, the prisoners have to take into account whether or not they can trust each other. Torp and Lolle (2009) have described two kinds of trust:

- *Trust is linked to the expected behaviour of others, namely to how trustworthy we perceive them to be.*
- *Despite all differences you trust other people because you believe that others share your fundamental moral values.*

Doney *et al.* (1998) and Robinson (1996) gives another way to define trust:

- *Trust is the expectation of regular, honest, and cooperative behavior on commonly shared norms and values.*

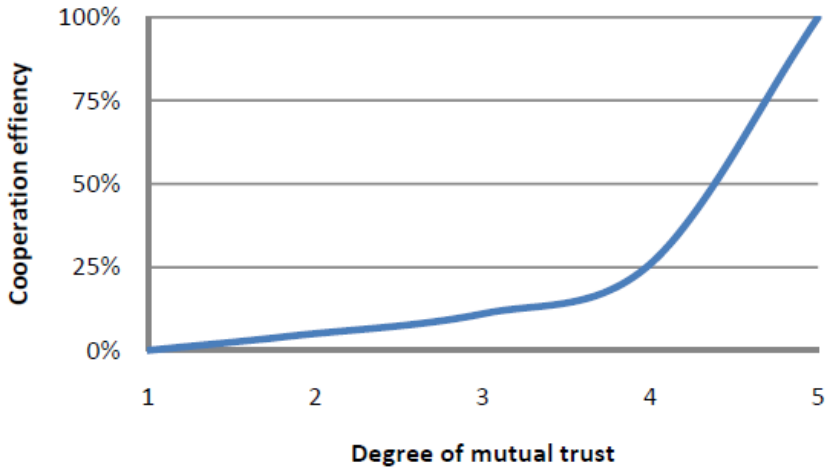
- *Trust it one's expectations, assumptions, or beliefs about the likelihood that another's future actions will be beneficial, favourable, or at least not detrimental to one's interests.*

This leads to this research's definition of trust concerning the Danish construction industry:

- *An expectation of others in a collaboration not to take advantage of others to cheat, because the norms say so, and that the most value is achieved through a trustworthy cooperation.*

4.1 Why is trust important?

Trust is important because it reduces the costs of control, optimizes the process and generally creates a more effective workflow. By increasing the general trust in a community with 10 % it has been shown to give a financial growth of 0,5 % (Svendsen & Svendesen, 2006). These savings can also be seen in the construction industry, where not only the costs of control are reduced but also the workflow becomes more effective with fewer flaws and errors. The link between trust and the cooperation efficiency can be seen on figure 3.



4.2

Figure 3. Link between trust and cooperation efficiency. (Olsen and Høgsted, 2006)

4.3 The creation of trust

To create and maintain trust certain elements are needed. Trust is created through long periods of trustful and unselfish acts, which can be conducted into following points (Høgsted, 2008):

- Open dialogs and exchange.
- Mutual understanding for other people's needs.
- Knowledge of others' values and conditions.
- Unselfish efforts to achieve common goals.

Olsen & Høgsted (2006) has made a hierarchy of needs that states some fundamental sets of elements that have to exist before trust between the parties can be achieved. Goodwill in the context can be seen as "Unselfish efforts to archive common goals." The hierarchy of needs can be seen in figure 4.

Figure 4. The hierarchy of needs. (Olsen and Høgsted, 2006)

In the following trust indexes on different levels of the community is described.

4.4 Trust in Denmark

In general Denmark is seen as one of the most trustful nations in the world and in the past years it has been in the top of many studies of trust. There is no particular reason why trust is so common in the Danish society, but Svendsen & Svendsen (2006) argues that it can be traced back to the co-operative movements (in Danish called andelsbevægelser) back in the 1900, where farmers organized in associations. These associations lead to a higher trust level where the organizations were founded on common set of norms, values and goals (economic, rights, politic). (Svendsen & Svandsen, 2006)

In Denmark we have a saying "a word is a word", which is a norm many people live by in their everyday life. Besides being the most trustful nation in the world, Denmark is also known as one of the happiest nations in the world. Whether happiness creates trust or trust creates happiness is unknown, but there seems to be a connection (Jespersen, 2008).

The situation is completely different in the construction industry where the cooperation normally is based on contracts, and where mutual trust is poor if even existing. The situation creates a conflict culture where the individual parties sub optimizes and only thinks in short terms when decisions are made. In the event of problems the parties are more interested in finding the guilty party instead of moving on and finding a solution to the problem. These standpoints have lead to an industry where there has been no increase in the effectiveness throughout the last decades.

On company level the culture is very trustful, which can be seen through open dialogs, an understanding of the needs of others, values and conditions and unselfish efforts to achieve common goals.

In the light of this paper it can be determined that the construction industry is surrounded by trust, why it must be possible to transfer some of the ideas, to increase the trust level in the Danish construction industry.

The construction industry must base their future cooperation on trust and honesty, and make use of the individual party's strengths, to insure the most optimal project.

Cooperation must be based on common norms, values and goals to insure that everyone is working in the same direction. In the following, two possible solutions are listed in order to increase teamwork and trust between parties.

5 Conclusion and Further Research

Today 2/3 of all partnering projects use incentives to create a better cooperation between parties. Therefore, this element is considered very useful in the creation and maintaining of better common trust. The incentive gives the different parties a common goal which makes them communicate and share knowledge. There are many ways on how to make an incentive, where the common goal is to move focus and ensure that elements important to the client are optimized. The incentive should work as an "eye-opener" for the joining parties, and make a "win-win situation" for all.

Another option is to make trust a competitive tool, where the individual parties are judged by their behaviour and get a grade on how trustworthy other parties consider them to be. This method causes the parties to act more trustworthy because their grade depends on it. The trust index can be included in the selection criteria's; where the client can select the most trustworthy partners.

Currently we have The Building Evaluation Centres key performance indicators. Their purpose is to make the selection process easier by giving companies grades on how well they meet certain expectations. The collection of key performance indicators is mandatory by law for state financed construction works, but can also be used by the private sector. The key performance indicators are measured by flaws and errors, accidents, time and money. An extra key performance indicator could be a trust index.

To measure trust the following questions has been constructed, where each question is being measured on its importance for the client, and afterwards a grade of how well the individual contractors has done on that particular point. These scales and grades are put together to make a key performance indicator on trust. The questions can be seen in table 3.

Table 3. Questions to determine the trust index.

Questions	Importance (1-5)	Grade (1-5)
Professional and contract based qualifications cooperation's		
The project is based on openness.		
Open dialogs and sharing of knowledge.		
Mutual goals, where other person's needs and values are considered.		
Display of goodwill and unselfish behaviour to reach mutual goals.		
Honesty concerning problems in your own subcontract.		
Maintaining a good cooperation between the individual parties.		
Optimizing meetings with contractors.		
Equivalence between the different parties.		
Overcoming occurring problems and conflicts.		
Follow agreements.		
Incur own errors.		

In both Danish and European tendering legislation it is possible to use all kind of selection criteria, if the criteria are measurable and unambiguous (Ussing, 2008). The establishment of a key performance indicator on trust makes it possible to select collaborators based on their level of trustworthiness. This leads to the main message of this paper:

Make as a client demands to your collaborative partners' trustworthiness because it helps to promote economic growth and better cooperation, and through this let trust become a competitive factor. Make as a client requirement for documentation of trust and weight this equally with economy.

The summary should then followed by flagging potential of further research emerging from the investigation. For ongoing research this may include the next stages of the research that will be conducted by the researcher to complete the research, whilst for completed research this may include emerging new possibilities revealed during the course of the research and/or potential for expansion based on the scope and limitation of the research set earlier.

5.1 Further research

This paper is a vertical analysis on the topic of trust, in the sense that the paper concerns a national, construction and company level. As a further research it would be appropriate to undertake a horizontal analysis, and hereby meaning, investigating what differences there are between the trusts in the construction industry compared to other industries in Denmark. By doing this, it will be possible to determine, whether the construction industry is unique when it comes to lack of trust.

Further research could be to compare the trust in different industries with the level of trust in other countries. By doing so it is possible to determine if the level of trust on a national level has any influence on trust in different industries.

6 Acknowledgement

This paper has been carried out in collaboration with Henrik Jensen, Joe Jim Jensen and Birgitte Krag Festersen, during their final thesis for M.Sc. in engineering with specialisation in construction management.

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The Role of Knowledge Sharing in Company Learning within Small and Micro Construction Consultancy Companies in Ireland

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Abstract:
The construction consultancy sector of the Irish construction industry is made up predominately of micro; less than 10 employees, and small, less than 50 employees, companies these small and micro companies (SMC's) have specific management and development issues associated with them. For SMC's to remain competitive the generation and exchange of specialist knowledge in these fields is vital.

The aim of this research is to investigate the issues of Knowledge Sharing's role in company learning within a construction consultancy based SMC's in Ireland. The areas focused on in this research are:

Are there specific issues relevant to Small and Micro companies in the context of Knowledge Sharing?

What are the circumstances that should prevail to allow people to share knowledge?

What are effective methods of facilitating company learning and how can they be developed?

Using a hybrid research methodology the research tools of questionnaires and semi structured interviews, have been applied. The application of these tools will allow the accumulation and analysis of the primary data to support the discussions. Research completed to date points to lower levels of company support for company learning and knowledge sharing techniques.

The results indicate some strong cultural supports towards knowledge sharing are already in place in companies but and increased application of collaborative techniques to enhance company learning are required.

Ultimately the presentation of a company learning strategy to assist companies in implementing the process of knowledge sharing (KS) and company learning will be developed. The broad application of this company learning strategy among SMC's

would assist company learning to become a natural and integrated process supporting their day to day work.

Keywords:
company learning, knowledge sharing, Ireland

1 Introduction

Knowledge is the prime source of competitive advantage among small and micro construction consultancy companies in Ireland today. Professional skill and ability, technical efficiency and client centred service are all accepted as standard minimum requirements. Professional training or Mode 1 knowledge (Gibbons et al., 1994) is homogenised through college degrees and professional bodies training requirements. The one area were companies actively compete is in knowledge; their knowledge of the economy, the industry, the regulations, the client pool etc. How efficiently a company can marshal its staff knowledge and its company knowledge will be the key detriment on its survival in the industry.

Unlike other assets knowledge and knowledge sharing skills cannot simply be bought like another computer, printer, or hired as another staff member. A KS environment must be gradually developed and "grown" within a company (Ringer, 2007). This is achieved through the right culture and facilities occurring within a company (Payne and Sheehan, 2004). This research is focused on the role of KS within company learning of a company. It focuses on Mode 2 - knowledge from application (Gibbons et al., 1994) or tacit knowledge. The focus group of companies are small and micro construction consultancy companied within Ireland. This group was selected because of a striking lack of research undertaken on this particular sector of the industry. KS is a vast area of research with substantial literature support in the form of books, journals, web sites, conferences etc. (Nonaka and Takeuchi, 1995). The areas of KS that are focused on in this research are:

Are there specific issues relevant to Small and Micro companies in the context of Knowledge Sharing?

What are the circumstances that should prevail to allow people to share knowledge?

What are effective methods of facilitating company learning and how can they be developed?

Knowledge is a significant resource to companies but one that poses many difficulties in its management. Key to the difficulties is the effort required to maintain the maximum benefit or integrity of the knowledge once it is shared and distributed. Thus there are many strategies that can be formulated to leverage knowledge from staff into the wider company for improved performance. KS strategies will vary from country to country, from industry to industry and from organisation to organisation. Thus more needs to be understood about the specific issues effecting KS in small and micro construction consultancy companies (SMCCC) in Ireland.

The research conducted in this study is informed by the actual practices that exist in the area of KS in SMC in the Irish construction consultancy sector. It will allow companies to appreciate the areas they are progressing well in and to identify areas where greater potential for exploiting company learning exists.

Professional practice tends to be very much focused in the "now", it is a thread that is repeated in the interviews on a number of occasions that staff and managers are focused on completing the job in hand and far less time is spent on the strategic development of the company. Academic research can assist companies in proposing potential future strategic paths for the company to pursue.

2 Knowledge Sharing within SMC's

In a company for KS to be seen as important the company's management need to focus on it. This can be achieved by assigning staff or responsibility for its instigation. For KS to be developed and expanded assigned staff or responsibility is required, here the role of knowledge managers are important. The tasks for knowledge managers are typically to control and filter knowledge to ensure their staffs has the appropriate knowledge infrastructure to compete the work required of them. Company managers should work out new roles, the role of knowledge manager that determine new skills for knowledge coordination and create a culture that allows staff to identify themselves within the company and to share knowledge for a common gain or competitive advantage. Staff's prestige or status within a company should derive more from sharing useful knowledge within the company than from owning it.

In Large organisations it is often easier for companies to have specialised staff for IT, KS, etc but within SMC's all staff tend to be involved in the direct service the company provided and there is very little scope for having specialised staff available. Thus for KS to develop in a company all staff need to have an appreciation for its benefits and how they can play a proactive role in KS development within their company.

KS provides the link between the individual staff member and the company. This attempts to transfer the knowledge residing in the staff member to the company level. KS is a dynamic process affected by factors that exist at company, team and individual level (Davenport and Prusak, 1998)(Davenport and Prusak, 1998)(Davenport and Prusak, 1998). (Bollinger and Smith, 2001) believe that if a supportive organisational culture and top management support are not in place, there will be little incentive for staff to share knowledge. (Bandura, 1986) corroborates this assertion, stating staff may decide not to demonstrate particular behaviour's if they believe it will not improve their status within the company. (Robinson et al., 2001) concludes that a lack of top management support can hamper the success of a KS strategy this view is also supported by (Al-Ghassani et al., 2002). Leadership from senior management in KS will help motivate others to get involved in KS. A supportive senior management to KS will encompass company motivation, proactive culture and mutual staff trust. These methods are also supported in (Egbu et al., 2010) research on KS critical success factors.

2.1 Culture

Culture reflects the deep foundations that a company is based on, its values, beliefs, history and traditions (Robinson et al., 2005). One cultural aspect which is crucial for KS is collaboration. This is because KS requires individuals to come together to interact and exchange ideas. How attitude to KS is developing within the company and extrinsically to the company within the broader industry is important. Because knowledge is often seen as a source of power, individuals may naturally tend to be reluctant to share it (Kim and Mauborgne, 1998). A number of researchers also identify the cultural barriers that exist and can hinder the implementation of a successful KS

strategy and learning approaches. A study carried out by (Peng and Akutsu, 2001) showed that cultural factors can have an impact on the knowledge transfer process. (Wyer et al., 2000) outlined some issues, which may constrain change in company culture; the commitment of top managers, top managers may constrain the progress by being reluctant to have open management approaches and empowering staff. (Hamlin et al., 2001) six-step model for the successful implementation of change management presents a comprehensive solution. A key driver in the implementation of change is that ownership, commitment and involvement to the new strategy must be secured throughout the company, including that of top-management.

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2.2 Motivation

Personal motivation to share the knowledge one possess must be understood so that a company can develop structures to encourage staff KS. Staff may think that possessing valuable or unique knowledge allows them to retain a competitive advantage over other staff (Bock and Kim, 2002). KS will be more likely if individuals are rewarded for this (Newell et al., 2002). For successful KS to develop a grass root desire must exist so employees contribute to and benefit from their company's intellectual resources (Hauschild et al., 2001). In order to build a knowledge-based enterprise, incentive systems should be focused on criteria such as KS and contribution, teamwork, creativity and innovative solutions (Wong, 2005). KS will be more likely if individuals are rewarded (Newell et al., 2002). Staff motivation goes hand in hand with staffs trust with each other and with the company.

2.3 Trust

Unless there is a high degree of trust within companies, people will be sceptical about the intentions and behaviours of others and thus, they may withhold their knowledge. Building a relationship of trust within a company will help to facilitate a more proactive and open KS process (Wong, 2005). Thus a culture of collaboration and trust will go hand in hand. The restructuring and downsizing of companies breaks the idea of lifetime employment and replaces it with a strong element of precariousness in the employment relationship (which adversely) impacts the level of trust in organisations (Sharkie, 2005). In Sharkie's research he put forward 6 factors that affect the level of trust an employee has in their company. They included

the worker's employment security with the organisation,

the employer's improving an individual's employability,

enlightened management,

perception of fairness,

supportive environment, and

rewards for work done.

If most or all of these factors exist in a company it is more likely that KS will occur. (Hendriks, 1999) and (Ardichvili et al., 2003) concurred that no matter how motivated staff are, they do not share knowledge with those they do not trust. (Levin and Cross, 2004) found that the level of trust affects not only the sharers but the seekers of knowledge too. (Andrews and Delahay, 2000) take the research further and claim that when there is trust between individuals, they are more likely to take note of and receive knowledge in addition to providing worthwhile knowledge in return.

2.4 Senior Management

Various researches have been conducted in this field using a variety of terms including small business owners, business leaders, entrepreneurs or business managers. For the purpose of this research the term senior management will be used to address these areas. For small businesses to succeed, it is important to understanding the effective behaviour's senior management has on their staff and the company. (Robinson et al., 2001) concludes that a lack of top management support can hamper the success of a KS strategy this view is supported by (Al-Ghassani et al., 2002) and (Robinson et al., 2005). (Carrillo et al., 2000) identify the need for leadership in KS which will help motivate others to get involved. Culture, trust, motivation and management style are all recognised as issues that impact on KS and by extension company learning (Arif et al., 2010) and (Egbu et al., 2010) work have also identified these areas. By senior management having an adaptive role they can adjust to their environment, learn from experience, and as a result, change their behaviour (Marcketti and Kozar, 2007). Senior managements leading role is necessary in order for businesses both large and small to be competitive in the modern economy. Managing knowledge is a critical capability for SMC's to master because it helps them leverage the key resources of staff knowledge and experience (Desouza and Awazu, 2006). An emphasis on forming meaningful relationships with staff has become increasingly more significant as senior management attempt to enhance both staff effectiveness and company performance. Besides, using knowledge directly, senior management must also transfer knowledge to staff. Seldom, do SMCCCs have the capabilities to recruit the best minds in the business; hence they must settle for less qualified but motivated individuals.

2.5 Facilitating Company Learning

It is understood that the capacity for thinking together in teams or as a company is different from individual intelligence. The main purpose of thinking together in a company is to enable coordinated action that contributes towards the company's strategic plan. Society value intelligent individuals but seem to lack ways of understanding and working with thinking in the team-as-a-whole. The size and complexity of professional skills required in SMC means that the knowledge required to run an effective enterprise is too great to be held in one brain. Hence, effective business leadership and management require the pooling of knowledge and "thinking skills" from a number of different staff members. Effective collaborative thinking is the "engine room" for the modern "knowledge organisation", and the "learning organisation" (Ringer, 2007).

Ringer's research centred on team interaction, in relation to the SMCCC's which are the focus of this research many of the companies contain only 3-5 staff members and this function very much as teams. Through Ringer's research a number of indicators were identified when poor quality company thinking was present. A number that are relevant to and furthered in this research are summarised as follows;

The atmosphere of a team does not feel safe for most participants to think and speak freely. Hence, individual thinking may be strong, but collective thinking is impaired because the thoughts of any one team member are not spoken and hence made available as stimulus for further thinking of other team members.

Teams type of thinking - convergent thinking is required for decision making. but divergent thinking is required when a team is seeking to be creative in the search for more options. Teams seldom specify what kind of thinking they need to be conducting. This lack of clarity can lead to confusion and low quality collective thinking.

Senior managers usually underestimate the psychological and emotional power of what they themselves say and do. In general, their every move is noticed by staff and these "data" have a powerful influence on "how we do things around here" – i.e. team or company culture

2.6 Company Learning

As knowledge is held by individuals it is the basis of company learning, The sharing of this knowledge among multiple individuals with different backgrounds, perspectives, and motivations becomes the critical step for organisational learning to take place (Balasubramanian, 1995). The lack of company learning is often crystallised for a company when a staff member is leaving .The experience and insight of a departing staff member is lost to the company if it has not converted that person's knowledge into explicit form, and integrated it into the company so that it is ready for use. (Tserng and Lin, 2004) and (Kamara et al., 2005) agree with this point stating that when an expert or professional leaves a company the library of knowledge and experience gained by them also goes leaving little or nothing behind of benefit to the company. Companies learn haphazardly from experience and rarely capture it in ways that can be transformed into available knowledge embedded in the company memory (Huber, 1996). (Fiol and Lyles, 1985) show that company learning is multi-level, occurring at the individual, group and company levels.

2.7 Communities of Practice

Etienne Wenger (Wenger, 2001) is considered one of the foremost experts on CoP. He stated that CoP are a specific kind of community. They are focused on a particular area of knowledge or expertise and over time accumulate knowledge and build community knowledge. They develop their shared experience by interacting around questions, problems, solutions, and insights gained. They build a common store of knowledge and their community is based on the practice of that knowledge. CoP is governed by internal, informal, and unspoken rules dominated by specialised language development. If we accept that the role of CoP's in the business environment is to share knowledge and improve the way the company does business, and that they are community workplaces where people can share ideas, mentor each other, and tap into interests, each CoP can be a focus of learning and competence for the company. Company culture seems to play a significant part in communities and how they operate. The members of a community need to trust each other and the company before they are willing to share their experience and understanding. Convincing staff to develop or participate in CoP requires on-going commitment from senior management to permit communities to self-organise and collaborate as they see fit with suitable encouragement and support. Successful communities maintain a clear purpose and active leadership. CoP's should support innovation and staff creativity through collaboration and collective solutions.

3 Research Methodology

Because of the nature of trying to study practical KS in companies' cognisance needs to be taken of the complex and interdependent nature of the company issues, staff mix, work pressures and practices that exist. From reviewing research philosophies the most applicable was the Ontological and Epistemological perspective this tended towards the constructivist end of ontology and the interpretivist's end of epistemology. This philosophical stance resulted in the adoption of inductive reasoning being applied to the research approach and the selection, design and development of the research tool, questionnaires, to be applied which in turn impacted on the nature of data collection.

Quantitative research strategy will support deductive reasoning and the positivist range of the epistemologists' philosophy. Qualitative data collected is soft data designed to develop an in-depth understanding and explanation for people's behaviour, motivations and attitudes. (Naoum, 2006). The questionnaires structure used included opinion statements and a range of responses based on an adapted Likert scale. This research strategy will support inductive reasoning and the interpertivists range of the epistemologists philosophy. The literature review helped to gain a better understanding of existing theory, practice and current development on the area of research. Through the review specific research questions emerged that provided the basis for the development of a suitable research aim and research objectives. (Saunders et al., 2002) the data collection tool chosen was questionnaires and the designing stage consisted of initial design, redesign as necessary, pilot survey, feedback, final design, approval and issue. Altogether 71 questionnaires have been returned. The questionnaires were distributed to a cross-section of SMCCC's in Ireland.

4 Findings and Analysis

Despite the SMCCC offering different skills and services their basic structure and focus is similar. All work within the same industry, all are small or micro companies all have a high dependency of staff skills to fulfill their professional services and all work in hierarchal team structure.

The following tables 1 through to and including table 4 address the methods used by companies to facilitate company learning. The object of focusing in on these areas is to gain an understanding as to how companies are dealing with the difficulties of encouraging and maintaining company learning.

Table 1.Staff Motivation

How would you describe staff motivation to share new knowledge with:					
Adapted Likert Scale	**Teams**	**Senior staff**	**Other staff members**	**Management**	**Administration staff**
Poor	2.82%	4.23%	4.23%	0.00%	12.68%
Fair	15.49%	14.08%	9.86%	5.63%	23.94%
Neutral	18.31%	16.90%	26.76%	26.76%	32.39%
Good	53.52%	52.11%	47.89%	52.11%	21.13%
Very Good	9.86%	12.68%	11.27%	14.08%	8.45%

In relation to staff sharing new knowledge in table 1 we are seeing good levels being recorded in most areas. Administrative staff is the only area where these is lower levels of knowledge sharing taking place.

Discussion

Numerous bodies of research have highlighted the importance of strong positive motivation levels existing among staff to facilitate KS. It is encouraging that levels are so strong in this area as research has also shown it is difficult to develop positive motivation among staff that are resistant to sharing knowledge.

Table 2.Senior management involvement

	Are Senior Management Involved in:			
Adapted Likert Scale	**Identifying knowledge sources**	**Contributing to company knowledge**	**Reviewing and distributing new knowledge**	**Resolving problems encountered**
To no extent	4.23%	2.82%	7.04%	5.63%
To little extent	26.76%	14.08%	18.31%	7.04%
To some extent	46.48%	42.25%	43.66%	33.80%
To large extent	19.72%	39.44%	26.76%	52.11%

Table 2 highlights a reasonable level of senior management involvement in identifying, contributing to and distributing new knowledge. However the highest involvement is in resolving problems encountered.

Discussion

The research of the literature on numerous authors has shown that involvement and leadership by senior management is vital to the success of KS in a company. It is the senior management of a company that set the standards and targets that staff members need to attain. Table 2 shows the highest level of senior management involvement is with problem solving. This by its nature is a reactive type of management rather than a more proactive method which would see greater involvement in knowledge identification and contributing to company knowledge. Senior management's lower levels of involvement in these proactive areas of KS would appear that there is no real driving force behind KS in the majority of SMCCC in Ireland.

Table 3.Sharing Knowledge Attitudes

	Opinion Statements			
Adapted Likert Scale	**The company applies knowledge learned from experience to new projects**	**Staff withhold their valuable information in order to retain an advantage over other staff**	**I would require an incentive from management to share valuable knowledge with other staff**	**Sharing knowledge will allow a company to develop**
Disagree	2.82%	36.62%	40.85%	0.00%
Partly Disagree	4.23%	29.58%	28.17%	0.00%
Neutral	2.82%	14.08%	16.90%	5.63%

Agree	63.38%	19.72%	14.08%	25.35%
Strongly Agree	26.76%	0.00%	0.00%	69.01%

The opinion or attitudinal statements used in table 3 sought to look at company issues and their impact on KS. There is very strong feeling that application of knowledge learned is applied to new projects. Equally strong is the denial that staff would withhold their knowledge in order to gain an advantage. Very few staff members would require an incentive to share valuable knowledge with others and there is a strong belief among staff members that sharing knowledge will allow a company to develop.

Discussion

The outcome of each of the statements in table 3 is supportive of strong company learning and meaningful KS. Looking in conjunction with table 1 staff are motivated enough to share their knowledge and the vast majority do not require an incentive from management. Equally there is a strong belief that sharing knowledge is good for a company and will help it to develop and that few staff would knowingly refrain from sharing useful knowledge with another staff member.

Table 4.Methods of Company Learning

	Does the company support any of the following methods of company learning:					
Adapted Likert Scale	**Personal research**	**Internal work exchange**	**Communities of practice**	**Internal training**	**External training courses**	**Continuing Professional Development**
To no extent	7.04%	26.76%	28.17%	5.63%	18.31%	7.04%
To little extent	39.44%	19.72%	35.21%	9.86%	21.13%	15.49%
To some extent	33.80%	38.03%	25.35%	40.85%	39.44%	29.58%
To large extent	15.49%	9.86%	2.82%	38.03%	15.49%	42.25%

Table 4 suggested numerous examples of methods used to promote company learning. These methods are based on literature and research focusing on methods of companying learning. All methods how some level of engagement by companies with CPD and internal training being the most utilised and internal work exchange and CoP the least used areas.

Discussion

Each of the areas noted in table 4 can have benefits for company learning as each involve the potential for both personal and company learning development. There is engagement at some level with each of the methods put forward but the area of CoP is not engaged in to any significant extent. This is a disappointing situation as much of the literature on KS points to the benefits of having active CoP integrated into a company and how they can assist in the advancement of KS. Added to this is the difficulty of trying to initiate the development of CoP as by their nature they are outside the normal management structure of a company and when the culture is supportive they will develop through staff initiative.

5 Conclusion and Further Research

A number of the questions posed at the outset of this research have now been answered:

Are there specific issues relevant to Small and Micro companies in the context of Knowledge Sharing? - In SMC's continual monitoring and checking of KS behaviour can be counterproductive. The development of cultural norms to promote sharing is preferred. This is supported by the research on SMC's and on communities of practice (CoP).

What are the circumstances that should prevail to allow people to share knowledge? – A strong culture of sharing and co-operation needs to be developed based on good levels of staff motivation and trust and strong senior management support.

What are effective methods of facilitating company learning and how can they be developed? – Company learning is a combination of individual staff development and team or company learning. Methods set out in table 4 suggest a number of methods of both individual learning and company learning.

For KS to become integrated into the majority of SMCCC in Ireland there needs to be engagement in a number of areas which are interdependent. All areas need to be developed in tangent so that a synergy will evolve and the benefits gained in one area will support the development of another area.

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Who gets the jobs? Factors influencing the employability of property and construction graduates in the UK

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Abstract:
Against a background of a strongly performing property market, the last decade saw a significant rise in entrants to postgraduate built environment programmes in the UK. This reflected the emergence of conversion programmes with the result that, across a range of built environment pathways, employers can choose between two types of graduates: those straight from an undergraduate programme or those who have taken, following a first degree in another discipline, a conversion course in property or construction at postgraduate level. Based on a sample of 12,582 graduates from the HESA Destination of Leavers dataset for 2005/06 to 2008/09, this paper uses probit analysis to explore if there is evidence that the level of degree programme that a student graduates from (undergraduate or postgraduate) systematically affects their probability of finding graduate level employment. It considers different built environment subjects and a range of other factors that may influence employment outcomes, including university type, mode of study, gender, ethnicity and age. The approach adopted allows for the fact that similar characteristics may affect both the probability of undertaking a taught postgraduate course and that of obtaining graduate level employment. Results suggest that postgraduate degrees in land and property management are positively associated with graduate level employment, but this is not so in the areas of quantity surveying or building surveying. The paper concludes by relating findings to the wider discussion on changes in UK Higher Education.

Keywords:
bivariate probit, construction, conversion courses, graduate employment, real estate

1 Introduction

A major development in the education of students for property and construction professions has been the creation of postgraduate conversion programmes. These enable graduates in other subjects to obtain, in a relatively short time, core knowledge and skills required for employment in these disciplines and for the subsequent workplace training needed to gain membership of a professional body. Such conversion degrees have proved very popular, attracting UK and overseas students, and have increased the supply of graduates, which had been in steady decline throughout the 1990s. Thus, employers can now choose between two types of graduates: those straight from an undergraduate programme or those who have taken a conversion course following a first degree in something else (and, possibly, an intervening period of employment).

Yet whilst this development is well known, there is little evidence on the employment outcomes experienced by each group of graduates. Anecdotal evidence suggests that graduates from conversion programmes are popular with employers and, in some cases, preferred to students from undergraduate programmes. However, it is important to explore whether or not this is so because of the implications it could have for future programme provision and wider education policy, particularly in the context of recent changes in Higher Education funding, the increase in undergraduate fees in England and Wales, and the debate about access to the professions (Department for Business, Innovation and Skills, 2011). Hence, this paper analyses the employment of each group within a quantitative framework using data from the Higher Education Statistics Agency (HESA). By employing probit modelling techniques, it finds that postgraduate degrees do provide an advantage for securing graduate level employment in some, but not all, built environment disciplines.

The paper is structured as follows. Section 2 sets the rise of taught postgraduate courses in property and construction in the context of the general rise in postgraduate education in the UK in recent years. It also notes some existing knowledge regarding employment outcomes before proceeding, in section 3, to describe in more detail the methods used to test such outcomes. Section 3 also outlines the data that is used before section 4 presents results. Section 5 concludes by discussing the implications of the research findings.

2 Background Literature

Postgraduate education in the UK has grown markedly over the last fifteen years. Between 1997/98 and 2008/09, the number of enrolled postgraduates rose by 36% compared with a 27% rise in the undergraduate population (Smith *et al*., 2010). Particularly important has been the growth of taught masters programmes in this period, with their growth driven by international student enrolments, especially students from outside the EU (Sastry, 2004; House, 2010). Built environment subjects are amongst those that have shared in this growth, although with a greater emphasis on expanding part time provision than some other areas (Sastry, 2004; Boorman & Ramsden, 2009).

Taught masters programmes can take various forms, but it is possible to distinguish those that extend knowledge in a particular discipline from those that enable conversion to a discipline by non-cognate degree holders. In property and construction, examples of both can be found, but there has been notable growth in conversion programmes in recent years. This development occurred in the wake of falling undergraduate numbers for these subjects through the 1990s at a time when overall numbers in higher education were increasing (Dainty & Edwards, 2003; Wilkinson & Hoxley, 2005). For surveying, the creation of postgraduate conversion programmes was encouraged as part of RICS educational reforms, announced in 1999, which aimed to increase the number of high quality graduates entering property and construction professions.

The growth in student numbers on RICS courses since then has been well documented (e.g. Hoxley & Wilkinson, 2006; Key, 2010). Figures for new enrolments updated to 2008/09 are shown in Table 1. Undergraduate numbers have rebounded from a low point in 2002/03, whilst postgraduate numbers have increased dramatically from less than 500 such entrants in 2001/02 to over 5,000 by 2008/09. The latter trend now means that postgraduates make up the majority of entrants to RICS accredited programmes. Key (2010) notes a similar dominance in the number of programmes in the UK, with 183 RICS accredited postgraduate programmes in 2007 vs. 124 at undergraduate level.

Table 1. Number of entrants to RICS accredited programmes in the UK – 2000/01 to 2008/09

	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9
Undergraduate	2,949	2,572	2,554	2,688	3,064	3,660	3,727	4,031	4,258
Postgraduate	419	1,363	1,805	2,354	2,917	3,609	4,697	4,716	5,331
TOTAL	3,368	3,935	4,359	5,042	5,981	7,269	8,424	8,747	9,589
% Postgraduate	12%	35%	41%	47%	49%	50%	56%	54%	56%

Source: RICS Education and Qualification Standards

The rising proportion of graduates from conversion programmes is likely to have had an influence on the labour market for the property and construction professions. The popularity of postgraduate students with employers has been highlighted by Ashworth (2007), whilst Hoxley & Wilkinson (2006) note a positive response from employers in building surveying. This is tempered by concerns over the reduced time in conversion programmes for the delivery of technical knowledge (Birch *et al*., 2005; Hoxley & Wilkinson, 2006). Nonetheless, these studies and press articles (e.g. Benyon, 1999) highlight a range of positive attributes that employers associate with postgraduates, such as maturity, motivation, wider experience and awareness, an ability to learn quickly and strong intellectual skills.

It should be noted, though, that much of the evidence on employment outcomes to date is anecdotal. In part, this reflects that there is limited data on whether the trends and qualities noted above translate into different outcomes for postgraduates in terms of employment. Research at the all subject level by HESA (2009) and House (2010) shows that postgraduates are more likely to be in full time paid work, more likely to be in managerial, professional or technical occupations and less likely to be unemployed at both 6 months and 3.5 years after graduation. In addition, there is a salary premium for postgraduates relative to holders of a first degree only. These advantages persist when analysis is split by mode of study (full or part time) and, as House (2010) notes, reflect not only the higher qualification level, but also the greater age and experience within postgraduate cohorts.

However, there are many other factors beyond qualification level that may be important for labour market outcomes in the property and construction professions and that have not been controlled for in previously published statistics. Furthermore, there are differences between built environment disciplines in the nature of their postgraduate programmes and there may be distinctive employer preferences with regard to level and mode of study (e.g. see Westcott & Burnside, 2006). Thus, whilst one might expect better outcomes for postgraduates given the greater investment by these students in their education, doubts about conversion programmes might be reflected in terms of little advantage for postgraduates in the job market. It is these issues that the analysis in this paper seeks to explore further using individual level HESA data that covers graduates from real estate and construction related degrees.

3 Methods

3.1 Modelling approach

The modelling approach adopted in this paper is based on the proposition that the probability of a graduate gaining graduate-level (as opposed to non-graduate level) employment is a function of the type of qualification they hold. In particular, the key

research question is whether students graduating from a taught postgraduate programme have a higher probability of gaining graduate-level employment than those from an undergraduate degree programme after controlling for other individual characteristics and macroeconomic conditions that may influence employability.

Based on this, a standard univariate probit model of the effect of a postgraduate qualification on graduate employment is given as

$$G_i^* = \beta_1 X_i + \beta_2 W_i + \delta PGT_i + \varepsilon_{1i} \quad (1)$$

where G_i^* is a latent variable denoting the probability of getting graduate level employment, X_i are personal characteristics affecting that probability, W_i are labour market factors and PGT_i indicates whether or not the individual holds a taught postgraduate qualification. In this model, ε_{1i} is taken as a normally distributed error term with a mean of zero and a variance of one that captures all of the unobserved determinants of the probability of gaining graduate-level employment.

The determinants of a having a PGT qualification could also be estimated using a univariate probit model as follows:

$$PGT_i^* = \beta_1 X_i + \beta_2 W_i + v_{1i} \quad (2)$$

where PGT_i^* is a latent variable denoting the probability of having a postgraduate degree and X_i and W_i are as defined above. v_{1i} is also taken as a normally distributed error term with mean zero and variance one, in this case capturing the unobserved determinants of the probability of having a postgraduate taught qualification.

If there is an overlap between the unobserved characteristics that determine the probability of getting a graduate-level job and the probability of having a post-graduate taught qualification, a univariate modelling approach such as that represented by equation (1) will produce biased results (Greene, 2000). In particular, the unobserved heterogeneity could result in ε_{1i} from equation (1) being correlated with the variables that explain PGT qualification. This in turn means that the PGT variable is not exogenous to G_i^* resulting in a biased coefficient on this variable.

Correcting for this endogeneity could be done using an instrumental variable (IV) approach, but there are potential shortcomings of this approach (see Greene 1998, 2000). Instead, the approach adopted in this paper follows that suggested by Greene (1998) and the following simultaneous recursive bivariate probit model was estimated:

$$G_i^* = \beta_1 X_i + \beta_2 Z_i + \beta_3 W_i + \delta PGT_i + \varepsilon_{1i} \quad (3)$$

$$PGT_i^* = \beta_1 X_i + \beta_2 W_i + v_{1i} \quad (4)$$

The error terms ε_{1i} and v_{1i} are jointly distributed as bivariate normal with means of zero, variance of one and correlation ρ. Z_i are factors that explain the probability of getting one of the endogenous variables (graduate level employment), but not the probability of having a PGT qualification. A key test for the bivariate model is whether the null hypothesis ($\rho = 0$) is rejected. Failure to reject this hypothesis means that the univariate probit model has consistent estimators. If ρ is found to be significantly different from zero and positive, then some of the unobserved factors increase both the probability of gaining graduate level employment and having a postgraduate degree and

this would lead to an overestimation of the importance of PGT qualification on graduate employment in a univariate model. Alternatively, if ρ is significantly different from zero and negative, then the estimated effect of PGT qualification on graduate employment from a univariate model would be underestimated. The variables that comprise vectors *X*, *Z* and *W* are explained below.

3.2 Data and model variables

Analysis is based on a sample of 12,582 graduates from built environment programmes included in the HESA Destination of Leavers from Higher Education (DLHE) dataset 2005/06 to 2008/09. Students are surveyed between 4 and 12 months after graduation depending on their graduation date.

A key issue given the research question is the definition of graduate level employment. A number of previous studies have used a classification developed by Elias & Purcell (2004) and which is applied here using the 3-digit Standard Occupational Classification (SOC) codes included in the HESA dataset. Table 2 shows the distribution of responses across the two binary dependent variables for all property and construction graduates in the sample. The 1,643 leavers not employed, but in "other activity" (including those undertaking further full time study and those assumed unemployed) are excluded from the graduate employability analyses.

Table 2. Employment type by qualification level

	Type of employment			
	Non-graduate level	Graduate level	Other activity	Total
First degree	1,081	7,104	1,401	9,586
Taught postgraduate degree	327	2,427	242	2,996
Total	1,408	9,531	1,643	12,582

The HESA data contains a wide range of variables. Gender, ethnicity and age group variables are included in both bivariate probit equations as previous research suggests that these influence both the probability of gaining graduate level employment and of undertaking further postgraduate study (Artess *et al*., 2008). Similarly, mode of study is included in both equations since part time study may be more strongly associated with a postgraduate route and may have a positive effect on getting graduate level employment following graduation. Meanwhile, during the four years covered by the data (2005/06 to 2008/09), the macro economy (and property market) moved from a period of economic boom to recession. It was felt that such major changes would affect not only the chances of a graduate gaining employment but also the probability of them enrolling on a postgraduate programme. Hence, year dummies are used in both model equations to represent market conditions.

There are two types of variables which are included in only the graduate employability model (represented by Z_{it} in equation (3) above). University type is included on the understanding that employers may have preferences for graduates from certain types of institutions, but that this does not influence the probability of having a PGT qualification. In particular the 209 institutions included in the DLHE dataset were grouped into two broad categories: "old universities" (including Oxbridge, Russell group, 1994 group and other old universities) and "new universities" (comprising post 92 universities and FE or HE colleges with degree-level programmes).

In terms of type of qualification, it was possible, for first degree graduates, to distinguish those leavers with good (first class or higher upper second class degrees) from those with less strong academic performance (lower second class or third/unclassified). Students graduating from either a postgraduate research degree or an "Other undergraduate" programme were dropped from the analysis on the basis that they are unlikely to be competing for the same employment opportunities.

Finally, to capture differences across built environment subjects, the JACS 4 digit subject variable was used to distinguish four categories of programmes: construction, building surveying, quantity surveying, and land and property management. Means and standard deviations of the explanatory variables by each of the four subject areas are shown in Table 3.

Table 3: Proportion of each characteristic by built environment subject area

Observations	Construction n=6316	Building surveying n=2175	Quantity surveying n=2198	Land & property management n=1893
Female	0.168	0.165	0.145	0.314
Black	0.026	0.024	0.032	0.029
White	0.824	0.874	0.827	0.827
Asian	0.051	0.047	0.045	0.057
Other ethnic group	0.016	0.015	0.013	0.018
Unknown ethnicity	0.042	0.021	0.025	0.029
Non UK domicile	0.041	0.018	0.058	0.041
Over 24 years	0.457	0.457	0.413	0.425
Old university	0.267	0.180	0.230	0.588
Part time study	0.416	0.320	0.529	0.226
Good degree class	0.467	0.559	0.527	0.249
Medium degree class	0.239	0.244	0.319	0.139
Low degree class	0.080	0.037	0.068	0.025
PGT degree	0.214	0.160	0.086	0.587

There are some key differences between subjects. Land and property management has a higher proportion of females and graduates from old universities, and the highest proportion of taught postgraduate leavers. In contrast, there are few leavers with a taught postgraduate qualification in quantity surveying, but this subject has the highest proportion of students that studied part time. Construction and building surveying are more similar to one another but there are a higher proportion of PGT leavers in the former.

4 Econometric Results

Table 4 presents the bivariate probit results for all built environment leavers and compares them to the estimates from an equivalent univariate probit analysis (where each equation is estimated separately). The top half of the table relates to the probability of gaining graduate level employment, whilst the second half relates to the probability of having a taught postgraduate qualification.

The estimate for ρ in the bivariate model is 0.2328 and significantly different from zero at the 3% level. This suggests that a univariate model of graduate employment would

overestimate the significance of a postgraduate qualification. Indeed, comparing the estimates across both versions shows that whilst in the univariate model, PGT positively and significantly increases the probability of gaining graduate level employment, once the endogeneity of the PGT variable is controlled for, the coefficient becomes insignificant.

In contrast, having a good (first or upper second class) degree significantly increases the likelihood of gaining graduate employment relative to the omitted category of a lower second class degree, while having a third/unclassified degree significantly decreases the same likelihood. The land and property management subject dummy becomes insignificant in the bivariate model (as compared to negative significant in the univariate model). Otherwise, the coefficients on the other explanatory variables in the graduate employment equation are qualitatively similar across univariate and bivariate models and have the expected signs.

The results relating to the year dummy variables are interesting, especially comparing across the graduate employment and postgraduate qualification equations. The sign and magnitude of estimated coefficients in the graduate employment equation are as expected given that, compared to the base year of 2005/06, the economy grew in 2006/07 (year 2) and then entered a downturn in 2007/08 (year 3) which deepened in 2008/09 (year 4).

Turning to the estimates in the postgraduate qualification equation, while the 2007/08 dummy is negative, suggesting an initial negative effect of the downturn on PGT admissions, the coefficient for the final year (2008/09) has a positive and significant coefficient suggesting that poor employment prospects may have increased demand for PGTs in built environment subject areas. This is somewhat counterintuitive, but it could reflect either a lack of alternative employment options or expectations of an upturn in the property market by the time that students graduate. Other coefficients in the PGT equation are of expected sign and are similar across both versions of the model.

Table 4: Results from bivariate and univariate probit models for built environment leavers

	BIVARIATE MODEL			UNIVARIATE MODEL		
Variable	Coefficient	Standard Error		Coefficient	Standard Error	
Graduate employment		*(n=10,937)*			*(n=10,937)*	
Female	-0.081	0.042	*	-0.111	0.040	***
Black	-0.255	0.102	**	-0.273	0.102	***
Asian	-0.265	0.070	***	-0.286	0.070	***
Other ethnic group	-0.027	0.127		-0.045	0.127	
Unknown ethnicity	-0.065	0.091		-0.123	0.089	
Non UK domicile	0.179	0.096	*	0.120	0.094	
Over 24	0.066	0.057		-0.040	0.040	
Old university	0.185	0.038	***	0.182	0.039	***
Part time study	0.330	0.040	***	0.312	0.040	***
Year 2 dummy	0.125	0.050	**	0.118	0.050	**
Year 3 dummy	-0.155	0.048	***	-0.151	0.048	***
Year 4 dummy	-0.517	0.045	***	-0.532	0.044	***
Good degree class	0.274	0.040	***	0.277	0.041	***
Low degree class	-0.291	0.067	***	-0.294	0.067	***
PGT degree	-0.105	0.176		0.300	0.051	***
Construction	0.030	0.044		0.015	0.044	
Quantity surveying	0.543	0.064	***	0.574	0.063	***
Land & prop. manage	-0.097	0.094		-0.276	0.059	***
Constant	0.986	0.059	***	0.997	0.059	***
Postgraduate taught qualification		*(n=10,937)*			*(n=12,580)*	
Female	0.285	0.036	***	0.286	0.034	***
Black	0.125	0.092		-0.062	0.079	
Asian	0.183	0.075	**	0.098	0.067	
Other ethnic group	0.173	0.119		0.209	0.106	**
Unknown ethnicity	0.484	0.075	***	0.446	0.070	***
Non UK domicile	0.568	0.081	***	0.504	0.072	***
Over 24	1.072	0.036	***	1.047	0.034	***
Part time study	0.239	0.036	***	0.313	0.034	***
Year 2 dummy	0.067	0.043		0.073	0.041	*
Year 3 dummy	-0.100	0.044	**	-0.109	0.042	***
Year 4 dummy	0.089	0.042	**	0.061	0.039	
Construction	0.173	0.043	***	0.167	0.041	***
Quantity surveying	-0.486	0.059	***	-0.474	0.056	***
Land & prop. manage	1.535	0.052	***	1.467	0.049	***
Constant	-1.822	0.053	***	-1.846	0.050	***
Rho = 0.2328	Chi (2) = 4.6709			Log L grad = -8417.24		
Prob > chi = 0.0307**				Wald grad = 3022.83 Prob>chi = 0.000		
Log L = -8417.24				Pseudo grad R2 = 0.0763:		
Wald= 3022.83 Prov > chi = 0.000***				Log L pgt = 5116.66		
				Wald pgt = 3578.12 Prob>chi = 0.00		
				Pseudo pgt R2 = 0.2591		

Notes: ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Omitted categories are white, under 24, full time study, new university and graduating with a lower second class degree. The omitted subject category is building surveying.

Tables 5 and 6 display results for each individual built environment subject area. The model specifications are similar to those above expect that, in these cases, subject

dummies are not required and the ethnicity variables are modified owing to the small number of observations in each category.

In only one of the four models is ρ significantly different from zero - the land and property management model. The sign of ρ in this model is negative, which suggests that a univariate model would underestimate the importance of having a taught postgraduate qualification for graduate employability. It follows that, in the other three subject areas, a univariate probit model of graduate employment would provide consistent estimates.

Table 5: Results from the bivariate probit models by built environment subject

	Construction (n=5,539)		Build surveying (n=1,836)		Quant surveying (n=1,927)		Land & property management (n=1,635)	
	Coefficient		Coefficient		Coefficient		Coefficient	
Graduate employment								
Female	-0.168	***	0.152		0.045		-0.017	
Non white	-0.121	*	-0.254	**	0.024		-0.292	***
Non UK domicile	0.552	***	0.112		-0.235		0.197	
Over 24	-0.070		0.224	**	0.165		-0.398	***
Old university	0.206	***	0.203	*	-0.126		0.041	
Part time study	0.413	***	0.292	***	0.717	***	-0.365	***
Year 2 dummy	0.010		0.253	**	0.015		0.253	**
Year 3 dummy	-0.212	***	-0.434	***	-0.283		0.178	*
Year 4 dummy	-0.565	***	-0.651	***	-0.781	***	-0.095	
Good degree class	0.284	***	0.318	***	0.229	*	0.170	
Low degree class	-0.270	***	-0.428	**	-0.455	**	-0.390	*
PGT degree	-0.026		-0.597		-0.128		1.683	***
Constant	1.080	***	1.035	***	1.635	***	0.006	
Postgraduate taught qualification								
Female	0.409	***	0.450	***	0.343	***	-0.066	
Non white	0.360	***	0.185		0.624	***	-0.194	*
Non UK domicile	0.262	**	0.669	**	-0.448		0.818	***
Over 24	1.107	***	0.933	***	0.915	***	1.111	***
Part time study	0.260	***	-0.017		0.653	***	0.458	***
Year 2 dummy	0.033		0.109		0.121		0.071	
Year 3 dummy	0.086		-0.661	***	-0.745	***	0.059	
Year 4 dummy	0.232	***	-0.213	**	0.215	*	-0.174	*
Constant	-1.803	***	-1.456	***	-2.537	***	-0.159	**
rho	0.125		0.461		0.007		-0.623	
Prob > ch	0.4418		0.1026		0.9803		0.0433	**

Notes: ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Omitted categories are white, under 24, full time study, new university and graduating with a lower second class degree.

The coefficients in Table 5 suggest that a taught postgraduate qualification only has a positive effect on the likelihood of obtaining a graduate level job for Land and property management students. For the other disciplines, the coefficient is not found to be significantly different from zero. Meanwhile, non-white ethnicity appears to have a significant and negative impact on the likelihood of gaining a graduate level job in three of the four subjects after having controlled for the type of qualification held and other personal characteristics. Being over 24 is estimated to have a negative and significant impact for land and property management leavers, but is positive for building surveying. Studying part-time is also significant and negative for land and property management,

but positive and significant for the other subject groups, corresponding with preferences noted by Westcott & Burnside (2006). Finally, the results relating to the year dummy variables are interesting, suggesting that the economic downturn affected land and property management employment prospects and PGT applications more slowly than for the construction industry.

In relation to the three subject areas where ρ is not significantly different from zero, with one exception, the results from the univariate version of the model (shown in Table 6) are qualitatively very similar across all variables to those in the bivariate model. The exception relates to the coefficient on the PGT qualification variable in the construction subject area. While in the bivariate version of the model, this is insignificant, in the univariate model it is estimated as significant positive: having a PGT qualification increasing the likelihood of graduate employment. This difference between the two versions of the model in this subject suggests that there may be some features about the nature of PGT courses in construction that the existing bivariate model is not capturing and which require further research.

Table 6: Results from the univariate graduate employment probit models by subject

	Construction (n=5,539)		Build surveying (n=1,836)		Quant surveying (n=1,927)		Land & property management (n=1,635)	
	Coefficient		Coefficient		Coefficient		Coefficient	
Graduate employment								
Female	-0.193	***	0.079		0.045		-0.044	
Non white	-0.142	**	-0.295	**	0.023		-0.379	***
Non UK domicile	0.539	***	-0.056		-0.234		0.485	*
Over 24	-0.131	**	0.081		0.163		-0.033	
Old university	0.203	***	0.199	*	-0.127		0.035	
Part time study	0.399	***	0.322	***	0.716	***	-0.289	***
Year 2 dummy	0.009		0.237	*	0.015		0.287	***
Year 3 dummy	-0.217	***	-0.364	***	-0.283		0.228	**
Year 4 dummy	-0.579	***	-0.637	***	-0.781	***	-0.166	
Good degree class	0.286	***	0.328	***	0.230	*	0.222	*
Low degree class	-0.270	***	-0.449	**	-0.455	**	-0.397	
PGT degree	0.191	***	0.207		-0.115		0.724	***
Constant	1.083	***	0.994	***	1.636	***	0.522	***
Log likelihood	-2066.4		-695.9		-334.9		-703.8	
Pseudo R2	0.06		0.0859		0.1543		0.0752	

Notes: ***, ** and * denote 1%, 5% and 10% significance levels, respectively. Omitted categories are white, under 24, full time study, new university and graduating with a lower second class degree.

5 Conclusion

Property and construction are subjects in which marked growth has occurred in the provision of postgraduate conversion degrees. The analysis in this paper provides evidence as to the value of such a postgraduate qualification in securing graduate level employment on leaving university. Results from the estimations suggest that it has a positive effect on the likelihood of securing a graduate level job in the real estate sector and, possibly, within construction as well. However, it appears to confer no significant advantages in the fields of building surveying and quantity surveying. Meanwhile, other coefficients highlight differences between land and property management and the other

subjects, though, in all cases, a good first degree appears to be a positive factor and a third class degree has a negative influence on employment outcomes.

These results could have important implications for future programme provision and wider education policy, particularly in the current context of changes in higher education funding, the significant increase in undergraduate student fees in England and Wales, and the ongoing debate on access to the professions (Department of Business, Innovation and Skills, 2011). Evidence on whether the earlier introduction and increases in fees deters students from postgraduate study is mixed (Smith et al., 2010). However the larger fee increases being introduced in parts of the UK from 2012/13 mean that, in future, postgraduate programmes will have to demonstrate clear employability benefits in order to attract students. Hence, the trend towards higher numbers of conversion programmes could be reversed, with the possible exception of real estate where the employment advantages for postgraduates appear to be clear.

The results also showed the impacts of the recession on the employment prospects of all property and construction graduates. Ongoing cuts in public expenditure on construction and infrastructure projects suggest that the job market for graduates will be continue to be difficult in the foreseeable future. Therefore, competition between graduates from different types of programme may well become more intense. Meanwhile, other results in relation to gender and ethnicity variables suggest that access continues to be an issue for the property and construction professions and this is worthy of further investigation in its own right.

The research does have limitations, particularly in terms of the definition of graduate level job, which does not necessarily indicate employment in either the property or construction industries. Thus, further analysis to reliably determine relevant industry employment could be valuable. Analysis could also be extended to examine interactions between economic conditions and the advantages of postgraduate or part time study. Nonetheless, the results to date expand the evidence on labour market outcomes in the property and construction industries and, thus, add to the debate in this area.

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Children's hospital design through participatory approaches: a Methodological Perspective

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Abstract:
The expertise of end users' in the development of new building is acknowledged in participatory design. Participation in a design process provides children with valuable opportunities for voicing their views and ensures that the relevant customer (children) requirements are available in all phases of process, and that they are not lost when progressively transformed into design solutions.

This paper aims to presents an overview of the research method adopted for the study on participation of children in design process of children's hospital. Research methodology is the application of various systematic methods and techniques that create new knowledge. The selection of an appropriate research method influences the credibility of the research findings and is an important aspect of any research success. The paper brings forward the theoretical approach used in the research process from the theoretical underpinnings to the collection and analysis of data. It presents an example of case study research and describes challenges on the development of case studies.

Keywords:
case study, children's hospital design, design process, research method

1 Introduction

A considerable amount of studies in healthcare design research have been performed by Ulrich (1991a, 1991b, 1992, 2000, and 2001). He concentrates on finding the relationship between the designed environment of healthcare facilities and clinical outcomes for patients. A theory of supportive design in healthcare settings by Ulrich's (1991b:97) includes the assumption that "supportive surroundings facilitate patient's coping with the major stress accompanying illness. The effects of supportive design are complementary to the healing effects of drugs and other medical technology, and foster the process of recovery."

Ulrich's (1991b) theory has defined two major sources of patient stress: their illness and its repercussions, and the nature of the physical environment. Furthermore, he discussed that patient stress has a variety of negative psychological, physiological and behavioural impacts on patient wellness (Ulrich, 1991a, 1991b, 1992, 2000, 2001). The main core of Ulrich's argument is supporting patient wellness through minimising environmental stress.

Patient's total wellbeing, from physical to emotional and social needs, is the prominent parts of any medical consideration. In order to provide such environment in which a patient is supported and encouraged to total wellbeing, all the users (patients and staff) should have genuine participation in its designing and planning process.

Understanding children's and young people's perspectives and needs as the users of the healthcare facilities can be used to strengthen the capacity of policymakers, designers, and healthcare managements to prepare a supportive environment based on their needs (Bishop, 2008). Also, the decisions based on assumptions made by adults about the needs of children and young people can be minimised, which in turn can increase the likelihood of designing supportive hospital environments, from the children and young people's perspectives (Bishop, 2008).

It is essential to understand what children needs and preferences are, and respond with design solutions which meet those preferences in the best possible manner. As such, participatory design approaches are suggested as the means to enable better identification of needs, supporting value generation. However, there are challenges in implementing participatory approaches in building design, especially in complex environments such as hospitals, and with delicate clients such as children. Wilson et al (1997) defines user involvement as `focus on users' and Heinbokel et al. (1996) defines it as `participation of users'. Participatory design refers to a design process where different stakeholders are involved in the design and their tasks start from the early stages of the design and continue all through the process (Gould and Lewis 1985; Blomberg and Henderson 1990; Cherry and Macredie 1999; Maguire 2001; Gulliksen et al. 2003) Requirements can be elicited by the designers through a number of approaches, for instance workshops and discussion of design issues with users (Baeka and Lee, 2008).

For the purpose of this study, user involvement is defined as a development process incorporating ideas and feedback acquired directly from end users (in this case, children and young people) at various stages of the process (Nousiainen, 2008). Such participation should involve different groups of patients in hospitals, such as: young children and teenagers, short-term and long-term patients, as well as other special groups such as chronically ill children who have to return to the hospital repeatedly (Eriksen, 2000).

This paper, analyses types of philosophies, approaches, strategies and methods of data collection used in a research demonstrating the reasons behind utilising this scheme in this research.

2 Research aim and objectives

The aim of this study is to develop generic guidelines to help designers incorporate children's perspectives in designing children's hospitals. Focus is on providing not only a friendly environment but one that will promote recovery.

The objectives stimulating this research are:

1. To understand the role of participatory design with children in providing a proper children's hospital to promote recovery during the healing process.

2. To identify and investigate the structure of user involvement process and the methods used to carry out the process

3. To identify problems and issues associated with engaging children during the design process of children hospital

4. To study the process of identifying children's preferences and establish how the preferences were considered during the design process of the case studies

3 Definition of research methodology

There are different definitions of research methodology concept that have been stated. Saunders et al. (2007) described research methodology as: “Something that people undertake in order to find out things in a systematic way, thereby increasing their knowledge”. Likewise, Kumar (2005) defined research methodology as “a taught supporting subject in several ways in many academic disciplines at various levels by people commit to a variety of research paradigms”. A researcher uses the appropriate systematic methods to collect and analyse data and to properly identify issues concerning with the work as well as the objectives of his study - research methodology.

In the word of Peter and Howard, good research is rigorous, systematic, integrated, focused and objective (2001:595):

"Research that meets the criteria of rigour, a systematic kind of modelling in its articulation and which ties back its process to a solid grounding in what we know about the area that we're being researched, so that there is a total integration of varying viewpoints in the grounding of the research design".

Sexton (2000:76) describes the ‘nested’ approach as a holistic, integrated research method, generating a framework that “provides the researcher with a research approach and techniques that benefit from epistemological level direction and cohesion”. Figure 1 demonstrates the application of the nested approach to this research. The next section concentrates on the paradigms driving the research.

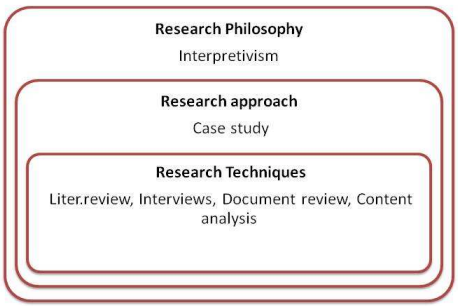

Figure 1: research methodology ‘nesting’

4 Purpose of the research

Collis and Hussey (2003) classify the research according to its purpose; Exploratory research which is conducted into a research problem or issue when there are very few or no previous studies to which more information can be obtained from. Descriptive research is research which describes phenomena as they exist. Analytical or explanatory

research is a continuation of descriptive research. Predictive research aims to generalise from the analysis by predicting certain phenomena on the basis of hypothesised, general relationships.

Therefore, this research can be classified as exploratory, explanatory and even descriptive type of research. It was exploratory in identifying issues influencing children's participation in the hospital design. It was also explanatory as it provided evidence to better understand why problems arise during design process, and was descriptive, in that it aimed to establish the activities that take place during participatory design process.

5 Research philosophy

Easterby-Smith et al (1997) states three reasons to clarify the importance of research philosophy for the research methodology which are; a) help the researcher to refine and specify the research methods, b) assist the researcher to evaluate different methodologies and methods and c) it may help the researcher to be creative and innovative in either selection or adaptation of methods that were previously outside his or her experience.

Two main research philosophies; Positivism and Interpretivism have been recognised by number of authors (Easterby et al, 2002). Positivism argues that "working with an observable social reality and that the end product of such research can be law-like generalisations similar to those produced by the physical and natural scientists" (Remenyi et al, 1998). The interpretivist philosophy emphasises the difference between research conducted among people rather than those conducted among objects (Saunders et al, 2007). Therefore, the social scientist should welcome and appreciate the different views and meanings that people place upon their experiences (Easterby et al, 2002).

For the purpose of this study interpretivism philosophy has been adopted as overall research philosophy due to number of reasons. To achieve the aim of the study the researcher is required to identify different views of people who have been involved in the design process of the hospital (such as designers, planners and NHS staff). Hence, the study encourages the people to tell their ideas, opinions and experience about the design process of children's hospital.

The main purpose of employing the Interpretivism paradigm in this research is to investigate and understand the experiences, perspectives, and to identity development of a small sample of the experience-rich participants of this study. To achieve the aim of the study the researcher is required to identify different views of people who have been involved in the design process of the hospital (such as designers, planners and NHS staff). Hence, the study encourages the people to tell their ideas, opinions and experience about the design process of children's hospital.

6 Research approach: case study

A research strategy is a general plan on how to answer research question(s) and consequently satisfy the research objectives (Saunders et al. 2007). Yin (2003: 14) described the case study as a research strategy in two ways, first, the technical definition begins with the scope of a case study: "as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries

between phenomenon and context are not clearly evident." Second, "the case study as a research strategy comprises all-encompassing method; covering the logic of design, data collection techniques, and specific approaches to data analysis". The aim of case studies is to reach a fundamental understanding of structure, process and process (Gummesson, 2000). It may be qualitative or combined qualitative and quantitative, depending on the circumstances (Yin, 1994; Silverman, 1998).

Case study is the most appropriate approach to satisfy the research aims and objectives of this study. It aims to investigate a contemporary event within its real-life context and Yin mentioned that case study is the most appropriate strategy to use in these kinds of studies. The main objective of this study is to gain empirically an in-depth understanding of the barriers affecting the engagement of children in design of children's hospital. Some researchers such as Saunders et al. (2000), Jankowicz (2005) and Gummesson (2000) asserted that case study is used if the researcher wishes to gain a rich understanding of the context through getting a comprehensive and informative information (appropriate information). Further, Yin (2003) suggested the case study as an ideal approach for research that focus on the "what, why, and how" questions. This research explores barriers affecting the engagement of children in design of children's hospital and the way to incorporate children's perspectives in designing children's hospitals, answering some 'how' and 'what' questions.

There is no definite answer to justify a single case or multiple cases strategy in a research. As Yin (2003) discusses that the single case can be used when it represents:

- The critical case in testing a well-formulated theory
- An extreme or unique case
- A representative or typical case
- The revelatory case
- The longitudinal case: studying a single case at two or more different points in times

Voss et al. (2002) argued that the advantage of single case study could be offering greater depth of study and its disadvantages could be limitations on the generalisability of conclusions drawn. It could also lead to bias such as misjudging the representativeness of a single event and exaggerating easily available data.

According to Yin (2003), multiple cases are generally used to replicate findings or support theoretical generalisations. In addition to that, multiple case study research increases external validity (Voss et al. 2002). In this way, the researcher chooses a multiple set of case studies which allows for a replication the same phenomenon under different conditions in appropriate research designs to confirm or disconfirm inferences drawn from previous ones (Yin, 1994).

6.1 Selection of cases

The Royal Alexandra Children's Hospital: After a major redevelopment, the Royal Alexandra Children's Hospital in Brighton reopened in 2007. The new Children's Hospital is one of only seven dedicated paediatric hospitals in the UK. The new development was able to transform the old hospital to a relatively more spacious

structure with more than three times the size of the original building it replaced and doubled number of beds. The project has won 2008's Prime Minister's Better Public Building Award. The redevelopment plan was aimed to provide the best possible environment in which children could receive treatment and recuperate and creating a welcoming environment. The two main key elements in the success of the development are: recognising the needs of individuals, most notably young people and their families and high quality services for families and children through effective engagement with users.

The Royal Manchester Children's Hospital (RMCH): The RMCH is the largest single-site children's hospital in the UK comprising 371 beds, including 17 intensive care and 12 high-dependencies. It converts two children's hospitals at Pendlebury and Booth Hall to a single building. It has been intended to establish and maintain a sense of the human-scale, therefore minimising the anxiety of patients and families crossing the hospital threshold for the first time.

These hospitals has been selected as case studies for this research due to the fact that the design has taken place with a through consultation process, which involved number of staff, patients and their families to balance the needs of users and providers of services, in a complex environment.

7 Research techniques

Six major sources are suggested by Yin (2003) in doing case studies which are: documentation, archival records, interviews, direct observation, participation direct observation and physical artefacts. Yin (2003) noted that no single source of data has a complete advantage over others, while the various source are complementary.

7.1 Literature review and synthesis

According to Hart (1998:13) the literature review is ''the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed'' Literature review has number of advantages such as: providing researchers the knowledge required to narrow the focus of their research topic, specifying the research problem in detail, identifying gaps in existing research knowledge, learning how to express certain views on the nature of the topic, identifying of neglected issues in previous researches, getting a rich source of secondary evidence on which to outline and finally creating a summary of research evidence (Burns 1997:27-29).A broad review of existing literature was carried out in this research to address the research and to create the context and insights into previous work.

7.2 Semi-structure interview

Easterby-Smith et al. (2002) considered the In-depth interviewing as the most fundamental of all qualitative methods. In-depth interviews try "to understand the world from the subject's' points of views, to unfold the meaning of peoples' experiences, to uncover their lived world," (Kvale, 1996:1).

Kvale (1983, p. 174) provided a definition of the qualitative research interview as "an interview, whose purpose is to gather descriptions of the life-world of the interviewee

with respect to interpretation of the meaning of the described phenomena". The main objectives of the technique are to draw out the experiences and perspectives regarding to the participants and also providing the opportunity that the participants would be able to point out their own personal feelings and ideas with regards to specific subjects. Boyce and Neale (2006) discusses the main advantage of in-depth interviews techniques, compared to other data collection methods provide much more detailed information. Open-ended, focused interviews more structured questions, along the line of a formal survey are identified as main types of interviews used in case study research by Yin (1994).

In this research, a semi-structured interview approach was adopted and the questions are designed in the form of open-ended in order to provide a way to encourage them to talk and point out their experience in their own words.

In this type of interview, the questions can be asked about the behaviour or experience, opinion or belief, feelings, knowledge, sensory, and background or demographic of the participants (Patton, 1987).

The main weaknesses of interviews have identified by Yin (1994:80) as:

- Bias due to poorly constructed questions
- Response bias
- Inaccuracies due to poor recall
- Reflexivity - interviewee expresses what interviewer wants to hear

Tape recording, transcribing all the interviews and complementary data gathering method was used to reduce the effect of these weaknesses.

7.3 Documentary evidence

The qualitative document analysis is the systematic study of documents which refers to "an integrated and conceptually informed method, procedure, and technique for locating, identifying, retrieving, and analysing documents for their relevance, significance and meaning." (Altheide, 1996:2)

Documents are created in particular contexts, by particular people, with particular purposes, and with consequences – intended or unintended, (Mason. 2002: 110). The documents may include media reports, website content, meeting minutes, and personal diaries (Pryor, 2003). Documents of diverse type have been collected and analysed, including:

- Case study organisation corporate publications
- Case study organisation public web site
- Electronic mail
- Presentation material
- Published information about the case studies on the internet

8 Data gathering

The first stage of the research aimed to identify and investigate the structure of user involvement process and the methods used to carry out the process.

The study, at this stage, was based on a literature review in the areas of process of participatory design with children and young people as well as the methods used to carry out the process. This review clearly demonstrated what the process of user involvement was like and the main goal for using the participatory design approaches as well as the potential benefits and challenges of such process.

Two case studies were developed that have involvement of children and young people during the design process. In each case study, the design process structure and problems and issues associated with engaging children during the design process were identified through documents and on interviews. A semi-structured interview technique has been used to obtain the necessary data from the design team, PFI members and NHS staff and to understand their experience and opinion of involving children during the design process of case studies.

Patton (2002) and Oberle (2002) express that there are no rules governing the number of interviews required for case study research, and the purpose of the study and available time and resources will affect the sample size in qualitative research. Accordingly, the total number of interviewees was 26 in the two case studies: 16 in Royal Alexandra children's hospital and 10 in Royal Manchester children's hospital. The number of interviewees was conducted according to the following measures:

- The researcher had managed to inform the project staff the purpose and questions of the interview. Some agreed to participate in the interviews, while others refused, as they did not have enough information about the research topic.

- To obtain as much as questions answered by the interviewees, as all the interviewees do not answer all of the questions and the amount of repetition in the answers obtained during the interviews.

The researcher arranged the interview times and dates according to the candidates preferences. Participants completed interview that ranged from 15-60 minutes in length. (Although the average running time for the interview was approximately 25 minutes, a few of the interviews were longer as the participants in these interviews were interested in discussing some topics at length). Occasionally participants were happy to carry out their interviews at the case study organisation to allow the researcher to access the appropriate documents. Otherwise, interviews were conducted through telephone conversation.

In order to make the process more effective and easier, the researcher sent the questions to the interviewees prior to interview meeting. It's worth to mention that the researcher was aware that this step could lead to bias.

9 Content analysis

Krippendorff (2004:18) defines the content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use."Ole Holsti (1969) offers a broad definition of content analysis as such a

technique which tends to create inferences by objectively and systematically identifying specified characteristics of messages.

Leedy and Ormrod (2001:155) define this method as “a detailed and systematic examination of the contents of a particular body of materials for the purpose of identifying patterns, themes, or biases”. This method, reviews forms of human communication in order to identify patterns, themes, or biases and to identify specific characteristics from the content in the human communications. The researcher is exploring verbal, visual, behavioural patterns, themes, or biases. (Williams 2007).

Prior questions have to be addressed in every content analysis to allow for transparency in the process which are formulated by Lasswell et al (1952, p. 12) and have been adopted in this research as: "Who says what, to whom, why, to what extent and with what effect?"

For the purpose of this study, the content analysis similar to what is described by King (1998:118) as “template analysis” has been used. It has not been used to quantify the themes (or to engage any discussion on quantification of themes) in the analysed documents or data as identifying them was more important than verifying the number of times each theme has been referred to or has been discussed. To elaborate on template analysis, King (1998:118) defined it as “the essence of the approach is that the researcher produces a list of codes (a ‘template’) representing themes identified in their textual data. Some of these will usually be defined a priori, but they will be modified and added to as the researcher reads and interprets the texts”.

In this research, interviews were transcribed and arranged in to text files. A list of codes or labels to assign meaning to the descriptive or inferential information (Miles and Huberman, 1994) was developed prior to data analysis in two levels-high and low. The higher level was about more general themes describing features such as process, methods and issues where the lower level was more detailed. Each code was linked to the research objectives it was derived from. To facilitate the analysis of the data, the researcher has to search into the interviews for expressions or variables, which can be verified as a code or create a new code. Identifying new code then requires the researcher to loop around the cycle to search for the variables relating to the new code, this process carried out until no new code was found.

In order to perform the analysis of the both of case studies in this research, the NVivo software has been used. It has been expressed as a useful tool for the content analysis by Richards (1999):

It provides a range of useful tools for handling rich data records and information about them for browsing and enriching text, coding it visually or at categories, annotating and obtaining accessed data records accurately and swiftly.

The NVivo has tools for recording and linking ideas in many ways, and for searching and exploring the patterns of data and ideas.

It can manage the complexity of the data. As the user links, codes, shapes and models the data, the software helps to manage and synthesize the ideas.

10 Conclusion

Patient's total wellbeing, from physical to emotional and social needs, is the prominent parts of any medical consideration. Therefore, all the users (patients and staff) should have genuine participation in its designing and planning process. Participatory design approach is directly related to value generation; through exploration of user's preferences, it was possible to recognise it as a solution for meeting user's needs in the central importance of enhancing the customer satisfaction. This paper summarises the research methodology to achieve the research aims and objectives of this study.

It can be concluded that in order to develop a successful research, the true understanding of the philosophical issues should be accompanied by a clear definition and design of research strategy. The clear definition and design of research strategy would result in unbiased and more convincing research outcomes. The philosophical understanding of the research ensures the compatibility and consistency between research philosophy, approach and techniques.

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Information technology and the digital economy

The Future of ICT in the Construction Industry through the Use of Cloud Computing

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Abstract:
To the eBusiness environment 'cloud computing' is known as the generic term for Information, Communication, and Technology (ICT). It serves as an umbrella term for the provision of services, such as storage, computing power, software development environments and applications, combined with service delivery through the internet to consumers and business. However, to a fragmented industry such as construction, the benefits of this service have still to be fully recognized. This paper presents the results of a Delphi questionnaire undertaken by 16 international experts on construction ICT. The paper analyses the expert groups opinions on the future of ICT in construction based on a cloud service which hosts construction-related applications. The survey was designed to evaluate opinions and to screen alternatives in order to discover new ideas relating to the topic. It was formatted into three main core sections; business process, cloud computing capabilities; and cloud-based business opportunities. Each of the sections analyzed the potential for developing a cloud-based construction service by identifying standardized deliverables, obstacles and opportunities for growth to the perceived benefits. The questionnaire itself is derived from an earlier survey based on cloud computing in the Irish construction industry and the results of this current questionnaire will identify further research questions. In order to establish if there was a strong relationship between the experts around the world; the paper presents quantitative results supported by the comments obtained from the qualitative analyses. The possibility of providing an interoperable process based on binding three focused construction applications through a single repository platform 'cloud computing' is the core focus of this paper.

Keywords:
building information modeling, cloud computing, Delphi technique, information communication technology.

1 Introduction

The structure of the questionnaire was divided into three sections; namely business process, cloud computing capabilities, and cloud business opportunities based on refining the results of a 2009 survey 'Building Support for Cloud Computing in the Irish

Construction industry' (Redmond *et al.* 2010). Within each of these segments were questions designed to analyze the potential for developing a cloud service based on combining three essential applications; Building Information Modeling (BIM), project management and accountancy. The panel comprised of residents based in the U.S. (50% - 8 respondents), UK (34% - 6 respondents), and Australia and France both represented by an individual (16% - 2 respondents) totaling 16 experts. The experts were from varied backgrounds; such as construction IT research consultants, university academics, lawyer, cloud developers, cloud BIM developer, BIM vendors, and a representative from a leading professional body for qualifications and standards in land, property and construction. Weinstein (1993) identified that there are two types of experts: those whose expertise is a function of what they know (epistemic expertise), or what they do (performative expertise). Weinstein describes epistemic expertise as the capacity to provide justifications for a range of propositions in a domain while performative expertise is the capacity to perform a skill in accordance to the rules and virtues of a practice. The experts chosen for this survey are a mixture of either or both epistemic and performative. They are of senior position in an established firm or institute relating to construction and ICT. This paper illustrates the results and discussions of a Delphi questionnaire undertaken in 2010 which will be used to establish the necessity for a cloud computing collaborative process based on a common database for the construction industry and to identify topics that will be used to form questions for the next form of research.

2 Delphi technique

The Delphi technique is in essence a series of sequential questionnaires interspersed by controlled feedback, that seek to gain the most reliable consensus of opinion of a group of experts (Linstone and Turoff 1975). Wissema (1982) underlines the importance of the Delphi method as an exploration technique for technology forecasting. Wissema further acknowledges that the Delphi method has been developed in order to make discussion between experts possible without permitting a certain type of social interactive behaviour as happens during a normal group discussion and hampers opinion forming. Powell (2003) suggests that the Delhi technique represents expert opinion, rather than indisputable fact and that further inquiry to validate the findings may be important. Powell also concedes that a Delphi study will be further enhanced if its limitations, possible implementation of findings and future research directions are discussed. The structure of the questionnaire outlined in this paper was designed to evaluate whether there is a strong relationship between the groups of experts.

This Delphi questionnaire forms part of a primary research of a PhD methodology based on 'Grounded Theorism' which was applied to identify and categorize elements and to explore their connections to cloud computing and the construction industry. Sayre (2001) views 'grounded theory' as a model of using modes of questioning to develop theories rather than to study them as a process whereby discovery by developing theoretical propositions from interview data and field research, often accompanied by establishing categories, refining them, and revisiting the questions repeatedly until specific propositions are developed for future testing.

3 The Survey

The methodology used for the questionnaire included both quantitative and qualitative research (open and closed-ended questions). The attitudinal research focused on

subjectively evaluating the opinion or view of the respondent towards particular topic. The exploratory research was used to diagnose the situation, screen alternatives and discover new ideas. The structure of the survey comprised of the following sections:

3.1.1 Business process:

Identify if a cloud collaboration tool based on combining the open Application Performance Interface (API's) of accountancy, project management, and a BIM application would benefit the industry. The benefits of re-engineering a previous innovative solution with the concept of construction as a manufacturing process were investigated and compared to Kagioglou *et al.* (1999). Kagioglou *et al.* had identified that traditionally ICT had been seen as a driver behind changes in the design and construction process and indeed in many Business Process Re-engineering (BPR) initiatives.

3.1.2 Cloud computing capabilities:

Focus on Armbrust *et al*. (2009), obstacles to adopting and opportunities for growth of cloud computing. This section also analysed Lowe's (2010) review of the five challenges associated with moving backup to the cloud in order to provide new and informative literature on the cloud's capabilities in contrast to traditional network infrastructure. However, as a cloud becomes ever more successful there are leading experts finding comparisons with the Dot.com era and rebutting them; such as Wohl (2008). The final question in this section investigates if cloud computing has advanced from the many mistakes made by the Dot.com bubble.

3.1.3 Cloud based business opportunities:

The key attributes of this section are the benefits associated with cloud computing in comparison with traditional premise-based facilities. The primary question requests the respondents to refer to their own company when making a decision, such as, would cloud be a cost benefit to one's firm? The respondent's knowledge is also called into question asking for expertise on whether cloud benefits are essential for business growth and do Small to Medium Enterprises have the capability of using such a service.

4 Findings and Discussion

4.1 Business Process

4.1.1 Developing a cloud collaboration tool based on combining open API's of accountancy, project management, and BIM applications.

The overwhelming positive response to the question illustrated in Figure 1 has 50% of the experts agreeing and 29% strongly agreeing. However, after further analysis of this open-ended question; the experts identified areas for concern such as security and the difficulty involved with combining open API's with different applications. One such expert supported the concept of developing a cloud collaboration tool but was unsure of the approach of using existing API's to address the problem. Another potential issue is the notion of developing a HTML for BIM and allowing multiple software vendors to produce software on that new web-based platform.

The majority of the experts acknowledged that the key to integrated BIM is a common database preferably in the cloud containing information about component parts of building modeled in disparate software programs. One such expert revealed that they had already undertaking this process for several years, using cloud computing based on BIM with web services connected to other applications in the cloud.

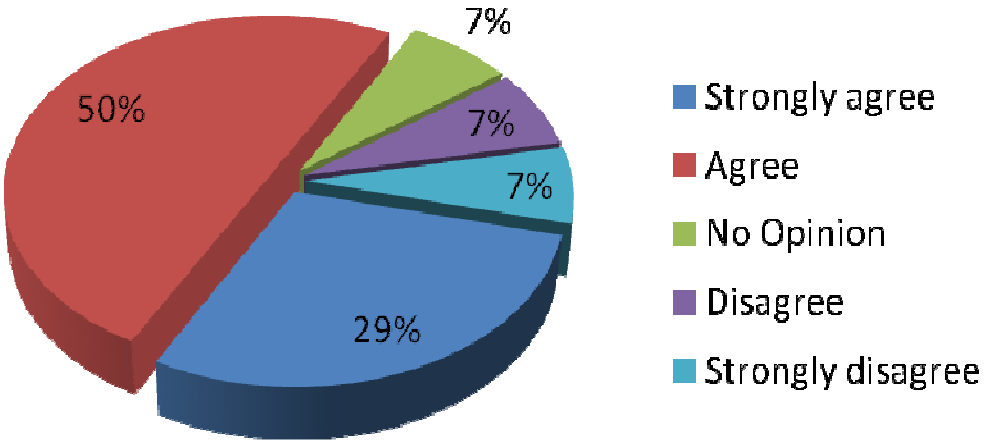

Figure 1. Developing a cloud collaboration tool, in response to the question:

'Would you agree that developing a cloud collaboration tool based on combining the open APIs of accountancy, project management, and BIM applications, would benefit the industry in having a standard supply chain service; please state the reason for your answer or if you think an alternative combination would be more effective (please name the applications).'

4.1.2 Construction as a manufacturing process

According to Kagioglou et al. (1999) the term BPR was first introduced in a 1990 article of the Harvard Business Review by Michael Hammer suggesting that re-engineering is "the fundamental rethinking and radical redesign of business processes to bring about dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed." In conjunction with these benefits Kagioglou *et al.* listed the main process findings of a Engineering and Physical Sciences Research Council funded project (UK). The experts were asked to grade these process findings as illustrated in Table 1. The experts only had a mixed concern about two statements, namely, (1) the need for a coherent and explicit set of process-related principles to be managed by the whole industry with the intention of changing the strategic management of the common process and (2) the need for construction operations that form part of a common process controlled by a single integrated team. The problem relating to the first issue can be traced to the fact that companies prefer to manage their own standard procedures until they have to collaborate with the rest of the design team. The second problem refers to the notion of integrated systems being less competitive in comparison to an open standard system. In contrast the expert panel strongly agreed that the required model should be capable of representing the driver's interest of all parties and be interchangeable allowing interfaces between existing practices.

Other strong indicators identified were the need for a generic and adaptable set of principles, standardised deliverables and a key emphasis on designing and planning to minimise error and networking during construction. The construction industry involvement being extended beyond completion – a post completion phase; received a high level of agreement (71%). The majority of the experts agreed with the process protocols, however having the whole industry reviewing the process and controlling the integrated system did receive negative responses. This is further identified in the open-

ended answers where one respondent stated 'We need to treat facilities and infrastructure like manufactured "products" instead of chaotic "projects" delivered by a disparate rag team of individuals and companies with no common purpose.'

Table 1. Construction as a manufacturing process, in response to the question:
'The following statements are related to construction as a manufacturing process. A major objective of the industry is to identify the ICT requirements needed to support a process protocol; please indicate your opinion on the following statements and please state the reason for your answer.'
(Sourced from Kagioglou *et al*. 1999)

Construction as a Manufacturing Process	Strongly agree	Agree	No Opinion	Disagree	Strongly disagree
The required model should be capable of representing the drivers interest of all parties involved in the construction process.	57%	43%	0%	0%	0%
There should be a generic and adaptable set of principles that allow for a consistent application of principles' in a repeatable form.	23%	77%	0%	0%	0%
A need for a coherent and explicit set of process related principles, the new process should be able to be managed and reviewed by the whole industry with the intention of changing and systematising the strategic management of the common management process.	14%	43%	29%	0%	14%
The need for construction operations that form part of a common process controlled by an integrated system.	7%	50%	22%	14%	7%
A need for a process protocol that can be interchangeable allowing interfaces between existing practices and practice support tools to be operated.	57%	36%	7%	0%	0%
Standardised deliverables and roles associated with achieving, managing and reviewing the process during construction.	14%	79%	7%	0%	0%
Key emphasises on designing and planning to minimise error and networking during construction.	7%	57%	29%	7%	0%
Construction industry involvement to be extended beyond completion - a post completion phase.	50%	21%	22%	7%	0%

4.2 Cloud Computing Capabilities

4.2.1 The Top 10 Obstacles to and Opportunities for Growth of Cloud Computing

The option of using FedExing Disks (international mail service) to solve the issue of data transfer bottlenecks for large data transfers received an insufficient agreeing response of 43% and a disagreeing response of 28%. The no opinion mark of 29% indicated that this should not be the main deterrent and alternative options should be identified. The highest agreeing responses by the expert group were allocated towards standardizing API's meaning a Software as a Service (SaaS) developer could deploy services and data across multiple cloud computing providers so that failure of a single

company would not take all copies of customer data with it, and scalable storage. This option of scaling presented an environmental solution by carefully utilizing resources which could reduce the impact of the data centre on the environment through short-term usage. Scalable storage and data lock-in received a total agreeing result of 86% and 85% respectively with no disagreeing responses. Another high level of agreement response was the data confidentially and auditability with its suggested solution of deploying encryption, virtual LAN and networks middle boxes; for example firewalls and packet fillers.

Table 2. Top 10 Obstacles to and Opportunities for Growth of Cloud Computing, in response to the question: The following statements relate to the top 10 obstacles to and opportunities for growth of cloud computing; please indicate your opinion on these statements and if other please specify.' The solutions are highlighted in red. (Sourced from Armbrust et al. 2009)

Obstacles and growth of cloud computing	Strongly agree	Agree	No Opinion	Disagree	Strongly disagree
Availability of service - Use multiple cloud providers	29%	35%	29%	7%	0%
Data lock-in - Standardise API's	14%	71%	15%	0%	0%
Data confidentially and audit ability - Deploy encryption	46%	39%	15%	0%	0%
Data transfer bottlenecks - FedExing Disks	21%	22%	29%	21%	7%
Performance unpredictability - Improve Virtual Machine support	14%	43%	29%	14%	0%
Scalable storage - Create a storage system	21%	57%	22%	0%	0%
Bugs in large distributed systems - Invent debugger	21%	43%	36%	0%	0%
Scaling quickly - Careful use of resources	29%	57%	14%	0%	0%
Reputation fate sharing (blacklisting) - Services similar to trusted emails	7%	50%	36%	7%	0%
Software licensing - Pay for use licenses	21%	57%	22%	0%	0%

The solution for data confidentially also suggested having geographical storage such as, services located in both the U.S. and Europe to deal with concerns about international law enforcements having the power to search email communications and various records, received no negative responses. As Table 2 illustrates the majority of the obstacles and their solutions received a high level of agreeing responses with such obstacles and solutions as; creating reputation guarding services similar to trusted emails services and inventing a debugger that relies on distributed Virtual Machines (VM); resulting in a high undecided response. Other ideas, such as improving VM support to combat performance and unpredictability, and using multiple cloud providers to prevent Distributed Denial of Service (DDOS); resulted in an above average agreeing response of 57%. The expert group also concluded that the option of pay-for-use licenses did seem attractive. In summary the solutions to the obstacles were broadly favourable to the group; however the solution for bottlenecks (Fedexing) needs more consideration. This section effectively highlights the benefits of cloud computing and demonstrations how the obstacles can be reduced.

4.2.2 Major Challenge for moving back-up to the Cloud

The issue of additional costs increasing because of the lack of knowledge on how backup patterns and needs meet one's requirements in comparison with one's selected vendor's pricing projected a disagreeing response of 36% and an undecided response of

14%. This response was the highest disagreement result out of all the challenges indicating that it is not a major challenge. In a similar reaction the challenge of backup services outsourced to the cloud with the upstream speeds often capped at very low rates in contrast to the downstream side of a pipe, meaning a cloud-based backup would saturate an upstream connection received only a 57% high agreeing mark and low disagreeing mark of 29%. A considerable challenge noted by the expert group was security; which is a repeat of *4.2.1 'The top 10 obstacles to and opportunities for growth of cloud computing,'* where deployment of encryption was one preferred solution. However, this statement relates to compliance issues, such as special attention on contractual language, geographical diversity (if your provider offers geographical redundancy in their service) and termination agreements.

Table 3. The 5 major challenges for moving backup to the cloud, in response to the question: 'Please rank in order 1 – 5 (1 being the highest) which of the following considerations do you think is a major challenge for moving backup to the cloud and if other please specify.' (Sourced from Lowe's 2010)

Challenge for moving backup to cloud	**1 (High)**	**2**	**3**	**4**	**5 (Low)**
Cost - not understanding backup needs	7%	43%	14%	22%	14%
Bandwidth - cloud saturate connection	14%	43%	14%	22%	7%
Security - encryption data	50%	29%	14%	7%	0%
Recovery - assess providers ability	22%	64%	0%	14%	0%
Vendor reliability - what happens to your data	43%	57%	0%	0%	0%

In review of this challenge; the expert group identified a high level agreeing rank of 79%, but this rank was eclipsed by the main concern (that of vendor reliability) which received 100% agreement rank. This statement presented the issue of negotiating up front about what happens to one's data if a company goes out of business or is acquired. In continuation to the previous challenge; the statement citing the possible solution of working with one's provider to assess their ability and willingness to help one quickly recover from disaster scored an agreement of 86% and a low rank of 14%. All of the noted challenges are recognized as a potentially serious issues for customers moving backup to the cloud; however, none more so than vendor reliability and recovery.

4.2.3 Clouds Advancements on the Mistakes made by the Dot.com Bubble

In this question the expert group were requested to rank their opinions on statements relating to the problems of the Dot.com market crash and why cloud computing will not become a similar bubble. The two most significant corrections were market requirements and a better educated market both receiving just over 90% agreement mark. The market requirements referred to new cloud applications that attempt to match what the best application in their category offers and then proceed to provide a better interface, better integration with other applications, and more web features. A better educated market meant cloud computing would offer access to applications more quickly than traditional decision and implementation processes. This statement also referred to the fact that cloud computing customers do not own the physical infrastructure, instead avoiding capital expenditure by renting usage from a third-party provider.

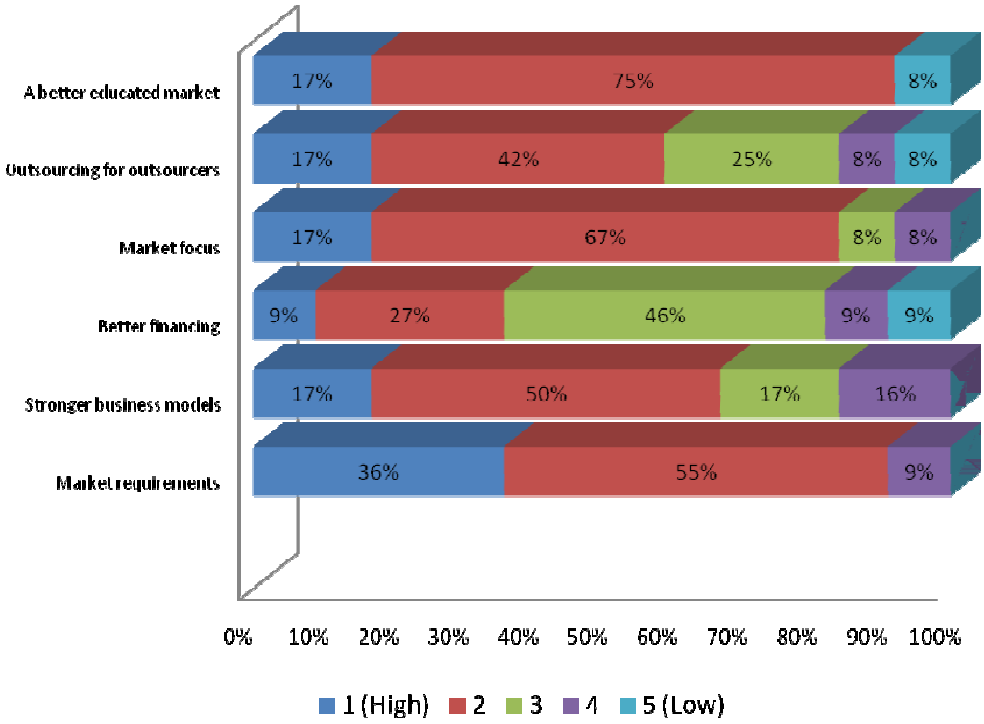

Figure 2. The cloud advancements on the mistakes made by the Dot.com bubble, in response to the question:

'Please indicate your opinion on the following statements relating to the cloud advancements on the mistakes made by the Dot.com bubble and if other please specify.' (Sourced from Wohl 2008)

The market strategy of vendors focusing only on a particular part of a marketplace meant that vendors are not actively focusing on multiple demographics unless they have multiple product and market strategies; this resulted in an agreeing response of 84% (Market focus). The issue surrounding stronger business models identifying that cloud vendors plan to monetize their software by either making a charge for each user or each transaction received a modest agreeing response of 67%. This was probably in recognition that different size enterprises will require different models. The most undecided response of 46% was in relation to better financing taking into context that venture capitalists have swarmed into the market and provided additional development and more sustainable marketing investments. The reason for the expert group's lack of enthusiasm associated with this correction is possibly related to the fact that the western world has not yet recovered from the global recession. The least positive response was outsourcing for outsourcers referring to the idea that vendors now believe it is better to partner for infrastructure than to invest in and run it oneself. The caution shown here was a repeat of the bandwidth issue (if backup services are to be outsourced to the cloud) in the previous question; it was identified as a challenge. The expert group has clearly indicated that the advancements of cloud computing are significant enough to warrant that there will not be a repeat of the Dot.com bubble, however there is still a considerable amount of caution in relation to the techniques involved.

4.3 Cloud Based Business Opportunities

4.3.1 Summary of cloud computing

In the expert groups opinion there is a lack of knowledge in the construction industry on the various types of construction cloud applications and due to the fragmented nature of the industry; a collaboration tool that provides interoperable software is a necessity.

This claim was further enhanced by the groups agreement of 85% (39% + 46%) indicating that the future of ICT is a service deployed from a centralized data centre across a network providing access to applications from a central provider and that cloud computing can act as a major agitator for improving ICT within the industry in the long run. The highest disagreement rank of 38% (15% + 16%) was related to the notion that the traditional packaged desktop and enterprise applications will soon be made obsolete by web-based, outsourced products and services which is slightly in contrast to the agreeing 77% response that suggests that cloud computing is an efficient and cost effective outsourcing process that gives company management the time to focus on their business. A similar result was also recorded for the statement that cloud solutions generate better opportunities by enabling enterprises to select more ICT priorities from an ever-growing menu of applications. The expert group has overwhelmingly stated that cloud is the future of ICT but they are still reluctant to predict that it is the end for traditional packaged desktop and enterprise applications. As in one expert opinion 'I don't believe that desktop applications will disappear. We need to provide strong information assurance for the cloud to progress. We should provide several options for payment, from per-use to annual licenses'. The pay-as-you-go payment option did only receive a modest 69% approval however this question was also subject to asking the respondent would they themselves implement it. In contrast to previous questions relating to the risk of security, the view that cloud computing presents information risk, but probably not significantly more than in a traditional outsourced environment, indicates that the group does acknowledge cloud's creditability. Redmond *et al.* (2010) identified through a study of the barriers for adoption of cloud computing that vendors do not necessarily believe that construction SMEs have the capability of using cloud computing. The expert group's opinion resulted in a mixed outcome of 46% in favour, 23% undecided, and 31% disagreeing. In summarising the industry and its productivity one expert stated 'Web-based solutions are critically important to increasing efficiency and productivity throughout the construction industry'.

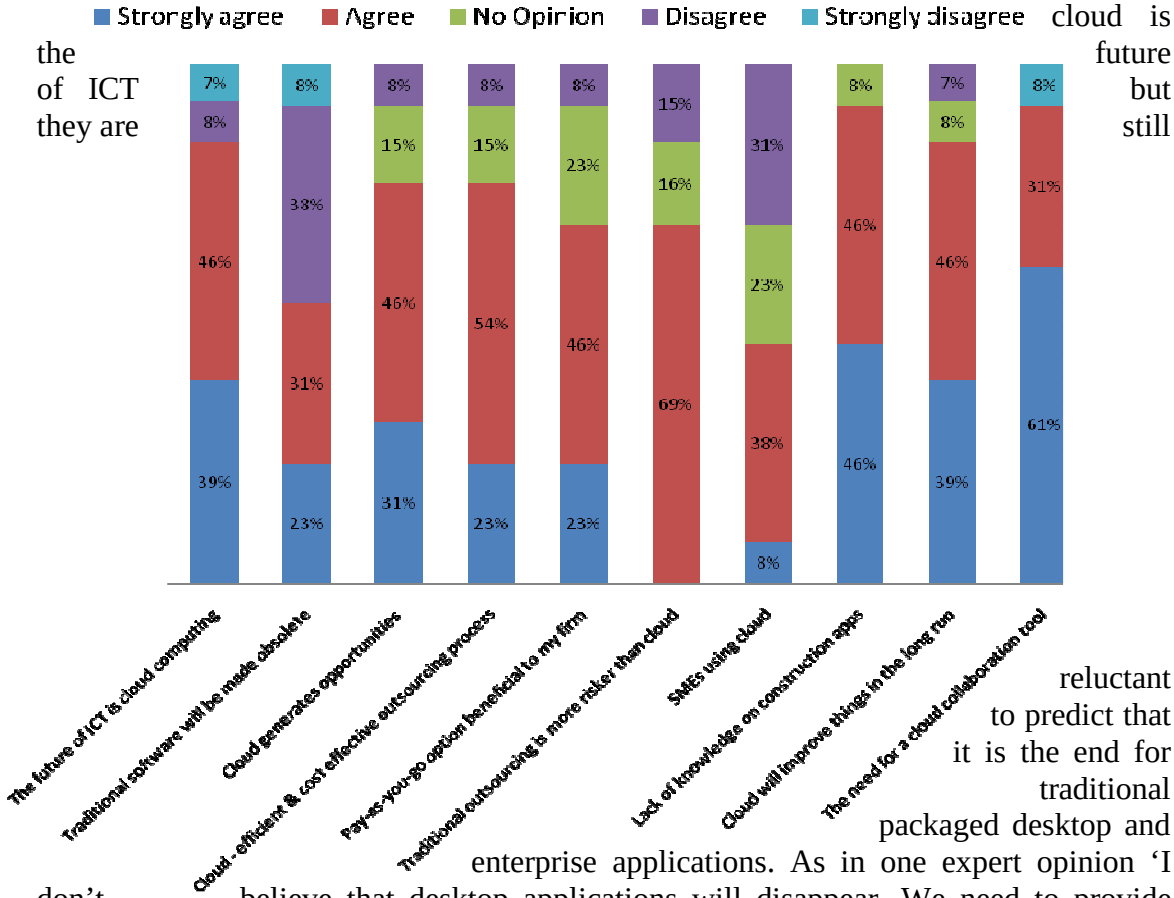

Figure 3. Summary of cloud computing, in response to the question:
'Please indicate your opinion relating to the following statements' (as indicated above).

4.3.2 Perceived benefits of cloud computing

The eight proposed perceived benefits of cloud computing were originally reported in Hore *et al.* (2010). These questions were sourced from Ramanujam's (2007) key points as to why Cloud/On-Demand would be a smart choice for companies. Hore et al identified through a mixed vendor and consumer survey sample of 90 enterprises that only 10% of enterprises disagreed with certain attributes of the benefits, such as, reducing capital cost of purchasing software and not having to worry about disaster recovery. In analysing the expert group's responses again disaster recovery was evidently a concern, with the experts indicating a disagreeing response of 23%. The highest disagreeing response of 25% was directed towards having the ability to manage a premise-based facility so attention can be redirected towards the customer. The highest agreeing response of 92% highlighted the benefit of allowing one to pay-as-you-go, pay for usage rather than for software licenses and hardware infrastructure. This was in contrast to the previous question (summary of cloud computing) where the respondents only delivered a 69% confidence grade. Both managing a premise facility and frequent updates had the highest undecided percentage rank of 25%. The notion of having access to the best of breed technology did; however; result in a positive 75% whereas managing a premise facility represented the most negative responses of all the benefits. Easy role out and maintenance, spread out costs (avoiding capital expenses and installation), and passing the onus of supporting growth onto the Software as a Service vendor all received above average agreeing responses relating to their benefits. In assessing the problems associated with premise-based facilities one expert carefully summarized this issue 'Premise-based facilities must serve the mission of the company that builds such facilities. A cloud-based as-built-BIM should be utilized intelligently and effectively by the owner to make better business decisions more quickly. Not all premise-based management decisions need to be outsourced. That said, increased access to higher quality information is critically important and hosting that information on the web makes sense'.

Table 4. Perceived benefits of cloud computing, in response to the question:
'Please rank in order 1 – 5 (1 being the highest) which of the following perceived benefits do you think is a major attribute to the construction industry and if other please specify.' (Sourced from Ramanujam's 2007)

Perceived benefits	1 (High)	2	3	4	5 (Low)
Allows one to get out of the business of managing a premise facility	25%	25%	25%	8%	17%
Allows one to pay as you go	33%	59%	8%	0%	0%
Easy role out maintenance	25%	50%	9%	8%	8%
Spread out cost	23%	54%	23%	0%	0%
Frequent updates	42%	33%	25%	0%	0%
Focus on growth	23%	38%	23%	8%	8%
No day to day maintenance	31%	46%	0%	23%	0%

5 Conclusions and Further Research

The objective of this questionnaire was to analyze selected expert opinions on the future of ICT in construction based on implementing a cloud service hosting three interoperable applications. The results indicated that there are several positive reasons as to why cloud computing should be considered, such as its ability to increase efficiency and productivity throughout the construction industry. In relation to BIM the experts acknowledged that the key to an integrated BIM is a common database (cloud) where component parts of the building are modeled in disparate software programs. The experts identified through the business process that construction development should be treated like manufactured products delivered by a team of professionals with a common purpose. The expert's reference to the Dot.com era emphasized that cloud was not a buzz word and that it has real substance. Including security; the main barriers to cloud computing are vendor reliability and recovering data. The main benefit of a cloud-based as-built-BIM is its ability to increase access to higher quality information resulting in faster business decisions. In conclusion; the results have demonstrated that the concept of developing a collaboration tool based on a common database is credible and that a cloud platform would be a key provider for an integrated BIM system. However, whether accountancy and project management applications are the most suited combination still needs to be determined and the process involved with developing such a service needs further investigating. The experts have evidently shown support for the concept but more data must be obtained and analyzed on how this service can be developed to meet the individual needs of professional practices at the design stage of a project.

6 Acknowledgement

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Intractability of data on complex construction projects caused by the reliance on Construction Project Extranets: a case study

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Abstract:
It is widely acknowledged that effective communication among team members on a construction project contributes to the success of that project. Efficiency gains in current information management and sharing practices, arising from a combination of database and internet-based systems, are also well recognised. Various studies support the range and scale of cost-saving potential on construction projects associated with the deployment of such systems. However, the experience on a recently completed large-scale development in the UK - MediaCityUK - raises concerns about the translation of this potential into actual use and benefit to construction processes and outcomes. Several factors common to many large construction projects: the huge amount and wide dissimilarity of information that is involved in the construction process, and project participants' widely varying specialties, expertise, education, professional skills, computer proficiency, and working environment, can impede the information management and communication on extranets, leading to very expensive and difficult-to-rectify mistakes. Finally, there are often material discrepancies between how architects of construction information management systems assume those systems will be used, and how they are actually used. These discrepancies can not only limit these systems' potential benefits, but also contribute to a range of defects associated with the intractability of user-submitted data.

Keywords:
data management, extranets, MediaCityUK

1 Introduction

In the UK, the majority of complex construction projects are delivered through Virtual Corporations (VCs) – project-based temporary organisations of clients, consultants and construction firms. Each partner in such organisations mixes and matches its 'core competency' with those of the other companies. The main objective of VCs is to assemble a `best of everything` corporation that can take advantage of economies of both scale and scope. This evolution toward VCs is driven by the increasing complexity of construction projects and an increasing need for specialisation (Vrijhoef, 2004).

Current efforts to improve organisation and procurement methods increasingly focus on more effective management of VCs, e.g., through horizontal integration of firms involved in the construction effort through formation of strategic partnerships, team

selection strategies based on the appointment of one-stop, multi-disciplinary design firms, and various forms and degrees of design-and-build procurement strategies.[1]

Two significant problems many VCs face are how best to co-ordinate all the activities carried out by the independent parties and exchange the large amount of complex data among those parties (Grabowski, 1998). The amount of information to be exchanged increases with the number of organisations involved in the project. Nowadays there can be more than 100 companies involved in the delivery of a large-scale scheme[2]. The number of design documents (such as drawings, schedules and programmes) in such a scheme may exceed 60,000, and the combined number of all documents and processes associated with the project delivery may exceed 165,000[3]. Given the sheer magnitude of all this documentation, it is apparent that effective inter-organisational co-ordination – especially accuracy, effectiveness and timing of communication and exchange of information among project team members, i.e. having everyone working to the same up-to-date information – will be critical to the success of complex projects.

To facilitate effective collaboration, every VC uses some form of business integration tool that includes all functions of project management for the enterprise and its partners – a Construction Project Extranet (CPE).

It would be unusual nowadays to find a large construction project that does not use a CPE, which typically provides a web-based access and user interface, document storage, configurable process workflow (to manage flow of documentation), and audit trail reporting (to track status and progress across activities and the entire workspace).

Extranets are a powerful medium through which vast volumes of information can be manipulated in a sophisticated manner. There are many Application Service Providers (ASPs) who provide extranets, e.g.: BuildOnline, Causeway, Cadweb, Sarcophagus, BIW, 4Projects, Business Collaborator and Bidcom, which are combining to form an industry group (Suchocki, 2006).

Extranet utilisation has become a common pre-condition for participation in the tendering process and potential appointment as a project team member. For example, all members of the Design Team on the (currently) largest residential development in London (£4bn) are requested to make an allowance for the use of a 'preferred Management Information System (i.e. BIW/Microsoft Share Point) to be specified/designated by the Client for storage, reconciliation and onward communication of design documentation'[4] at the Request for Proposal stage (RFP).

However, despite long co-operation in networks among construction team members and many years of utilising extranets, the construction industry still frequently suffers from delays, budget overruns, quality issues and defects. The causes of such issues are the subject of wide-ranging research, and there is also extensive literature on drivers of and costs of rectification of defects in construction. Yet, no investigations into CPEs themselves as a potential driver of defects have been discovered.

[1] Conclusion from the initial review of tender submissions (May 2011) for the design and construction of the new £225m landmark tower.
[2] Observed on MediaCityUK
[3] On MediaCityUK' project extranet (BIW) on 2 June 2011 there were 165,876 documents and processes (60691 Documents, 5112 Forms and Processes, 86855 Comments, 13218 Instructions and Instructions Responses) and 39080 Defects.
[4] EC Harris Request For Proposal (RFP) Form

Experience on a recently (December 2010) completed large-scale, complex development – MediaCityUK in Salford – suggests that certain problems associated with reliance on extranets, such as intractability and reduced interoperability of data, can contribute to a range of defects, and lead to very expensive and difficult-to-rectify mistakes. The initial feedback from the team involved in the delivery of another complex project (high-end residential scheme in London, project value: £50m, to be completed in June 2011) verified this problem, raising concerns about the translation of extranets' potential into actual use and benefit to construction processes and outcomes.

The construction industry's typically thin project margins (1% to 2%) only underscore the importance of the effective use of extranets (Chien *et al*., 2010). With many ASPs claiming savings of 1.3-5% of construction costs through the use of extranets (Chien *et al*., 2010), it is important therefore to identify any barriers to the realisation of those savings.

The paper consists of five parts:

1. Introduction: a theoretical analysis of current understanding of circumstances in which complex construction projects are delivered and tools utilised to facilitate collaborative working.
2. Literature Review: insight into the current research concerned with recognised problems linked to extranets' deployment.
3. Case Study: project-specific challenges to the successful operation of extranet system on MediaCityUK project in Salford.
4. Findings: results and interpretation of case study's findings.
5. Conclusion: insight into the implications of currently utilised extranets on the occurrence of defects on complex construction projects, and possible ways of mitigating such defects.

2 Literature Review

Four distinct sources of information and insights into the performance of construction collaboration technologies and their impact on project teams are considered in this review: 1) independent research by individual researchers and research groups, 2) research by project extranets providers, 3) research by the end users of these systems, and 4) direct practitioner input.

2.1 Independent research

The main focus of independent research into the performance of construction collaboration technologies appears to be on their collaborative working potential for project teams and end-user enthusiasm (El-Saboni *et al*., 2009, Diez *et al*., 2009), and potential and realised cost savings linked to extranets' deployment (Sommerville *et al*., 2004). The majority of published research focuses on the benefits associated with deployment of extranets, which might be grouped into four categories: 1) improvement in project team communication, 2) improvement in the distribution of information, 3) increased productivity and 4) provision of a collaborative environment (Chien *et al*., 2010).

Some research has focused on barriers to the effective use of extranets in the construction industry, for example a study by Mitchell and Demian (2008), who

identified three groups of barriers to effective use of project collaboration tools: technical, people-related and managerial.

Regarding technical barriers, Mitchell and Demian survey results have highlighted that extranets are not delivering the speed of service required (32% of respondents finding extranets to be 'very slow' and 36% finding them 'slow'), and user feedback recorded by Wilkinson (2011) questioned the reasonableness of certain processes: 'I am sure I'm not the only document controller who has to sit twiddling my thumbs while I wait for the 500th commented document to print/download/save. It's boring but necessary work that some people think can be avoided by purchasing an archive at the end of the project'.

The second identified group of barriers – people – was the subject of a study conducted by Daniel and Elling (2004), who concluded that extranets, like many tools, are useless without the right people. In the Mitchell and Demian survey, 71% of users received two or fewer hours of training, and 66% of respondents identified that the training received was insufficient to enable successful operation of the extranet. A good insight was provided by an experienced document controller: 'We all know how it goes. Peter reluctantly goes off to a training session and comes back all enthused. He has a quick one-to-one with Paul who then teaches Sarah who passes her knowledge onto Mark. Meanwhile, Peter has been offered a shiny new job with the Dark Side and suddenly no one in the office has actually had any formal training. Nobody wants to suggest they should go because, after all, they're really busy, they have enough knowledge for what they need to do and, in any event, someone would have to pay. The software vendor offers but nobody wants to pay their rates' (Wilkinson, 2011).

Regarding the third identified barrier – managerial – Chien (2010) survey results revealed that client support for extranet usage is low. However, it has to be noted that this situation may be understandable on small- to medium-sized schemes due to significant set-up costs of extranets. On large complex projects clients are on the forefront of extranet implementation as their deployment moves away many risks from the client to the project team.

2.2 Research by the extranet providers

All project extranet providers use statistics to support the proposition that their applications are useful and beneficial to a project and its client, and generally to validate product performance.

2.3 Research by the end users

In line with the end user account set out, for example, by Atkins' Research and Innovation Manager Marek Suchocki (2008), despite widespread adoption of extranets, their impact has been largely restricted to controlled file sharing with little improvement in information-sharing procedures or practice.

2.4 Direct practitioner's input

The direct professional input presented in the Case Study highlights some disadvantages that should be recognised. The main recorded problems are linked to users' capability of managing a huge amount of data, spamming, spelling problems, frequent changes in project team membership and the nature of learning in construction.

3 Case study: MediaCityUK

Since May 2011 British Broadcasting Corporation's (BBC) programme-making departments are up and running from Europe's first purpose-built creative and media development in Salford. This metropolitan borough of Greater Manchester joined Singapore, Seoul and Abu Dhabi on the world's media map with its £650m first phase of MediaCityUK, consisting of 700,000 sq ft offices including the BBC and University of Salford, 250,000 sq ft high definition (HD) studios including the largest HD studio in Europe and one dedicated to the BBC Philharmonic, 60,000 sq ft of shops and leisure facilities including bars, restaurants and healthcare services, a public park, an events space twice the size of Trafalgar Square, 378 new apartments, a 218-bed Holiday Inn, retail units, a supermarket, a 2200-space car park, a new bridge, a new tram link to Manchester's city centre and a highway junction. Each of the three BBC buildings was completed ahead of the agreed delivery date and under the planned cost (Plunkett, 2010), and the whole of Phase 1 achieved standards that did not even exist when the construction commenced[1].

MediaCity's VC operated like a social unit, responding to perpetually changing needs, scope, programme, budget and strategy. Driven by the client (Peel Group) and contractor (Lend Lease), it utilised BIW's extranet solution to co-ordinate all activities and exchange the huge amount of complex data and information. However, unlike many other large, complex projects, MediaCity featured no remote co-ordination of the shared platform.

On large and complex projects the co-ordinator is usually not involved in design nor works. Most of his activities are aimed at facilitating deliberation among the VC's parties on the progress of the project and measures to be taken. The co-ordinator is usually controlling the flow of materials and the use of capacity, eliminating political factors, overcoming conflicts of interest and aligning priorities. Due to the remote nature of his role, a distant co-ordinator is often assumed by the project team members to have only superficial knowledge of their processes (Kornelius *et al.,* 1998).

The co-ordinator role, usually fulfilled by a consultant project manager, was initially considered for MediaCity, and there was an attempt to introduce and establish this function on the project. However, due to the timing of the introduction, with procurement processes and site operations already underway, it became apparent that the size of the project, amount of data and complexity of its processes would exceed any one individual's management capacity. In response to this challenge, MediaCity's extranet was converted to a bottom-up (instead of the typical top-down) system. Following simple rules set out in the protocol, participants populated and interacted directly with the database. Effectively MediaCityUK's extranet thus became a self-organising system that functioned as an environment, creating an interaction space for its participants.

Experience from another project, a still-under-construction mixed-use 36-storey tower in London (value: £136m), in which a contract administrator has taken on the co-ordinator role, demonstrates that problems associated with controlling the data flow on large complex schemes can occur irrespective of the adoption of a self-organising system.

[1] BREEAM Communities Excellent Award

The unusual extranet structure used on the MediaCityUK project followed Peel Group's general project organisation strategy, which relies on a large number of local, highly specialised firms providing customer service within their (often very narrow) expertise, instead of the appointment of one or two one-stop multi-disciplinary design firms, design team joint ventures or complex sub-consultancy arrangements.

In addition, the design-and-build procurement strategy, which is commonplace on large complex projects, was abandoned in favour of one of the most challenging procurement methods in construction: management contracting (MC).

These three strategic decisions – 1) lack of top-down administration of the shared platform, 2) very large number of collaborating partners, and 3) a very rarely (nowadays) adopted procurement strategy – along with the huge amount of data produced by a project of this scale, created an unprecedented amount of information that needed to be exchanged.

During the project lifecycle, numerous post-contract changes to the scope, programme and location and shape of the buildings further multiplied the amount of documentation. As a result, sufficient specific knowledge about management issues could not be brought in by any one project team member. To resolve the strategic problems arising from these unique circumstances, an extensive amount of inter-organisational learning took place.

The necessary inter-organisational learning followed the main characteristics of learning on construction projects. In the construction industry learning is based on a movement away from known problems rather than towards imagined goals – i.e., based on correcting experienced unfitness (defects) rather than striving for planned fitness-for-purpose (Brand, 1995). Actual defects and problems encountered on-site were the main prompts for (corrective) action.

4 Findings

The experience on MediaCityUK raised concerns about the translation of extranets' potential into actual use and benefit to the construction processes and outcomes on large, complex projects. With the increased complexity of projects come diseconomies of scale - intractability and reduced interoperability of data. The discussion of findings will focus on intractability of data linked to reliance on extranets as platforms for co-operation and information exchange.

Two main aspects contributed to the intractability of data: 1) the unprecedented amount of data to be managed and 2) human error.

4.1 The unprecedented amount of data

The amount of data uploaded on the extranet that had to be managed, referenced and reviewed grew from 4,277 documents (drawings, schedules, programmes, scopes of works, registers and so forth) uploaded in the first year (2007), to 19,459 documents in the second year (2008), reaching 25,884 in the third year (2009) and then declining

(following several sectional completions[1]) to 10,833 documents in the fourth year (2010), giving a total of over 60,000 documents uploaded over a four-year period.

In addition to documents, there were also many (105,000) forms and processes that had to be reviewed, controlled and monitored – 3,106 in the first year and 29,353 in the second year. It was not possible to establish the statistics for the third and fourth year as every attempt to generate a list actually caused a fault in the extranet system preventing the request being completed – probably due to data overload.

The majority of case study literature concerned with extranets considers database sizes only up to 15,000 documents, and the teams involved in their delivery provided positive feedback on performance, save for occasional issues with internet speed and the need to download a great amount of data at the end of a project. Considering the difference in quantity of documents and processes (15,000 versus 165,000), it is possible that the problem of intractability of data simply didn't occur on case studies reviewed so far.

At the end of a second year of the MediaCity project, the cumulative sum of all documents and processes exceeded 56,000, prompting an ineffective and subsequently abandoned attempt to re-structure the data management strategy. This further raised a concern over how the optimum or equilibrium data cluster size could be determined within the project – and whether an algorithm governing this interaction could be found. Of course, some of the drawings had been superseded and some processes had been deactivated; nevertheless, the sheer amount of information to be processed at any one time posed a management problem and required a significant amount of on-site re-work.

In addition, as observed on smaller projects reviewed by extranet provider Cadweb (2010) during a performance evaluation of their product, extranet users created a significant amount of "spamming". Cadweb reported that on projects using their product, every file uploaded was distributed to an average of 11 people rather than five. The amount of spamming on MediaCityUK is consistent with this observation.

The significant amount of data – 100 documents on average being issued on each working day in the third year of site operations – resulted in a problem faced by many environments, both real and virtual: the system reached a scale where the growth turned cancerous, i.e., beyond which growth without damage is not possible.

It is generally recognised that co-ordination becomes impossible when there are too many participants. Oversized populations require additional mechanisms to cope, such as pattern-matching tools and feedback (Johnson, 2002) – both instruments yet to be contemplated by extranet providers. An illustration of the undeniable benefits from implementing such tools is provided by one end user: 'How about a nice button that downloads drawings with redlining and – this really is dreamland – a sheet that has all the written comments on it? These could be named something like this: (68)001_cmts.pdf, (68)001_red.pdf, etc' (Wilkinson, 2011).

4.2 Human error

The wide variation among the project participants of specialities, expertise, educational background, professional skills and computer proficiency impedes the information management and communication of the project team, leading to very expensive and difficult-to-rectify mistakes. Examples of such mistakes are: construction of high-

[1] MediaCityUK Phase 1 consisted of 20 Sections

performance partition walls in line with a long-revised specification, in the wrong location (to superseded general arrangement drawings), and accidental omission of drainage outlets in post-tensioned slabs due to setting out of services being undertaken on the basis of architect drawings that are not cross-referenced to structural engineer layouts.

Human error affects the following aspects of data: versioning, searchability and publishing.

4.2.1 Versioning

Versioning is a process by which documents are uploaded, or 'checked-in' (in extranet vocabulary) to the document management system. This allows users to easily access the most-up-to-date version as well as retrieve previous versions.

Many problems arise from spelling mistakes and improper use of spacing and sequences of words and numbers. For example, if a user erroneously uploads a schematic document as file type "SCHE" (schedule) instead of the correct "SCH" (schematics) – an easy mistake to make – a schematic will be filed as schedule, and the association of that file with its previous versions will be lost. This could easily result in some team members working to a version that has been superseded.

Inconsistency in file naming is also common when drawings are reviewed, amended and re-saved by users. The mistake is not necessarily the result of user error. E.g., if there is more than one user accessing a file simultaneously, one user's computer operating system may automatically re-save a file with a changed file name (e.g., as "0001(2).pdf" instead of "0001.pdf").

Finally, due to the often small difference between different categories of documents, for example schematics (SCH) and sketches (SK), many files are classified in practise by their authors as other (OTH), simply to avoid incorrect filing.

4.2.2 Searchability

Searchability is the ability to find documents and folders using metadata. Documents can be searched using various attributes and document content. Metadata may, for example, include a revision identifier, the date the document was uploaded, issuing company, the identity of the user uploading it, recipients to whom it was issued, whether and when they have accessed it, or keywords.

Changes to the scope of the project or to protocols following extranet software upgrades (which can reasonably be expected on projects spanning more than one calendar year), user modifications to the filing system, and company mergers have created variations to established protocols and processes and contributed to data 'loss' – end users' inability to find and retrieve information.

4.2.3 Publishing

Publishing a document on an extranet involves reviewing, authorising, printing and approving procedures. Despite the existence of protocols and company quality assurance processes, it is not unusual to find an odd page – among contractual documents or incorporated into a specification – contain personal user information, such as car leasing details or a credit card statement.

5 Conclusion

The delivery of large, complex projects by temporary organisations – Virtual Corporations – is characterised by a heavy dependence on the exchange of large and complex data and information. Various web-based project collaboration tools are available to facilitate co-ordination, accuracy, effectiveness and timing of communication and the exchange of information and data among project team members.

Most studies of such web-based project collaboration tools conclude that one of the main advantages of using extranets is that it ensures that all members of the project team have access to the most up-to-date versions of the various project documents, so that traditional mistakes generated from someone working from an old document or drawing are in theory removed (or at the very least reduced). However, the experience observed in the presented case study raises concerns about the translation of this potential into actual use.

The combination of extended fragmentation of the construction industry, the huge amount and wide dissimilarity of the information that is involved in the construction process, as well as a wide variation of specialities, expertise, educational background, professional skills, computer proficiency, and working environment among the project participants impedes the information management and communication on extranets, leading to very expensive and difficult-to-rectify mistakes. Also, on large-scale projects, where extranets are extensively used, team selection and procurement strategies resulting in increase of the quantity of project data and users further contributes to the problem of data intractability.

This study focused on the main identified driver of defects associated with the reliance on extranets: intractability of data. It also outlined the gap between current working practices in construction and behaviours assumed by the architects of such systems and researchers. In line with the end user account, the most frequently mentioned feature of extranets in academic research – accessible real-time data across the globe – is secondary to extranets' main purpose – controlled file sharing. 'Sure it's nice to send documents halfway across the world in seconds, or to be actively commenting on a drawing through a super-trendy interactive whiteboard, but at the end of the day, all these systems exist to stop someone being sued' (Wilkinson, 2011).

It is possible that problems associated with controllability of data can be resolved with Building Information Modelling (BIM). Following the completion of MediaCityUK scheme, the lead designer (co-ordinating architect) team commenced work on a £450m redevelopment of Leeds' city centre (Leeds Trinity) using BIM for communication and the development of information and data. BIM uses proprietary or open standard digital technology to provide a representation of all the physical and functional characteristics of a facility and its related project and lifecycle information (AIA, 2011). BIM allows each project team member not only to add to and reference back to all information they acquire during their period of contribution to the BIM model, but also to test proposed design solutions and assess buildability. Although the project is still in the early stage on-site, the feedback so far suggests that certain data intractability and reduced data interoperability issues[1] encountered on MediacityUK might have been avoided by deploying BIM.

[1] BIMs have their own known interoperability problems.

The MediaCityUK case study contributes to existing theory by showing that projects of that scale require a solution that goes beyond the vector-based CAD software and sharing of secure files. An important area for future research, therefore, is to gain a better understanding of the considerable risks associated with intractability of data on large, complex projects and whether this can be resolved by the combination of 3-dimensional shared models, pattern-matching tools and feedback.

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Innovative research methodologies

Collaborative Efforts by a U.S. University to Produce Practical and Relevant Construction Research through Product Development and Intellectual Property

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Abstract:
Scholarly efforts among construction management (CM) programs in the U.S. have historically produced research results largely related to management practice theory, pedagogy, and select technical performance. While beneficial, this type of research frequently does not capture the attention of professional construction practice, due to its often being perceived as practically 'removed' from industry. As such, relatively little research within construction management programs is externally funded, as compared to counterparts in engineering and related disciplines. This disconnect represents an opportunity for CM programs to find ways to increase practical research in an effort to better engage practitioners. This case study explores collaborative efforts focused on new construction products, tools, and materials developed between students and faculty from both construction management and industrial design programs at a major U.S. university, joined by practitioners from both disciplines. This paper details the latest iteration of the program, now in its fifth year, with respect to academic/industry development and research, and illustrates how the program has yielded opportunities for faculty and graduate students to produce research, patented products and intellectual property for the university.

Keywords:
collaboration, interdisciplinary studies, product development, innovation, industrial design

1 Introduction

In the U.S., research by university faculty in construction management programs has typically focused on three areas:

Management techniques

Teaching and pedagogy

General parameters related to a materials or methods of construction

Of the ten most downloaded journal articles from the International Journal of Construction Education and Research during 2010, approximately one-third focused on methods of design and construction such as LEED or BIM. Another one-third of the articles focused on teaching in construction management programs. The remaining

articles focused mainly on management practice or theory (Gunderson, 2011). While not quantitatively significant, these articles represent a broad spectrum of construction research at U.S. universities housing construction management programs.

At the same time, productivity in the construction industry has been on a relatively consistent decline since 1960 (Melnick, 2007). Exact definitions of productivity vary, but the clear trend is a construction productivity index far from desirable. Such a trend appears alarming considering the productivity gains in such industries as automobile and electronics manufacturing. Specific reasons for this decline have not been fully detailed. Few, if any, argue that academic research related to construction at U.S. universities has made any major shift in construction productivity.

Safety may also a tangible area where construction research has the potential to make a direct impact. Almost 6.5 million people work at approximately 252,000 construction sites across the U.S. on any given day (OSHA, 2011). OSHA further indicates that the rate at which fatal injuries occur in construction is higher than the national average in its category for all industries.

Many in professional practice might argue that academic research in the U.S. is distant and disconnected from what occurs on the construction jobsite. They might also argue that academic research often does not address real life organizational problems, and that academic research within the U.S. has limited relevance with regard to the tactile needs of the industry. This perceived disconnect between professional practice and construction academics has negatively impacted the growth of meaningful construction research within U.S. construction management programs, begging the questions:

How could U.S. construction management programs introduce meaningful, practical research? Could such research better engage industry practitioners? What other disciplines could best collaborate with construction researchers to add practical value to the industry? How could such relationships be forged and organized?

This paper presents a case study that explores collaborative efforts to address practical productivity and safety issues by developing new construction products, tools, and materials. The research was conducted at a major U.S. university by students and faculty in both construction management and industrial design programs. These individuals were joined by professional practice partners from both disciplines to provide input and guidance on the research and development. Now in its fifth year, the effort has yielded numerous peer reviewed published papers, closer ties to industry, and patented products that represent intellectual property for the university. While the long-term goals are for the innovative culture produced through the program to ultimately impact the classroom in the construction curriculum, this paper focuses primarily on the program output and research, and its potential impact on industry.

2 Literature Review

2.1 Construction Research Defined

Almost four decades ago, Paulson noted four key areas of construction research (Paulson, 1975):

Manpower and Organizational Development (training as well as organizational structure)

Management Methodologies

Innovations in Construction Methods

Construction Industry Dynamics (interaction with economy, government, labor, public)

More recently, Kulatunga et al further defined "Construction Research and Development" as "the systematic investigation to establish new or improved products, processes, management methodologies" to address the following (Kulatunga et al., 2007):

Customer Needs

Resource, Environmental and Economic Constraints

Government Regulations and Public Policies

Competitive Edge of Construction Firms

While stated differently, the definition of 'construction research' appears to not have changed much, and is still general in nature. Information resulting from this type of research is often generic in nature or simplified to conditions not realistic on a job site. Thus, results are not easily "translated into commercial advantage for any individual firm" (Courtney, 1999). Barrett and Barrett indicate that industry is often "disappointed with the contribution of (construction) research, either because it is too theoretical or because the simple solutions suggested do not work" (2003).

Such general research creates little incentive for U.S. commercial contractors to fund academic research in construction. Construction practitioners see working with academia as beneficial only to the extent that it "advances the company toward its goals" (Pertuze et al., 2010).

2.2 Practical Construction Research is Vital

Recent graduates of U.S. construction management programs generally operate in the field, earning their living on construction sites or in offices that support construction sites. As such, meaningful research for this group of individuals will "be applied and be geared toward field operations" (Mayo, 2000). Research that produces ideas or concepts that could be used directly by industry has the potential to positively impact the construction process.

Throughout history, improved productivity has been a consistent driver for economic prosperity. Research and innovation in construction is vital to improve productivity and to increase competitiveness (Tatum, 1989). If a clear connection could be made between academic research and new products that increase productivity, tangible benefits to the construction industry would be realized.

Funding of construction research projects undertaken by U.S. construction management programs is challenging (Mayo, 2000). The private sector represents possible sources of funding for U.S. Construction Management programs; however, they will require a commercial return on their investment (Courtney, 1999).

2.3 Potential Drivers of Future Construction Research

Several market factors' influences on what and how research is conducted at U.S. Universities are evident. These market factors occur outside the traditional paradigm of U.S. construction research; however, they have the potential to significantly impact future research trends.

2.3.1 Collaboration in the Built Environment

Shifts in project delivery approaches during the past thirty years have redefined the practice of design and construction within the U.S., with integrated models of project delivery involving teams of owners, designers, and builders becoming the rule, not the exception. The growth of the design-build delivery system as well as newer models such as integrated project delivery (IPD) are shaping the future of the built environment within the U.S. Other industry trends such as prefabrication and building information modeling (BIM) are requiring completely new perspectives on collaboration in the industry.

2.3.2 Collaboration in Academia

Similar trends toward collaboration are occurring in academia (Holley and Dagg, 2006; Selva and Carulli, 2007; Doerfler et al., 2009; Holley and Emig, 2010). By combining students of multiple disciplines in learning environments, students have the opportunity to recognize the goals of other disciplines, understand the knowledge base of participating parties, and learn how to work within a team to produce a product or service. U.S. design and construction programs are attempting to extend this beyond the classroom. The Architecture + Construction Alliance (A+CA) is one such organization that seeks to foster interdisciplinary work between architecture and construction management programs. Composed of 14 institutions in the U.S. that include design and construction within the same academic unit, a clear path toward greater collaboration in learning environment has been paved (Architecture + Construction Alliance, 2011).

2.3.3 Tight Margins for Private Firms

Construction firms compete on small profit margins. Firms are intensely competitive with the vast majority being small enterprises of individuals. With smaller firms and fierce competition, investment in research and development by U.S. construction firms has generally been small. Advances in construction within the U.S. tend to be project oriented. Many of these advances cannot be protected by intellectual property rights, thus disseminating rapidly through the industry.

As Courtney indicates, the costs of research are certain while the benefits are uncertain. In an environment where profit margins are small and competition drives the market,

little emphasis can be placed on "uncertain benefits" (1999). Thus, construction firms tend to view research and development as an optional rather than a core focus of their business (Roberts, 2002). At the same time, firms do not have sufficient margin to internally fund research and development.

Despite this historical resistance to research and development, new industry trends in technology (BIM and associated applications), green construction, and lean construction have provided opportunities for universities to reconnect with industry partners. As firms continue to embrace these tools and techniques in finding their competition edge, an opportunity exists for firms to tap university resources for research and development (Geiger, 2008). Research partnerships are most effective "when companies seek university expertise to address a broad spectrum of topics spanning several fields and intended to lay the foundation for future product development." (Geiger, 2008) Long-term relationships are becoming more common as industry seeks opportunities for competitive advantages.

2.3.4 Collaborative Work Outside the U.S.

Extensive efforts have resulted in increased collaboration and subsequent innovation in the construction industry. In Australia, the Building Research Innovation Technology and Environment Project has studied the "creation, adoption and diffusion of innovations" (Hardie et al., 2005). This project was initiated by the Cooperative Research Centre (CRC) which is a "national research, development and implementation center focused on the needs of the property, design, construction, and facility management sectors" (Cooperative Research Centre, 2009). The purpose of this collaborative centre is "developing key technologies, tools and management systems to improve the effectiveness of the construction industry".

In Europe, similar work has been conducted. Salford University in the United Kingdom has formed the "Centre for Construction Innovation". Its advertised purpose is to "further the growth of knowledge capital with the construction sector" (Centre for Construction Innovation, 2009). The centre attempts to promote interaction and collaboration between academia and industry on research and development issues. They indicate that the benefit to industry is the "advancement of research and development into new knowledge based markets, services and products" (Centre for Construction Innovation, 2009).

2.4 Opportunities for Collaboration beyond Design and Construction

Despite the need for construction research and development, the U.S. construction industry has a variety of challenges inhibiting effective research and development. One of these challenges centers on connecting the output of research with consumption in the industry (Kulatunga, 2007). Another challenge centers on effective communication with all relevant stakeholders in the research and development process.

If universities are to be an active part of this research and development, it is "essential to invent new ways to deliver the construction output in an economically, socially, and environmentally acceptable manner" (Kulatunga, 2007). Kulatunga further argues that effective and efficient research and development is vital in the construction industry to meet future requirements of all stakeholders (2007).

The following case study examines one approach by a major U.S. university to collaborate on construction research beyond the traditional bounds of design and

construction by partnering with industrial design. Very few collaborative efforts have been undertaken between industrial design education and construction education in the U.S. to improve construction productivity.

3 Research Methodology

This paper presents a study of a collaborative interdisciplinary research and development effort between industrial design and construction management programs at one U.S. University over a five year period. During the evolution of the program, improvements, drawbacks, and output were tracked by the researchers. The program development was iterative in nature and was without precedence in U.S. construction disciplines. With limited data and no comparison studies, a qualitative approach is employed by virtue of articulating the program's results, success, and shortcomings as they relate to the efficacy of providing meaningful tactile research in construction education.

4 Discussion from Ongoing, Evolving Interdisciplinary Research

Many products, tools, methods, and apparatuses used throughout industry are the result of input by industrial designers. As discussed in the literature review, few attempts, if any have been made to integrate industrial designers with construction professionals in a research setting at a U.S. university. In an effort to make the research truly collaborative, industry professionals, executives, and tradesmen were also invited to participate in the work. It was unknown at the project's inception whether it would be a repetitive effort, but as the report will indicate, the researchers determined that there was significant opportunity in continuing the process.

Initial goals of the research project were as follows:

Provide subjects for faculty research that would consider products, tools, and materials, as opposed to historically traditional research on management process theory, and construction education

Expand interdisciplinary collaborative efforts and opportunities for collateral learning between 'builders' and 'designers' among students and practitioners

Potentially develop products that might ultimately benefit the construction industry

Provide potential intellectual property for the university and inventors

The program costs were initially internally funded by the academic unit, covering expenses of product development and other fundamental necessities.

4.1 Year One – 2006

The collaborative research team included faculty and students from construction management and industrial design programs as well as a panel of construction executives. Construction management students were enrolled in a Master's program largely populated by students whose undergraduate degrees were outside the construction industry. The industrial design students were undergraduate seniors.

Product development ideas were actively sought by participating faculty and industry members. A formal list of potential ideas was generated by discussion with the construction executives and eventually narrowed to a list of fifteen industry problems that needed a specific product developed to address the noted problem.

The development of the products generally followed the industrial design studio format (Figure 1). Industrial design students led the development while construction management students assisted and coordinated discussion with construction professionals.

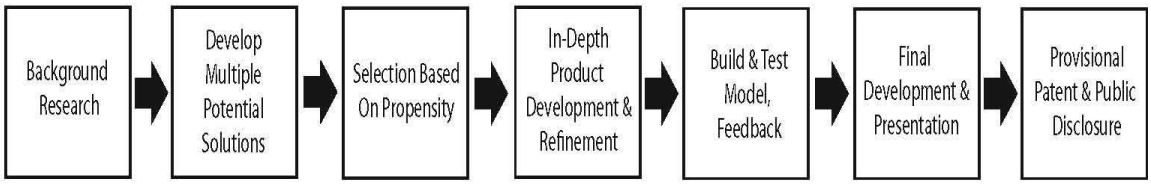

Figure 1: Initial linear progression of product design process

Of the fifteen products designed in year one, two products generated the most interest (Figures 2 and 3). One product was a pipe joint "wrap" for use with solvent based adhesives on plastic piping in cold weather. Essentially, the product keeps the temperature of the adhesive high enough to cure. The second product was a truss-lifter that allows home builders to lift trusses quickly and efficiently to upper levels without the use of a crane. The heat wrap was licensed by the university to an outside company, and the truss lifter has been patented by an independent manufacturer.

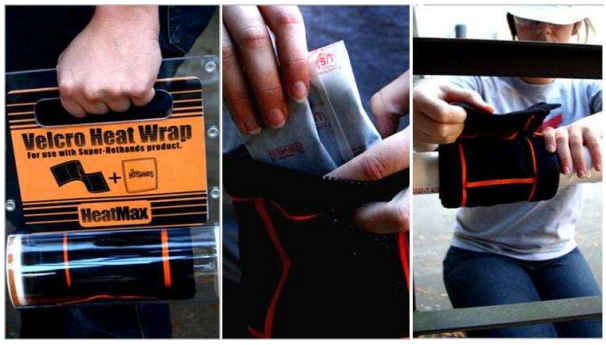

Figure 2: First year product developed to allow pipe joints to cure in cold environments

Figure 3: First year product developed to hoist residential trusses

Several products developed produced subjects for faculty research. The pipe wrap was tested quantitatively, yielding reduced curing times for pipe joints installed in cold weather conditions. Field research of the truss lifter was done by construction faculty and students. Results indicated substantial market potential for the truss lifter and

suggested possible areas of improvement including tilting of the trusses at the top of the lift and improved operating gear to enhance safety of the entire crew.

4.2 Years Two and Three – 2007, 2008

Based on the results of year one, the internal funding was continued for years two and three. Two key developments resulted based on year one. First, participating faculty recognized the need for education on technology transfer and intellectual property issues. An approach was devised, and all products were presented only after provisional patents were filed with the U.S. Patent and Trademark Office. Second, the industry participants were shifted away from construction executives and toward middle managers and project managers. This change allowed for more frequent interaction with students during the semester and provided a more direct link with the end users of many of the products being developed.

During this time period, it became evident that the process was best suited for smaller products. The researchers believe it is primarily a function of budget and timetable; also, a smaller product allows for deeper focus by the student developers. One such product was a chair for post tensioned cables in elevated flatwork, featuring a "living hinge" as well as leg indicators that allow for identifying the location of tendon drapes once formwork is removed (Figure 4).

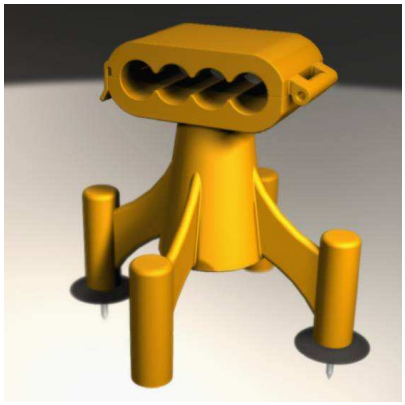

Figure 4: Post-tensioned cable chair for two-way slab construction

Again, several products produced published research. The PT chair produced peer-reviewed published qualitative articles, and clearly demonstrated that this was a successful way to include industry in the methodology. The chair was evaluated by university students and faculty using industry focus groups in major cities. These focus groups were composed of end-users of the potential chair including general contractors, concrete finishers, chair producers, and tendon and rebar fabricators. Papers were published by faculty members using the information gained in the focus groups. Such research provided a basis of information of potential outside manufacturing partners and provided ideas for a second generation development of the product.

4.3 Year Four – 2009

Several shifts were made in the research in year four. In the first three years, pairs of students worked on a specific project with all faculty and industry partners. In year four, students worked in teams with a dedicated faculty advisor and construction industry partner. This allowed teams to source problems, do research, and develop potential solutions in small, interactive, collaborative groups.

Year four also yielded the first informal partnership with industry. A curtain wall manufacturer asked a team of students to look at a specific connection issue that required excessive field labor to install. Representatives from the manufacturer became part of the student/faculty/industry team and provided support and feedback in the development process.

Second generation products were also examined in year four. The post tensioned chair from previous development was refined by a student team in conjunction with faculty focus group research (Figure 5). Based on raw materials to be consumed, the projected cost of chair manufacturing was reduced, and the chair was combined with elements of a product already in the marketplace. During the refinement process, a concrete industry company expressed interest in the product and worked with the students. Construction faculty and students then partnered with the interested firm to further evaluate the product. In this process, the chair has been shared with key stakeholders in the process providing information on marketability, final costs, and further product enhancement. All of these issues provide fodder for additional construction research.

Figure 5: Iterative Post-tensioned cable chair design

Partnerships were expanded in year four to include field superintendents and trade organizations. Many of these individuals worked in concrete and carpentry fields and provided a great source of problem generation.

Initially, the researchers hoped that the program would produce “ready for market” products. As year four concluded, it became more evident that this program may best serve an initial research and development component for industry. In such a model, products developed could then be transitioned to industry for further market study and improvement prior to offering a market-ready product. This approach is uniquely suited for furthering construction research as the products generate research. This research, in turn, generates refined product development. As products are refined, further research opportunities are apparent and market propensity improves.

4.4 Year Five – 2010

After four years of output, faculty leaders decided that an expansion of the program was necessary for long term success. Specifically, a year-long effort was envisioned as opposed to a semester-long approach in an effort to have appropriate product follow-up, manufacturing interface, problem sourcing, and partnership development. In April of 2010, an external three-year commitment of funding was secured for such an approach, which included resources for product development, post-development research, and industry partnering to pursue non-provisional patents.

Year five yielded the first major partnership with industry. One of the U.S.'s largest producers of construction related tools, products and devices partnered with the university, providing problem sourcing and development feedback.

Figure 6: Concrete Reader

Figure 7: Laser Mast

Figure 8: Ergonomic Kneeboard

Figures 6, 7 and 8 show three second generation efforts; 6 is a concrete reader which easily attaches to vertical formwork to easily show when the concrete is at the desired grade, and to also quantify it if poured too high. Figure 7 shows an improved interior laser mast to eliminate/minimize blocking and rough-in layout at multiple elevations simultaneously, and 8 shows a more ergonomic kneeboard for concrete finishers that transitions from a static position to one of swiveling, simply by shifting body weight. (all three with provisional patents secured.)

The results of year five continue to show process improvements, with faculty research subjects, manufacturing partnerships and expanded funding commitments key. The expanded year-round effort allows faculty leaders to improve industry relationships, pursue potential manufacturers, and to secure non-provisional protection on the products with the greatest market potential.

5 Conclusions and Further Research

Construction Management programs within the U.S. have struggled to produce meaningful, practical research of direct benefit to industry. Few construction management research agendas are externally funded when compared with more traditional engineering programs. This paper demonstrates one way in which collaborative endeavours with other disciplines and construction professionals were successfully used to produce relevant and practical research.

The current financial commitment will continue the effort through a total of at least seven years. Industry interest, manufacturing interest, non-provisional patents, and significant funding provide qualitative validation that the program is poised for potential long-term success. Quantitatively assessing efficacy towards the program goals as stated in the methodology, in its five years the program has produced over 60 provisional patented products, 12 of which were extended domestically, and four of which are non-provisionally patent-pending. Two others have licence agreements with private manufacturers, and over twenty articles in refereed journals and proceedings have been published in multiple disciplines enumerating research and development results. Faculty engagement in research continues to increase, and the university is now realizing its first private income from construction related intellectual property.

Future research is needed in the area of post-development support and the pursuit of intellectual property and market presence. Specifically, what factors most influence the development of products beyond the initial concept phase in construction? How could these best be measured, and what elements identify long-term success in such an endeavour.

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Deciphering Design Process

Using qualitative methods to inform collaborative built environment research

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Abstract:
The challenges faced by the building industry highlight the need for collaborative work between practitioners from different backgrounds. The building industry is becoming increasingly multi-disciplinary. Given this context, building practitioners should be able to integrate their design processes, working methods and problem-solving techniques. Multidisciplinary design is considered fundamental in the success of building performance; an aspect which is traditionally approached deterministically. This article argues that qualitative research methods are helpful to inform collaborative work between building practitioners. This paper presents previous research in the area of collaborative design and development of design aids with focus on simulation software for building energy performance. Despite the remarkable advances in this field, the development and assessment of design tools has, so far, been mostly reliant on quantitative methods and numerical approaches. It is argued that identifying the underlying principles and dynamics of building practitioners' work is likely to enhance problem-solving in project environments and inform design aid and software development research. Therefore, qualitative methods could potentially assist in deciphering the complex nature of building design. This paper introduces two research projects concerned with collaborative work between building practitioners working towards the delivery of optimised energy building solutions. It discusses the use of two qualitative methods; semi-structured depth interviews (SSDI) and ethnography to formulate an understanding of collaboration in project environments. The article presents the reasons for choosing this method, reflects on the research process and discusses challenges experienced throughout. The researchers aim to highlight that the use of qualitative methods could assist the development of design aids and tools.

Keywords:
design process, building practitioners, building energy performance, qualitative methods and multidisciplinary collaboration

1 Introduction

There is a long tradition in the use of qualitative methods in architectural and construction research (Franz, 1994; Carvalho et al., 2009; Oak, 2011). Project environments are characterized by the ill nature of their dynamics both in terms of problem solving and process (Rittel and Webber, 1974; Rosenman and Gero 1998). Qualitative approaches are suitable methods to enable a deep and rich understanding of complex phenomena whose borderlines are not well defined and lack full exploration. The old paradigm of architecture as an aesthetical and subjective area is being shifted by a technical performance-based view. Instead, buildings are regarded as machines

expected to satisfy needs and functions expressed by measurable indicators (Necdet, 2002).

These technical aspects are characterized by their numerical nature when analysed from the product perspective; building performance. Nevertheless, the design process and work dynamics in construction settings remain ill defined (Rittel and Webber, 1974). Therefore, inductive approaches to gain understanding become relevant to investigate alternative facets of project environments including their technical aspects. Built environment research aiming to improve performance of buildings is likely to benefit from qualitative approaches to build up knowledge through the awareness of building practitioners' experiences, viewpoints and contexts of work.

Social aspects arising from this type of research are unlikely be reduced to numbers. Qualitative research becomes a suitable mechanism to construct and explain project environments, especially given the high interplay of actors and technical requirements. The strength of qualitative research lies in enabling the researcher to be the key research instrument for describing, analysing and interpreting data. The information collected on field conveys a rich picture about the context and process. The understanding is negotiated between participants and researchers as experience is outlined and the context gains meaning. It is an ongoing process of constructing theory; to *"identify, develop and relate the concepts"* (Strauss and Corbin, 1998).

With regards to energy and low-carbon design, software developers have pooled their efforts towards designing tools that inform building design decisions. Building performance simulation (BPS) packages can be used to predict the dynamic responses of buildings to their environments and to evaluate and compare output results of different design options. Building designers routinely deal with a number of parameters that substantially influence a building's performance, such as orientation, form and fabric. They regularly make decisions with regards to material, glazing areas and systems, all of which affect performance of the building as well as the aesthetic quality of the building product. BPS therefore allows building designers to test and compare the effect of their ideas on the overall performance of the building, with regards to lighting, ventilation, thermal performance, among others. Results are fed back to alter or 'fine tune' ideas, to achieve better results (CIBSE, 1998). However in practice, software solutions are not always well-synchronised with the building design process. Despite remarkable advances in this field, users of BPS packages tend to be mainly researchers, physicists and experts who value empirical validation (Attia *et al.,* 2009). On the other hand building designers, to whom BPS promises considerable benefit, fail to integrate it within their design processes (Attia *et al.,* 2009; Morbitzer *et al.,* 2001).

2 The need for collaboration

This emphasises the increasing requirement of a multi-disciplinary collaborative design approach in the building industry. Factors to be considered in building projects are growing in complexity. The need for collaboration surfaces when a professional is unable to carry out a particular task himself, because it lies out of the realm of his own knowledge and skill (Kalay, 2001). Collaboration therefore becomes an enabling force, allowing completion of more tasks than would be ordinarily permissible, with maximum effectiveness.

In light of this, all members of the design team need to be able to integrate their design processes, working methods and problem-solving techniques, to ensure successful design performance. While this may seem a straightforward notion, collaborative scenarios between architects, engineers and sustainability consultants working towards enhanced performance of buildings are seldom synchronised. Kalay (2001) attributes this to a difference in worldview. Building practitioners tend to come from fundamentally different educational and professional backgrounds. Consequently, they have different goals, objectives and foundation belief systems. Collaboration may result in misunderstandings, confusion and frustration. A shared understanding, on the other hand, becomes possible when collaborators are aware of the differences between social positions and worldviews, shaping a united foundation of understanding between all team members. Understanding worldviews and shared realities therefore calls for use of qualitative social research methods, which enable us to decipher the complex natures of practitioners involved in building design.

Previous research acknowledging difficulties faced by building practitioners tend to use empirical methods to make changes and developments at software level. This includes development of new interfaces, for example in (Ochoa and Capeluto, 2009), development of new tools, examples of which are reviewed in (Malkawi, 2004) and suggestions of interoperability between BPS and Building Integrated Modelling (BIM) as illustrated in (Chaisuparasmikul, 2006) and (Hamza and Horne, 2007). These examples are far from being exhaustive, and are just used to illustrate the nature of research conducted in this field. In the few cases where research has been conducted to better understand requirements and needs of building practitioners, such as in (Attia *et al.*, 2009), data has been collected through large-scale surveys aiming at reaching generalisable results. While these attempts are helpful and provide key information for future software developments, this article advocates the need for in-depth understandings to inform quantitative work. Conducting social research on a narrower yet deeper scale may provide invaluable knowledge that could further assist quantitative and software-level solutions.

3 Research Projects

This section presents two research projects that use different qualitative methods. The first project, ‘Understanding communication between architects and simulationists’ uses semi-structured depth interviewing (SSDI) and the second one, ‘Unveiling low carbon processes’ uses ethnography. Both projects are concurrent and currently under investigation. They are interconnected in nature; both projects examine apparently ‘numerical’ aspects of problem-solving in building projects: thermal simulation and energy consumption. Here each project is individually introduced; describing aims and objectives, explaining research design, data-collection, analysis and interpretation and presenting aspects that are unique to each project. Common reflections on the use of social methods in built environment research are drawn from both projects and discussed in section 4, as well as common challenges and concerns. Finally, conclusions and further implications of adopting qualitative methodologies in built environment research are raised.

3.1 Project 1: Understanding Communication between Architects and Simulationists

This project investigates the difficulty of integrating BPS within architectural design process. This is attributed to low-grade communication between architects and

'simulationists;' members of the construction industry responsible for building energy simulation (engineers, building physicists and software developers). Research in the area of BPS is usually regarded as quantitative and empirical. This is not a surprising phenomenon; BPS relies on mathematical calculations to simulate reality, and to predict the effect of complex interactions between the building, surrounding environment, internal loads, systems design, indoor thermal comfort, etc. (Prazeres, 2006). Development of BPS software packages draws on fundamentals from several disciplines; physics, mathematics, material science and human behaviour (Malkawi, 2004). Hence, a numerical approach to this research area on the whole is presumable. Rather than using BPS packages themselves, this project suggests that simulationists should be relied upon to carry out energy calculations, and report results back to the architects throughout the process. Architects would therefore invest more time and effort into making informed design decisions, instead of attempting to translate the plethora of numerical outputs which are presented as calculation results.

3.1.1 Research Aims

A social investigation, advocating the need for in-depth understandings and insights on the users of the software, is presented. It aims to construct an image of architects' and simulationists' social worlds; their education, experiences, worldviews, paradigms, problem-solving methods and working needs. These are multi-layered, profound, subconscious and complex human interactions composing one's professional identity. The research also aims at exposing and comparing these social worlds, highlighting similarities and differences between each group.

3.1.2 Research Design

The method chosen for data-collection is semi-structured in-depth interviewing (SSDI). A set of intensive individual interviews is conducted with each participant to construct a biographic narrative. The duration of each interview is typically between 1-1.5 hours for each session. Only few questions are prepared in advance of each interview to steer the discussion, allowing for the assumption that responses cannot be predicted in advance (Wengraf, 2001). Consequently, the interviewer can then probe further topics that come up by improvising new questions. The subject can express personal opinions, ideas, perceptions and beliefs. Improvisation gives the interviewer the opportunity to adapt to the subject's world; sharing outlooks and concerns. Therefore, SSDI has been found appropriate for investigating such complex, multi-layered and profound issues 'in-depth' (Boyce and Neale, 2006). Purposive sampling is used to select interview participants. Four architects and four simulationists are interviewed; comprising eight participants in total. Architects are chosen based on the criteria that they work in medium to large-sized practices delivering sustainable design-solutions; working closely with simulationists to achieve this. Simulationist participants are required to have worked closely and regularly with architects who approach them to assess their designs.

A) Interviews 1-3: Each of the first three interview sessions is based on a thematic Central Research Question (CRQ). These are presented in table 1. Interview questions are developed from CRQs, to be aimed at each interview subject directly. Each interview is audio-recorded, transcribed verbatim and read prior to the following session. Observations are highlighted and impressions formed, which can be built upon during the subsequent interview session.

Table 1. Central Research Questions addressed during interview sessions

Int. #	Theme addressed		Central Research Question behind the theme
1	*"Professional upbringing"* and *"professional identities"*	Background education	**CRQ 1:** How do background education and experience help shape the worldviews of architects and simulationists, in relation to the building industry?
2		Professional experience	**CRQ 2:** How much are architects and simulationists aware of ***their own*** practice and problem-solving? How much of this knowledge is conscious and how much of it is sub-conscious?
3	Personal perceptions of the 'other' group		**CRQ 3:** How much are architects and simulationists aware of about ***each other's practice*** and problem-solving? How do they perceive its importance within their working processes?

B) Interview 4: The final session of the set of interviews is deliberately left 'open,' and not directly linked to a particular CRQ. It is conducted with the aim of clarifying topics discussed during the first three interviews, which may require further explanation. It is also conducted to either confirm or deny any impressions that the researcher may have previously formed, and to verify any observations that have been inferred. Questions prepared in advance of the fourth interview are contextual; their design being largely dependent on data generated during the first three.

3.1.3 Data-collection and Analysis

Unlike quantitative research, there is no definitive, clear-cut divide between data-collection and interpretation. They are strongly interwoven, and an image of the practitioner's social reality is constructed through interpersonal interaction between interviewer and subject (Strauss and Corbin, 1998). Meanings emerge from a conversational setting, instead of being forced through a theoretical perspective. Rather than occurring as a mechanical activity where analysis is a logically tight procedure, interpretation puts the researcher into the position of detective; looking constantly for recurring themes and patterns (Wengraf 2001). Furthermore, data collected informs the process as well as actively contributing towards the findings, allowing the researcher to revise any decisions that have been made throughout the project.

Analysis and interpretation occur frequently and across several stages. Data management and organisation as it is being collected is considered a crucial first step. This includes activities such as transcription and making detailed field-notes, which allow the researcher to observe each interview separately, and to acknowledge each as having its own coherence, structure and meanings. Primary themes and patterns are identified from the beginning, and less important material is promptly filtered. A loosely structured framework of codes is formed, and emerging themes, categories and patterns can be fit.

Two coding strategies have been proposed to synthesize and conceptualise findings from different interview transcripts:

1. Selective coding: A framework consisting of pre-defined codes; developed in accordance with the CRQ themes and interview questions. Relevant responses and statements could be coded into their respective categories.

2. Open-coding within newly-occurring themes; in line with the semi-structured nature of the research, open codes may be issues that are raised frequently during interviews, yet do not fit into the selective coding strategy. Coding categories are likely to increase and become more fine-tuned as more data is collected. Open codes are identified based on frequency of occurrence within the data.

The coding system allows the data to be observed vertically. Rather than examine each interview as a separate entity, data can now be interpreted crossing an entire set of interviews. Interpretations can be drawn by conducting comparisons across architects and simulationists to fulfil the aims of the research. Figure 1 below reveals exemplar alternative typologies of interpretation and comparison facilitated through adoption of a formal coding strategy such as the one described.

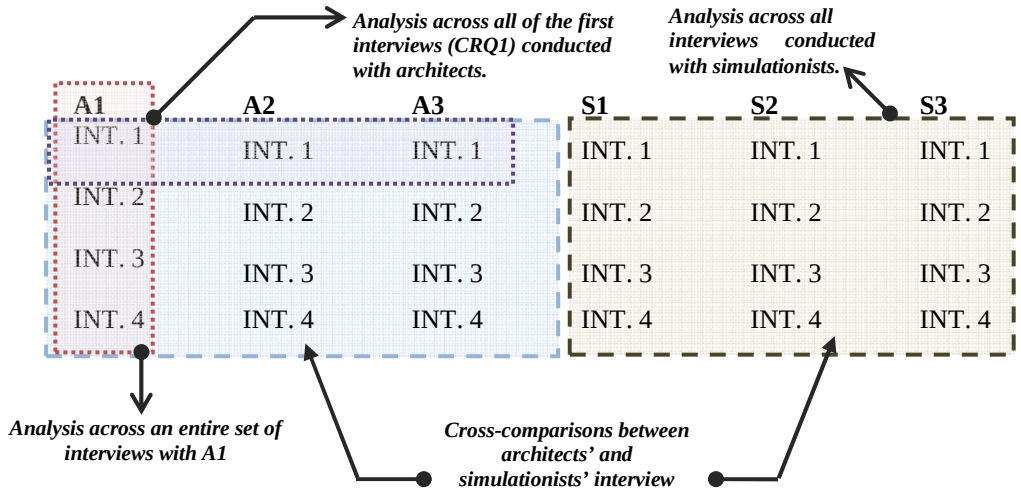

Figure 24 Alternative typologies of interpretation and comparison of coded data

3.2 'Going Native' to Unveil Low Carbon Processes

United Kingdom has committed to an 80 per cent reduction in carbon emissions in the building stock by 2050. Welsh regulations are aiming for higher CO2 reduction targets compared to the rest of the UK. The Welsh Assembly Government is aspiring to enforce 55 per cent reduction of the carbon emission levels of new dwellings by 2013. However, it is uncertain that the construction industry will be able to deliver projects that meet those requirements (Maunsell, 2009; Zero Carbon Hub, 2010) Research suggests that despite the willingness of building practitioners to adopt low carbon practices, there are serious barriers that jeopardize the achievement of CO2 reduction targets (NHBC, 2008; Hamza and Greenwood, 2009).

This project analyses formal mechanisms; legislation and policies intended to enforce the adoption of low carbon standards in project design. It aims to unveil the social process of understanding, learning and negotiating of low carbon concepts during project delivery and find the link between low carbon policies and informal adoptions during project delivery. The researcher is immersing herself in few architectural practices for a period between nine and eighteen months corresponding to real-time project development. Architects' context of work is the main 'setting' being studied; however, as projects progress, other practitioners working in design and construction phases are being involved in the research through other qualitative techniques such as interviewing and analysis of documentation produced by non-architects. An intentional trade-off between depth of immersion in a single setting and the use of a comparative case-study was made on the basis of identifying key commonalities and differences in delivery processes observed in few projects so to 'unveiling' low carbon process.

3.2.1 Ethnography as Research Approach

There are two aspects associated to low carbon design; the quantifiable factor and the qualitative factor. The first is concerned with building performance, assessed in a numerical fashion i.e. reduction of carbon emissions and estimated through simulations. The qualitative aspect is related to building as a process where communication, negotiation, tacit rules and experiential knowledge inform building development. In the latter, performance is correlated with the social processes adopted in the delivery. Energy performance is not only about quantitative procedures but also about non-material ones. It is the result of social processes that facilitate a shared view and ownership of energy matters that are reflected in targets for the product and the process.

The ethnographic approach used to analyse energy design intends to clarify how the performance element of building as a product is related to the social aspects of building as a process. Ethnography allows a close observation of how the dynamics of delivery process are either able or unable to embed performance in the product. One of the main limitations of numerical oriented research is their tendency to model idealised scenarios of use, reducing them to 'laboratory conditions' with high control of variables. In this situation, users and context of application are at risk of being misrepresented and neglected.

This project analyses product and process by identifying casual techniques and informal mechanisms that embed performance, their role in informing project delivery and their instrumentation as 'tools to encapsulate' low carbon knowledge. These techniques will be mapped against project schedule and deliverables. This could inform the development of mechanisms and tools to facilitate low carbon building delivery. Ethnography has been selected as the method suitable to understand low carbon process through the elicitation of participant's perspectives and experiences and the observation of project development (Hammersley and Atkinson, 2007).

Ethnographic data collection methods such as interviewing, participant observation and document analysis are being used to 'go native' and follow-up a small number of projects, explore and map the experiences and working process of practitioners delivering low carbon buildings. An actor network theory is being employed to 'represent' the context to reduce the risk of bias and assumptions during description and interpretation of the findings. This approach intends to overcome potential limitations and challenges of mapping the non-linear and iterative nature of low carbon process.

3.2.2 Research Design

Early concepts were developed through desk based studies and extensive literature review. Key topics were discussed with practitioners to gain a preliminary understanding of the context. This exploratory phase was followed by the analysis of real time project progress.

The first stage aimed to map the general panorama of low carbon delivery, in terms of technical knowledge and legislation awareness. The main data collection method was semi-structured interviews. Twenty-three interviewees were chosen through a theoretical sample based on a comprehensive literature review and the recommendations of key informants experienced in the Welsh building industry. Key informants are involved in initiatives to disseminate energy regulations and best practice in the Welsh construction sector. The participants belong to different educational backgrounds: architects, mechanical and services engineers, environmental engineers, sustainability

consultants, civil and structural engineers, employed by firms specialized in the non-domestic sector with a portfolio of sustainable and BREEAM certified projects. The early findings from this first stage informed the development of fieldwork protocols and research design during the project follow-up phase. It also contributed to the selection of projects analysed in the second phase, through snowball sampling.

The second phase corresponds to a deep study of real time project development. These building projects belong to the educational sector where non-speculative public clients aim for higher sustainable targets than those currently enforced by legislation. Therefore, their delivery process is likely to surpass minimum legislation thresholds. The data collection methods of this phase include interviewing, non-participant observation and document analysis. The data is being triangulated to compare the delivery process of different projects.

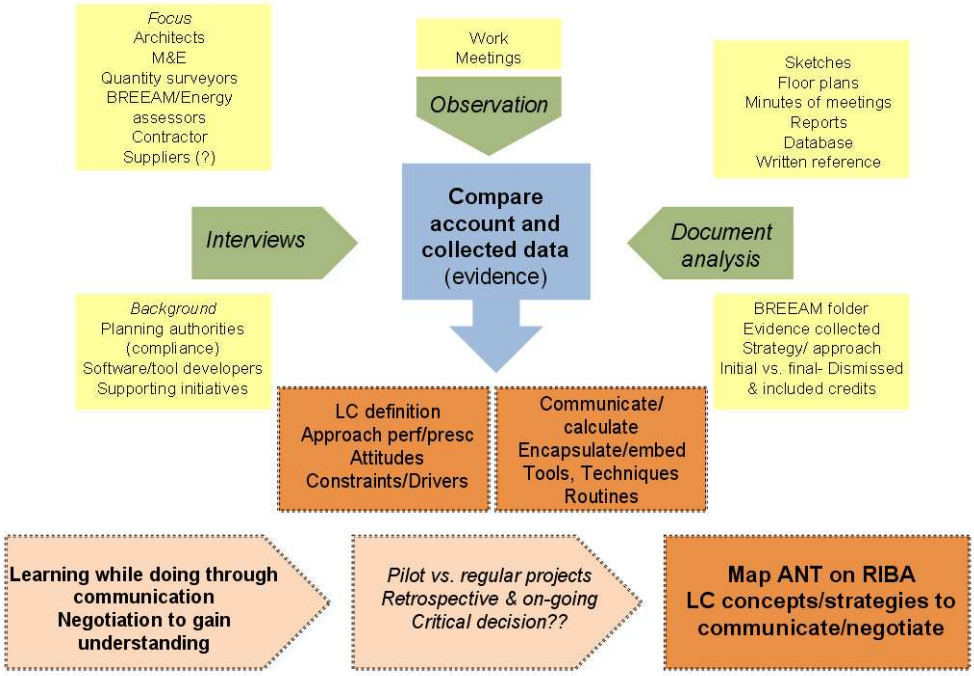

Figure 2 Data collection methods and themes explored in low carbon delivery process

In order to construct the context, special attention is made to the relation between self-accounts (first phase) and project follow-up observation (second phase). This combination of methods is used as a triangulation technique to gather evidence from different sources that could both corroborate and contest what is found on the field. It is important to remark that participants help to construct the context. Data by itself is not enough to construct it. Participants' motivations, views, perceptions, attitudes and opinions outside the scope of building as a product and process are also contributing to building up context in the light of research enquiries.

The analysis of energy aspects of projects using an ethnographic lens seeks to reveal commonalities and differences in delivery, linking product and process. Techniques, tools and routines identified in the follow-up phase are compared to self-accounts obtained from interviews to 'densify' theoretical categories and inform findings.

4 Discussion of Research Projects

The projects outlined in section 3 are at early stages of progression. Therefore this discussion is centred around development of the method, rather than final research findings. The authors advocate the benefits and anticipated contribution of use of these methods within the wider body of knowledge, and outline limitations that qualitative researchers in the built environment are likely to face.

An initial approach to understanding the context might raise awareness about existing misconceptions and limitations of current implementations and attempts of integrating software, tools and aids. Meanwhile, research of energy in buildings involves technical and human aspects. Realisation of better performing buildings is not only the result of simulation and calculation tools but also the inclusion of practices, knowledge and worldviews adopted by building professionals. Qualitative methods help to identify gaps, breakdowns and needs in design and delivery processes, evaluating the adoption of design aids and assessing the implementation of tools that facilitate better practices. A closer examination of the context could help to represent patterns and behaviours, informing models and aids, and recommending applications and scenarios of use. One of the potential contributions of these early research projects is that they embark on a bottom-up approach, where the research examines the level of building practitioners from a wide range of backgrounds, up to the level of the tools that they use.

While this research promises the above benefits, it is also important to be aware of its limitations. While undergoing the projects, the researchers are facing the following:

Sample size: It can sometimes be difficult to determine what the 'correct' sample size is for qualitative methods, particularly when the aims of the research do not include producing generalisable results. A small sample size is often considered suitable as it may allow a deeper and more thorough investigation (Taylor and Bogdan, 1998).

Reliance on the participant: Qualitative methods rely on finding subjects who agree to participate, and building up a trusting relationship, so that the researcher is no longer considered an 'outsider' approaching participants and is therefore granted access to relevant data.

Understanding the participant: The researcher must be well-trained in reading and understanding the varying personalities of participants. The fact that each will have a different personality must be acknowledged, and each will therefore require a novel demeanour when being approached.

Thorough reading of collected data: The researcher must be aware of recurrent themes, patterns and statements in the data. Meaning may associate itself in what is not always clearly visible; or in what has not been directly conveyed. Common and repetitive patterns are equally as important as novel and original statements.

Contradictions: Positive and negative assessments of the same opinions or social phenomena by the same participant may arise. Contradictions may themselves be regarded as 'data.' Patterns or reactions such as confusion or uncertainty represented might be noteworthy.

Time-resources: Qualitative methods of data-collection and analysis are time consuming. Balancing research activities to work around participants' schedules means

that a dataset could be conducted over a prolonged period of several weeks, making it unlikely to quickly reach publishable findings.

Criticisms: Ethnography is often criticised; arguing that the researcher is in a position to influence participants' behaviour and responses. This may be overcome by studying projects over a long period of time, while attempting to maintain a trusting relationship with participants to facilitate continuity of the research. Discussing outcomes of the research with participants may further contribute to this; while acknowledging the fact that ethnographic-based research is a process of negotiation and understanding between the researcher and participants.

5 Conclusions

This article has discussed the application of two qualitative research methods, semi-structured depth interviewing (SSDI) and ethnography. They are used to reveal the complexity of social aspects in fields traditionally regarded as purely numerical. The process, challenges and reflections about the implications of using qualitative approaches are presented. In the light of the discussion, the authors present final remarks related to the application of qualitative methods in built environment research:

Qualitative findings facilitate a wider understanding of realities that could become the departing point for further exploration using other research approaches aimed to generalize and explain phenomena. In the cases of the above projects, qualitative research lays the foundation to develop further enquiries to be tested in a numerical fashion.

Qualitative research in the architectural field, as well as with any other, is cyclical and iterative. It is not always possible to fully design the research before embarking on data-collection because, once the data begins to arrive, any decisions made will be under revision for the remainder of the research process. Data-collection and interpretation overlap; every activity contributing to data analysis forces the researcher to constantly revisit and refine the process, as well as contributing towards the final outcomes.

Research design enables to choose the evidence likely to 'saturate' overarching themes for interpretation and inform findings related to research scope and aims. This process initiates with first enquiries and leads the researcher towards mature levels of understanding – the fuller picture could only be constructed after uninterrupted loops of questioning, critical thinking and reinterpretation.

Use of qualitative research is at risk of being regarded as 'too subjective,' particularly in the eyes of members of the deterministic research community, since interpretation relies to a large extent on the researcher's position and standpoints. This needs to be acknowledged throughout the research process. Triangulation techniques enable the researcher to critically revise the method, reflecting on the findings and enhancing their rigour.

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International & Comparative Law

Complex Construction Projects between Remedies and Partnering

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Abstract:
The imperatives of cooperation and competition conflict when providing Value for Money services in complex construction projects. While competition is mostly formalised through public procurement, cooperation is less formalised. Harnessing competition and cooperation is made difficult by the fine balance between transparency and trust. Transparency is needed to foster trust but the judicial ways in which transparency is reached shatter confidence. While project management highlights strengthened cooperation through partnering to develop successful projects, procurement regulations do not leave any formal space for it. Comparing Belgian and English complex construction projects indicates how to start mapping out various tensions in articulating competition and cooperation. In England, partnering has been introduced as a remedy for recurring litigations, which result in delays and high costs for the public purse. Partnering revolves around a fair exchange of information between parties to foster innovation. Public procurement directs information to all market players regarding the whole decision-making process of the public authorities. Yet, information regarding innovation needs protection. Institutionalisation of public control over elaborating and performing these complex projects leads to over-layered techniques, hindering the overall transparency of the system which supports high investments of public money in these projects. Belgian procurement is basically rigid. There are many judicial challenges, often claiming that public authorities failed in their duty to give proper formal justification for their decisions. This shifts discretion from public authorities to judges and experts to assess confidential information. Yet, besides these formalised solutions, cooperation between public authorities and contractors occurs at the margins of the law itself. In both England and Belgium cooperation and competition between public and private partners in complex construction projects are embedded in a wider context of legal rules and informal behaviour. The transparency and formalisation of these public-private relationships needs to be assessed beyond the parties, within the institutional and interpersonal dynamics.

Keywords:
complex projects, partnering, remedies, transparency

1 Introduction

Major construction projects are central to current policies kick-starting investments aimed at bouncing back from the current economic downturn. With tight financial constraints, governments are asked to optimize the taxpayers' money invested in these

projects more than ever. Yet, the means to achieve successful projects in public infrastructure are uncertain. Project management emphasises partnering as a way to design and maintain complex constructions. This suggests a high level of trust between public and private contractors, developed over long periods of time. By contrast, the law, especially public procurement, seeks to develop a competitive market for bidders and new entrants, willing to enforce public procurement rules through legal challenges. This approach trusts that legal rules have a beneficial impact on securing efficiency in market exchanges. The two approaches need to develop a common ground, building on the strengths of each to secure Value for Money (*VfM*) and successful projects. This paper seeks to map out some of the key tensions between these two approaches, based on a comparison of Belgian and English complex projects: the law is overly predominant in the first, while the second straddle procurement regulations and managing through partnering.

Complex construction projects are often organised through public private partnerships (PPPs) and private finance initiatives (PFIs). They integrate in one major project a range of contractual, financial or economic relationships. These projects are based on '*the bundling of construction, maintenance and sometimes other services into long-term "whole life" contracts under which private sector contractors are responsible for the construction and functioning of public buildings over many years, in return for annual payment by public authorities*'.[1] In PFIs, an additional layer of complexity lies in the use of private debt finance. The balance in these bundles of contractual and informal relationships is partially embedded in the legal context of each country: Belgium and England differ in their use of the techniques developed in EU public procurement. A common core of techniques used to foster competition may be challenged or supplemented by less formal techniques of cooperation.

At the heart of PPPs/PFIs, the tension between competition and cooperation is reflected in the interplays between transparency and trust. The need for innovation starts with actual techniques in construction projects and pervades the legal environment in which these projects operate. Information is needed to develop appropriate solutions to overcome the high risks in these projects. Parties thus have to trust each other. Trust needs also to be developed among the public and their representatives, by communicating project information justifying how taxpayers' money is spent. Yet, disclosing information may benefit competitors, enhancing their chances of winning the next tender. This logic does not work on its own however. From the start, there is an imbalance in the information spread between the various players: mechanisms fostering trust need to channel how information is exchanged. The variety of English and Belgian experiments illustrates how this balance in information is central to enabling successful complex projects.

Section 2 maps out the tension between partnering and information culminating in legal challenges and remedies in England, where a balance is developed through various layers of public control. Section 3 lays out the highly formalised context of procuring complex projects in Belgium, which curtails strictly public choices. It details how transparency may lead to displacing public discretion to judges and experts. Yet, informal practices of mutual exchanges between public and private partners have been very much developing in the corners of the legislation. Section 4 suggests that control of

[1] Select Committee on Economic Affairs, *Private Finance Projects and Off-balance Sheet Debt* (63-1 HL 2009-10) para 3.

transparency needs adaptation depending on where tensions arise and that alternatives to transparency may need to be worked out.

2 Challenging public choices in English complex projects

Investments in complex construction projects face a major issue, namely failures in the market and projects: prominent projects are delivered with major overruns both in budget and time, when they are not cancelled mid-way. The need to develop an efficient market and successful projects draws sustained attention to the factors underlying *VfM* and risk management. Gaps in information put *VfM* and risk-taking in jeopardy, deterring potential contractors. To reduce this information asymmetry, a change in the approach to the projects has been long encapsulated in how PPPs/PFIs were supposed to bring about new ways to manage public infrastructures and make public choices.

From both a construction (Hibberd, 2010) and a procurement perspective (Braun, 2003), PPPs/PFIs are presented as a dramatic change in the approach to complex projects. In practice, this change happens incrementally at three levels. First, partnering is presented as a bridge between complexity and innovation. At management level, it draws attention to the overall lifecycle of the project, from design to termination (Section 2.1). Secondly, PPPs/PFIs triggered the competitive dialogue, formalising the decision-making process related to complex projects. This specific procurement route is embedded in a tight system, where remedies should foster transparent decisions respecting public procurement regulations (Section 2.2). Finally, these first two levels of changes need to be coordinated, at both project and policy levels. Coordination happens as state institutions organise spaces for it to happen or when individuals seek to test the decision-making process all the way through (Section 2.3).

2.1 Partnering: an ideal to move towards

Partnering is a first change strategy for dealing with market and project failures in constructions. It has been stressed since the 1990s as an important component in developing complex construction projects, as innovative techniques were needed in a time of under-investments in public infrastructure. PFIs were one way to bring in private investment in public infrastructure, building on the innovative potential of private contractors. Cooperation was highlighted as a requirement for securing the best from new technologies or new market opportunities (Collins, 1999). Partnering would bring about this cooperation, helping to overcome the adversarial relationships hampering the construction industry from delivering *VfM* projects. Partnering plays a range of functions in projects. Firstly, it enables innovation when the public authority and the private contractor design the project (Section 2.1.1). Secondly, it contributes to a whole-life approach throughout the supply-chain, especially in the performance phase (Section 2.1.2). Partnering cuts across this distinction to apply transversally to the supply-chain during the project design and to the performance of public-private relationships. However, partnering may also cause trouble as it is non-legally binding (Section 2.1.3).

2.1.1 Innovation in planning complex projects

Complex projects require a planning taking into account their specific features in terms of idiosyncratic assets, large investments, risks notably linked to their long duration. Partnering may help in these respects. Project management understands partnering as '*a long-term commitment between two or more parties in which shared understanding and*

trust develop for the benefit of improving construction' (Bybballe et al, 2010, p. 239). Similarly, legal scholarship emphasises that partnership can be defined as follows: '*[e]ssentially the relationship is based on trust, dedication to common goals and an understanding of each other's individual expectations and values*' (Mason, 2009, p. 206). In both cases, trust and sharing (understanding or goals) are highlighted. The challenge is to bring these ideas in the relationships between public authorities and their private contractors.

The partnering approach should allow to bringing new ideas, processes or techniques influencing the overall duration of the project, resulting in *VfM* not at one point in time but over the whole-life cycle of the project. Partnering agreements bring about ideas such as fairness, honesty, transparency in how parties deal with each other Recent project management research calls for caution about the risks involved by partnering (such as wishful thinking, risks of exclusivity, encouraging opportunism) (Bresnen, 2007). Some consensus seems to emerge that more empirical studies on the perceived advantages of partnering and the variety of its formal and informal expressions are needed (Bybballe et al, 2010).

Despite these theoretical uncertainties, partnering seems to answer a genuine need to develop a framework to understand how relationships are managed during the course of a project. Contract law is here not helpful to give some predictability to the parties to the project, especially in the phase preceding and following the actual construction. Hence, partnering has been applied to PFIs, either in general[1] or in specific projects such as Building Schools for the Future (*BsF*) and its 'strategic partnering agreement'. Partnering principles have also been encapsulated in various standard models, such as NEC3, JCT, PPC2000, resulting from practice and project analysis. These documents do not operate alone: supporting mechanisms such as a partnering team or partnering adviser should also be implemented. This results in the principle of behaviour being documented. Parties communicate to each other what their expectations are and their own commitments should problems arise. Agreed norms of behaviour are thus formalised. How does this perform, once partnering principles are incrementally agreed upon?

2.1.2 Performing partnering

Originally, partnering was mainly a way to approach litigations crippling construction projects in the performance stage. Partnering is a strategy to tackle risks, in terms of both preventing them and addressing them once they have arisen. It should bring the parties into a mindset facilitating a constructive management of issues, with the benefit of securing successful projects. This mindset needs to be slowly integrated within the project from the start, to find practical applications in risk management.

First, in the design phase, partnering considerations are extended to the supply-chain in two ways. Early involvement of contractors (and their sub-contractors) in designing the project would allow to gaining time, ensuring more certainty about pricing, both in the defining and in potential savings, and bringing a cultural change in the private contractors (Mosey, 2009a). The issue is to find a proper process to ensure this early involvement. One such form is to proceed in two stages: first, to tender a pre-construction services agreement where the private contractor provides preparatory

[1] OGC, *The Integrated Project Team – Teamworking and Partnering, Achieving Excellence in Construction Procurement Guide*, 2005; OGC, *Best Practice, Forming Partnering Relationships with the Private Sector in an Uncertain World*, n.d.

services while the project is being designed. Secondly, the contractor submits a tender for the works to be carried out following the design developed according to public authorities needs/requirements. This two-stages approach may struggle to ensure that competition is properly maintained between the two stages as required in the public procurement regulation (Barber and Jackson, 2010).

Secondly, partnering would provide management solutions for weaknesses in contract law, especially for changing circumstances, resolving issues or need of renegotiating solutions to supervening events. This may have three consequences however. First, partnering may become fairly detailed regarding the various stages and principles to be followed would problems arise. Secondly, if partnering results in changes in scope or price of the contracts, this may again not fully respect public procurement. Finally, partnering operates within a legal framework for construction contracts encouraging adjudication and 'pay now, argue later' principles.[1] However, these techniques may in practice enhance hostility between parties and thus threaten any partnering ideas (Tackaberry, 2009).

Partnering seems to be crucial both between public and private contractors and in the supply-chain. It does not solve all issues however: it only helps to design projects from a benevolent perspective, which should be reflected in how supervening events are addressed.

2.1.3 Informal reliance, not legal protection

Partnering revolves around ethical norms of behaviour that partners have expressed and are committed to respecting and developing as the project progresses. It works only as long and as well as partners actually walk their talk when confronted with issues. Here a paradox appears regarding the bindingness of partnering.

On the one hand, the absence of legal bindingness is underlined on a recurring basis.[2] Partnering does not give rise to any legal rights. It is for this very reason that parties agree to commit themselves to partnering principles, even within a well- documented framework.

On the other hand, this absence of legal bindingness also leaves the partners without any legal protection when the contracting party does not respect its commitments. This explains why recent surveys on the practical implementation of partnering agreements show reluctance to use them (Mason, 2009), despite repeated efforts by public authorities[3] and professional bodies[4] to highlight its benefits.

The partnering paradox lies in its very nature of generating trust in the other party by accepting a soft commitment to behaviour standards. Contract law accepts that managing projects alongside partnering helps find innovative solutions to complex issues. Public procurement does not share this accommodating perspective in tackling market and projects deficiencies.

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1 *Housing Grants, Construction and Regeneration* Act 1996.

2 OGC, *The Integrated Project Team – Teamworking and Partnering*, Achieving Excellence in Construction Procurement Guide, 2005, p 6.

3 Business and Entreorise Committee, *Construction Matters* (127-I HC 2007–08) para 132.

4 CIC, *A Guide to Partnering Workshops*, 2005; CIC, *A Guide to Project Team Partnering*, 2nd edition, 2002.

2.2 Public procurement: formalising information exchanges

EU public procurement frames the second strategy for tackling market and project failures. It aims to develop an efficient market based on principles of transparency and equality. Transparency is strengthened at three levels: first, in the decision-making process and the design of a project meeting public authorities' needs and requirements; secondly, in the information provided to the unsuccessful bidders; and thirdly, both levels are made effective through legal challenges.

This pattern, common to all procurement routes, calls for specific attention regarding major construction projects due to their complexity, reliance on innovation and increased need for efficiency. Public procurement regulations address these points in a tailored way. First, complexity in construction projects has resulted in competitive dialogue (Section 2.2.1). Secondly, innovation in project design triggers questions of commercial confidentiality, to be balanced with the accountability required by taxpayers' money (Section 2.2.2). Thirdly, the efficiency of the market is ensured thanks to market-players supposedly being eager to secure their markets and hence to enforce the rights they have under public procurement (Section 2.2.3). Transparency here works in the relationships between the public and private parties and among all market players. This increases the complexity of already difficult projects.

2.2.1 Competitive dialogue: designing complex decision-making

Complex projects require clear framing of the relationships between the procuring authority and all potential bidders**.** The EU 'classic' directive designs a specific procurement route for complex projects.[1] The key idea is that complex projects involve a range of issues, and public authorities are not necessarily well equipped to decide pre-emptively what would be the best answer. Room needs to be maintained for testing innovative approaches and integrating a range of components into one single operation, encompassing the whole-life cycle of the project. Conversely, the overall decision-making process of public authorities needs to include consideration of how information is communicated to the candidates at all stages of the project's elaboration.

The starting point is the complexity of a project. Complexity involves a range of questions and uncertainty about the most suitable approach to a range of issues. In public procurement, a 'particularly complex contract' is defined as '*a contract where a contracting authority is not objectively able to (a) define the technical means* […] *capable of satisfying its needs or objectives; or (b) specify either the legal or financial make-up of a project or both*'.[2] In the case of such complex projects, competitive dialogue has been devised as a practical solution to the uncertainties linked to the choice between concession/procurement and the applicability of negotiated procedures, each having their own transparency requirements. The ECJ case law on the defining criterion between concession and procurement – the risk allocation between the parties – is not always easy to apply. Furthermore, public authorities do not know before starting the tendering process what may be the best risk allocation, and hence under which legal category the contract will fall, and therefore the tendering route and the level of transparency which should have been followed due to the result. Thus, the choice of process is already a matter of information exchange.

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1 Directive 2004/18 of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, art 29.

2 *Public Contracts Regulations* 2006 (hereafter *PCR* 2006), reg 18(1).

Secondly, competitive dialogue channels information before and after of the negotiations between a limited number of bidders, leaving the actual layout of the negotiations to the procuring authority. Before the formal opening of the dialogue and negotiations, public authorities need to detail the procurement process and the dialogue. Information must be given to potential candidates on public authority's needs and requirements.[1] The various stages of the dialogue narrowing down the number of bidders need to be made public from the outset.[2] This flexibility is a source of complexity, as public authorities have to predict the issues likely to arise and factor them into the formalisation of their dialogue process. Formalisation also extends to the information which may be exchanged once the dialogue is closed. In this tightly knitted formalisation there are two different pockets of discretion. The first one starts when the dialogue is opened: negotiations are possible on any aspects of the procurement.[3] The second one relates to the criterion for awarding the contract: the most economically advantageous tender ('MEAT'). The factors and their weightings need to be made public at the start of the process but the final assessment belongs to the public authority.

Thirdly, this mapping of the competitive dialogue may not leave aside practical issues. Most problematic is for public authorities to design in advance the dialogue and to target the issues to be negotiated to avoid wasting time. Hence, the Treasury questions whether the competitive dialogue should be used as the default procurement route for complex projects.[4]

While complex projects were supposed to be awarded thanks to this competitive dialogue, doubts about the efficiency of this process arose. A key element in any procurement dealing with complex projects is the ways in which information related to public decisions and innovative techniques may have to be disclosed.

2.2.2 Uncertainty in broadening information duties

While information has to be directed to all potential market players likely to bid for a contract, specific information on the decision has to be given to the rejected bidders. Justifications have to be given. Debriefing has to be organised. Internal public authority documents may have to be communicated. The exact scope of this duty to provide information depends on the techniques used: either the *Freedom of Information Act* 2000 ('FOI' Act) or the *Public Contracts Regulations* 2006 ('PCR 2006'). A balance between the innovation to be protected (commercial confidentiality) and accountability needs to be struck to safeguard trust – either among the market players or among taxpayers.

First, *PCR* 2006 provide how information may be exchanged during the procurement process and which information has to be communicated to the bidders once the contract is awarded.[5] During **t**he competitive dialogue, information may not be communicated to some tenderers in a discriminatory way. Awarding authorities may not transmit solutions or confidential information from one tender to other candidates.[6] Finally, a

1 *PCR* 2006 reg (18)(4) and (5).
2 *PCR* 2006 reg (18)(12).
3 *PCR* 2006 reg (18)(21).
4 HM Treasury, *Review of Competitive Dialogue*, 2010.
5 *PCR* 2006 reg (30) and (32).
6 *PCR* 2006 reg (21)(b) and (c).

debrief of the bidders occurs, once the award decision notice sent. It should state full reasons for the decision in choosing the winning bid.[1]

Secondly, the *FOI* Act is part of the means to ensure greater accountability on government in general. Any members of the public, including bidders may use it to obtain information regarding the procurement process, even beyond the post-tender phase. In doing so, bidders may gain access to wider information than in relying on the *PCR* 2006 and may unearth irregularities in the bidding process. Commercial information may be protected but the practice suggests that public authorities must show that the risk of prejudice for commercial interests is real (Oonan, 2010).

Thirdly, the extended duties to disclose information conflict with the protection conferred to confidential information, for instance that relating to innovative techniques. The ECJ decided that national review bodies had to strike a balance between the two competing interests.[2] English courts applied this ruling. In the *Amaryllis* case, the judge decided that some information needed redaction by the parties and he asked that the full documents and the redacted ones would be made available to him, before progressing with the case.[3] In another (Scottish) case, the court gave the parties seven days to agree between themselves the safeguards they would find appropriate (e.g. restrictions, undertakings).[4] Nothing hampers to apply the solution in England (Henty, 2011). Judges recognise thus that parties play thus an important role in shaping the information available.

As the projects are complex, these balances in the duties related to information become highly sophisticated; respecting regulations is therefore increasingly challenging.

2.2.3 EU remedies, a temporary pain?

While partnering sought to prevent litigation to foster *VfM* projects, procurement, especially the 'remedies' directive, seeks to foster the availability of legal challenges so that self-seeking rejected bidders will promote efficiency.[5] There is indeed a paradigmatic shift in English procurement. Traditionally, decisions related to awarding public contracts were only very little challenged. The impact assessment to the implementation of the remedies directive noted that the consequences of this implementation may be uncertain.[6] Yet, changes were starting to emerge prior to this. For instance, judicial challenges were constrained by tight time limits, which had been successfully challenged[7] just months before the entry into force of the regulations implementing the 'remedies' directive. Questions now arise regarding how transparency may be influenced by legal challenges, being reinforced or re-directed? How would this affect the delivery of complex construction projects?

The theory is that the whole process of information exchange regarding procurement should allow the rejected bidders to understand public authority's choice and assess whether this decision is regular and if not, on what grounds it may challenge it. Courts

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1 *PCR* 2006, reg (32)(2) as amended by *Public Contracts Regulations* 2009.
2 ECJ, C-450/06, *Varec v Belgium*, 14 February 2008, see below under 3.2.
3 *Amaryllis Ltd v HM Treasury* [2009] EWHC 1666 (TCC), [2009] BLR 425 (QBD (TCC)).
4 *Healthcare at Home Ltd v Common Service Agency* [2011] CSOH 22 (OH).
5 Directive 2007/66/EC of the European Parliament and of the Council of 11 December 2007 amending Council Directives 89/665/EEC and 92/13/EEC with regard to improving the effectiveness of review procedures concerning the award of public contracts.
6 OGC, *Impact Assessment of the transposition of the EU Remedies Directive into UK regulations (excluding Scotland)*, 2009 p 5 para 14.
7 ECJ, C-406/08, *Uniplex (UK) Ltd v NHS Business Services Authority*, 28 January 2010.

assess what should be disclosed on the basis of what may be needed for the rejected bidder to assess whether it is entitled to a remedy, to challenge the choice in court – hence, to assess if public procurement rules have been followed or not. This means that the aim is not to provide a learning process about the project design as such but about the procurement mechanisms. What made a project most economically advantageous and distinctively successful is not to be disclosed to competitors. Yet, tensions appear here: public authorities are trapped between the need to comply with their information duties under the procurement directives and their duty to keep information confidential.

A breach of transparency requirements may bring such serious sanctions as the court making a declaration of ineffectiveness, rendering the contract unenforceable for the future.[1] In practice, courts adopt a strict approach to transparency requirements, both at the level of principles and in their applications. First, courts start with the principle that regarding the compliance with transparency requirement, public authorities have no discretion or margin of appreciation, while in matters of judgment or assessment of the bids they had such discretion.[2] Secondly, courts apply transparency to the extent to which criteria, sub-criteria, including the weightings applied to these to assess the MEAT have to be communicated from the outset.[3] This resulted in the procurement to have to be started again. When procurement is cancelled and has to be re-run, the public authority may face new difficulties in dealing with increased layers of upset bidders.[4]

This leads to even longer and more complicated procedures: parties have to weigh up whether a claimant has a good chance of winning the case or not before progressing with the complex project and its planning. A possible solution advocated during the implementation of the remedies directive was to incentivise the chosen bidder to ensure that the procurement process had been awarded on a regular basis.[5] One form of cooperation between public and private partners is thus put forward as a way to safeguard the balance between competition and efficiency in the awarding of complex projects. If this route were to be followed, EU procurement regulations would have had a pedagogic effect on how parties may have to behave to secure successful projects. Yet, it may also extend the timeframe to develop complex construction projects.

2.3 Transition from failing projects to efficient market: multi-layering of public control?

The reasoning based on partnering (Section 2.1) and public procurement (Section 2.2) addresses different issues regarding the parties to relationships and contractual phases. Procurement relates to the horizontal relationships between market players in their race towards the contract. Partnering relates to the vertical relationships between the public authorities and the (would-be) contracting party and supply-chain. Procurement emphasises the elaboration phase as defining the success of the project in the competitive, equal and transparent choice of the contracting party and the long-term contractual modalities. Partnering highlights the importance of giving due attention to performance in the designing of the project, in order to reach *VfM* over the lifecycle of the project. This presentation of the strategies for developing major complex infrastructure projects underlines the role of the public authority tendering the contracts and the private bidders and contractors. However, in practice, two different layers of

1 *PCR 2006* reg 47K as amended by *Public Contracts Regulations* 2009.
2 *J Varney & Sons Waste Management Ltd v Hertfordshire CC* [2010] EWHC 1404 (QB).
3 *Letting International Ltd v Newham LBC* [2008] EWHC 1583 (QB); 119 ConLR 89 (QBD).
4 Eg: *Apcoa Parking (UK) Ltd v Westminster City Council* [2010] EWHC 943 (QB).
5 OGC, above (n 6) para 34.

pressures are added to the complexity of the projects: first, central processes and institutions; secondly, individual claimants. Both influence how information is channelled and managed between the public and private partners and towards the outside.

First, innovation is seen as a key issue in public procurement that should be addressed with cultural changes and '*long term strategic procurement planning*'.[1] Such planning was started with the public bodies (Partnerships UK, OGC and the Treasury) revolving around PPPs/PFIs. The *Government Construction Strategy* goes further in urging regular updates of the planning of major infrastructures over the next two years, so that the private sector can develop its own planning strategy.[2] Infrastructure UK is also overseeing the planning of infrastructures across departments. The planning of individual projects is also supported through institutional machinery such as the Gateway Review Process and the Major Project Authority. The latter, located in the Cabinet Office, is now in charge of strengthening assurance and support for major projects over the whole lifecycle of the project.[3] The details of these projects would fall within the current transparency agenda, and hence be made available on the Internet. Yet, this overall transparency strategy may leave some bidders wary as publishing on-line schedules including winners' bids may contain innovative techniques (Henty and Mannings, 2011).

Secondly, individuals have been refused standing in public procurement, as rejected bidders looking after their self-interest are supposed to best represent individuals' interests regarding the proper application of public procurement.[4] Recent case law shows that this principle may be curbed in the future in favour of recognising the standing of individuals who are affected in an identifiable way by non-compliance with public procurement (Bailey, 2010).

Thirdly, individuals may use other legal means to challenge construction projects or get information on their operation than public procurement however. They can act as part of the collectivity (or of the overall system). They have then met with mixed success. The *Veolia* case shows how a decentralised approach to transparent decision-making and control of taxpayers' money is delicate. In this case, a local elector used the *Audit Act 1998* to get access to Veolia accounts relating to the performance of a waste management contract. The local authority was willing to disclose the information, but Veolia challenged the decision on grounds of commercial confidentiality. In first instance, the reasoning was not followed, but the Court of Appeal accepted limiting the *Audit Act 1998* to preserve commercial confidentiality: some of the information would even be protected by the ECHR, and its first protocol (art. 1).[5]

Formalised/institutionalised public control interfaces between taxpayers' money invested in public projects and services provided to end-users. How can this formalisation transform a market failure into a successful market? According to project management, partnering bridges complexity and innovation and is badly needed in complex infrastructure projects. Yet, procurement regulations do not leave any formal space for partnering, assuming that public authorities' discretion should not be trusted.

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1 Science and Technology Committee, *Public Procurement as a Tool to Stimulate Innovation* (148 HL 2010-12) recommendation 8.

2 Cabinet Office, *Government Construction Strategy,* 2011, para 2.6.

3 HM Treasury and Cabinet Office, *Major Project Approval and Assurance Guidance,* 2011, 19 p.

4 *R (Kathro) v Rhondda Cynon Taff Country BC* [2002] Env LR 15.

5 *Veolia ES Nottinghamshire Ltd v Nottinghamshire CC* [2010] EWCA Civ 1214.

This results in a strengthened need for state oversight of infrastructure planning and project organisation from design to implementation. So far, only limited access to the overall emphasis on transparent decision-making about public money in complex procurement has been given to individuals. Furthermore, commercial confidentiality leaves a space open to parties' negotiations once the issue has been submitted in principle to a judge. The tensions in the information flows thus lead to a requirement that private contractors disclose more information to their competitors or to public authorities voluntarily, on conditions that the public does not gain a far-reaching right to proper access. These tensions can interplay differently. Belgian PPPs show how the formalisation of decision-making and extended disclosures of reasons has led to a shift in discretion to judges and experts.

3 Complexity in Belgian PPPs: paralysis in public choices

In England, developing a complex infrastructure project suggests the management of relationships between public authorities and private contractors. These are currently being formalised and institutionalised from the start to the termination of a project. Information exchanges are developed to foster both cooperation and competition, with strategic approaches by the parties on both accounts. This only partially reinforces the needed trust, both between the contracting parties and among the market players in general. The overall process happens the other way round in Belgium. The legal framework limits public discretion, with little space for organising projects creatively. Public discretion appears paralysed.

The procurement of Belgian infrastructure projects is first and foremost a legal matter, before a planning or management one. The starting point for procurement has become highly formalised. High levels of judicial challenges have followed, many based on the violation of the duty to give formal justification of how decisions have been taken. The balance between transparency and commercial confidentiality has given rise to a displacement of discretion from the parties or public authorities to judges and experts. Finally, besides all these highly formalised solutions, cooperation between public authorities and contractors is encouraged around the law itself. The contrast between the two approaches highlights the need to map out the variety of solutions in order for public authorities to tailor procuring major construction projects to their specific challenges.

3.1 Formalism and routine litigations: key-ingredients to planning procurements

Procuring complex projects in Belgium stumbles over a basic choice between concession and public procurement. Concessions require that the private party bear most of the financial risks and because no public money is at stake, only a general principle of transparency applies. Public procurement regulations are used when a public authority pays for the works and services provided by private partners and therefore bear most of the risks. The main issue is that risk allocation is only known at the end of the decision-making process but needs to be anticipated by the public authority so that the proper processes and transparency formalities are applied. Public authorities may be tempted to set the highly detailed Belgian procurement framework aside whenever possible. Yet, the administrative court, the *Conseil d'Etat*, strengthened the rigid legal framework to control narrowly how public discretion is exercised, so as to limit discretion and risky creativity in the contractual relationship. Formalism is imbedded in

the system on three accounts: contractual documentation, available procurement routes and the legal challenges enforcing these.

The first source of formalism in Belgian procurement regards the procurement route. This developed from old practice based on scholarship stressing the risks of possible abuse of their discretion by public authorities (Flamme, 1990). The classic directive opens up the possibility of procuring projects on the basis of open and restricted procedures, competitive dialogue and the negotiated procedure. Each of these routes triggers problems. First, open and restricted procedures do not leave space for the required reciprocal adjustments to the complexity of a construction project. Secondly, the 2006 Belgian statute transposing the classic directive mentions the competitive dialogue as a possible route for complex public procurement.[1] However, the statute is not yet in force due to a lack of the required statutory instruments for developing the bare legal provisions. Thirdly, the negotiated procedure is the last option open. It is especially interesting as it allows for MEAT and is more flexible regarding the tendering process. It is however an exceptional procedure, available under limited conditions. Because of misuses of the negotiated procedure, the *Conseil d'Etat* exercises great scrutiny of it (Durviaux, 2008a). Facing this dramatic situation where the legal framework does not leave much formal space for cooperation, discussions and innovations from bidders during project negotiations, current literature advocates the development of a more flexible legal framework for complex projects (Durviaux, 2010).

The second source of formalism in Belgian procurement revolves around the use of 'mandatory special terms' (*cahier spécial des charges*) and 'general standard terms' (*cahier général des charges*). These apply to contracts alongside the statutory provisions and instruments. General standard terms set the main conditions applicable to the performance of all procurements. Procuring authorities then draft special terms relevant to a particular contract: this is normally at the start of the process, prior to any knowledge of the bids. The general standard terms have become quasi-mandatory and do not allow for much adaptation (Flamme and Flamme, 2006). The special standard terms can only derogate to the general standard terms for issues essential to specific requirements of the project.[2] The *Conseil d'Etat* closely scrutinises the 'special justification' these derogations require. A rejected derogation will not apply to issues supervening during contract performance. This rigid system does not allow for adjustment to the specific needs of the public authorities, often seeking to embed contractual documents similar to the English PFIs in their general terms. The technique of labelling projects as 'PPP' to justify these derogations is debatable: no legal features in PPPs make them inherently different to other contracts (Rekenhof, 2008-2009, 65; Van Garsse, 2007; Durviaux, 2008b). Scholarship, however, suggests that a legal basis for adapting the public procurement statutes to PPPs would be needed in this respect as well as in the available procurement routes (Durviaux, 2008c).

The third source of formalism and rigidity in Belgian public procurement is the extent to which judicial challenges are legally open and are effectively used. The *Conseil d'Etat* has no jurisdiction to annul a contract but may well strike down any decision taken by the public authority (Mast et al, 2009). Over the course of the decision-making about the choice of contracting party, a range of decisions may be taken. Therefore the question of the timing in challenging these decisions arises. The *Conseil d'Etat* decided that all

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1 Loi (*Act*) 15 June 2006 *relative aux marchés publics et à certains marchés de travaux, de fournitures et de services* art 27.

2 Arrêté royal (*Royal Decree*) 26 September 1996 *établissant les règles générales d'exécution des marchés publics et des concessions de travaux publics*, art 3.

these interlocutory decisions may (but not should) be challenged together with the end-decision. This means that even the specific standard terms, one of the first stages of the whole process, may be annulled. Finally, these judicial avenues are regularly used. For instance, various challenges against a water treatment project in Brussels were brought to the *Conseil d'Etat.*[1] In Belgium, litigation as a process around the procurement process needs to be integrated as a matter of routine into the planning of the procurement process. These circumvolutions may be best illustrated with transparency.

3.2 Transparency on trial: tensions in protected interests

The constraints on the processes followed in public procurement are becoming increasingly formal, narrowing down public discretion. Yet some discretion may emerge as public authorities have to respect conflicting duties such as that flowing from transparency and commercial confidentiality. Belgium, however, illustrates that the discretion to balance these interests is not ultimately borne by public authorities but by judges, occasionally helped by experts.

Belgian public authorities face layers of far-reaching duties. They have to respect general principles of good administration,[2] a general duty to give formal reasons[3] and a specific duty to give reasons in public procurement matters[4]. This last duty applies across EU and domestic procurements. In theory the specific duty to give reasons requires more information to be given to interested persons: however the general duty to give reasons covers possible gaps in the public decisions not covered by the specific duty but still relevant for participants in public procurement in various ways.

Bidders have used these far-reaching duties to give reasons for challenging public decisions. Public authorities are indeed compelled to provide a court file to the administrative judge, to which the claimant has access. The court file has to contain all the information public authorities relied on to arrive at their decision, including thus potential confidential information. This is used to ensure that the claimant can access all relevant information. Yet, this may conflict with the protection of commercially sensitive information in public procurement. The *Varec* case provides a starting point for mapping this conflict. In this case, the *Conseil d'Etat* referred the matter to the ECJ and the Constitutional Court.[5] These courts arrived at a roughly similar solution. The ECJ[6] highlighted that public procurement mainly aims to ensure undistorted competition. Public authorities should not disclose commercially confidential information. Furthermore, awarding procurement contracts is 'founded on a relationship of trust' between authorities and bidders. Hence, bidders need to be unafraid that the public authority will disclose commercially confidential information. Yet there is a need to balance these principles with the right to a fair hearing. The review body (in this case the *Conseil d'Etat*) must then have full access to the information required to decide with full knowledge of the facts – commercial information included –.

The *Varec* case has resulted in review bodies having to strike the balance on a case-by-case basis. Typically, the solution has been formalised in a statutory provision without guiding the judge further on how to cope with the matter.[7] Scholarship draws attention

1 CE, nr 96.293, 11 June 2001, Tractebel; CE, nr 80.175, 11 May 1999, Aquaplus.
2 Belgian Constitution art 32; Loi (*Act*) 11 April 1994 *relative à la publicité de l'administration.*
3 Loi (*Act*) 29 July 1991 *sur la motivation formelle des actes administratifs.*
4 Loi (*Act*) 23 December 1993, new art. 65/4 ff.
5 Constitutional Court, nr 118/2007, 19 September 2007.
6 ECJ, C-450/06, *Varec v Belgium*, 14 February 2008.
7 Loi (*Act*) 24 December 1993, new art. 65/26.

to the lack of clarity about the principles mapping judicial intervention here (Gonthier and Vastmans, 2010). Three main options are open: firstly, commercial information is not relevant to the outcome of the case and can be put aside; secondly, information is mildly confidential and relevant to the solution and then the judge has to transmit it to the claimant; thirdly, information is highly confidential and crucial for the solution and the judge may then have discretion over whether or not to disclose it (Bombois et Dubois, 2008). Scholarship approaches the issue from an all-or-nothing perspective, a choice between disclosing or not. The alternatives of partial disclosure, retraction and compensation for confidentiality are not considered, while the Constitutional court had hinted at these.[1] The *Conseil d'Etat* uses procedural tricks to avoid the issue. In most cases decided since *Varec*, such information was deemed not necessary for the *Conseil d'Etat* to decide the case (Gonthier and Vastmans, 2010). However, in at least one case, the *Conseil d'Etat* asked an expert to give his opinion on confidentiality.[2] Nowhere the solution developed in England of enjoining parties to negotiate suitable protections has been mentioned in Belgium.

Transparency is however a powerful legal weapon in the hand of rejected bidders. They use the argument often. From the *Conseil d'Etat* decisions where the claimant stopped the judicial process and the awarding authority decided to re-run the procurement, one may assume that rejected bidders may convince the public authority of irregularities in the procurement process. In a way, this looks like a form of cooperation in securing the regularity of public decisions.

3.3 Cooperation in the shadow of the law

As explained in Sections 3.1. and 3.2, Belgian public procurement is basically formal. Yet, at the margins of this far-reaching formalisation, cooperation occurs in various forms. Four cases illustrate this practice of cooperation throughout the whole process framing the development of construction projects.

First, the cooperation between public authorities and private contractors starts at the very general level of formalising public procurement rules. Indeed, the statutory instruments implementing EU directives are drafted in a specific body, the *Commission des marchés publics*, with representatives of public and private sectors.[3]

Secondly, cooperation is acknowledged through codes of ethics, focusing on the behavioural norms civil servants should endorse in carrying their duties. The codes of ethics are currently in a developmental stage, so that the specific modalities of this acknowledged cooperation have to be worked out formally (Judo and Nolet de Brauwere, 2010).

Thirdly, cooperation between public and private entities is also present during the actual development of complex construction projects. For instance, market analysis – or the sounding out of the market before formally launching procurement – is allowed, as it does not fall under the procurement regulation as such. Yet, these market investigations have been detailed in official guidance.[4] Furthermore, public procurement regulations contain some provisions which can be interpreted as incentivising a lightly cooperative attitude between public and private entities, for instance in the correction of mistakes in

1 Constitutional court, above (n 5) para B.9.3.
2 CE, nr 184.598, 24 June 2008, Siemens.
3 Arrêté royal (Royal Decree) 10 March 1998 *organisant la Commission des marchés publics*.
4 Kenniscentrum PPS, *Marktverkenning- en raadpleging door openbare besturen*, 2008, 106 p.

the bids or the procurement documents (Lindemans and Honnay, 2010, disputed in Durviaux, 2010). Finally, public procurement regulations explicitly prevent some types of information (esp. confidential information) being transmitted to bidders. Other types of information may then be part of communication and cooperation between public authorities and bidders.

Finally, cooperation may be traced up to the litigation stages: the decisions of the *Conseil d'Etat* bear the marks of parties using alternative means (phone calls or 'privileged information routes') to get information such as justification for the public decisions.[1]

That Belgian public procurement is over-formalised seems obvious. The tight general standard conditions do not leave much space for innovation and creativity. However, these general standard conditions have been incrementally developed to respond to problems of trust in how public authorities may use their discretion in public procurement. However, interactions and cooperation are also present throughout the procurement policy and projects. The over-formalisation of the process does not prevent less formal ways of behaving. Yet, the modalities of these behaviours are not clearly framed, which does not help transparency or trust in how public decisions are made.

4 Conclusions

Comparing the Belgian and English legal systems highlights how competition and cooperation need to be articulated to develop complex construction projects. This articulation stumbles on how trust should be maintained across the market, between the interested parties and from the public. Transparency plays a cardinal role here; yet its modalities, extent and limits lead to the development of alternative mechanisms to compose the trust required from some actors. This middle ground is inhabited by expertise, parties' arrangements and public pressure vary is framed by two levels of tensions: within the actors of the system underlying construction projects and within particular public-private relationships developed around specific projects.

On the one hand, the general logics of the two systems are mirror images of each other. In England, the process tends towards more formalisation and institutionalisation. Cooperation in the form of partnering does not entail legal consequences but is to some extent formalised in one document developed by the parties: partnering agreements are drafted detailing the positions of each party and communicating to the other the basic principles of the relationships and mutual expectations. In Belgium, the process would tend towards de-formalisation. The overall interactions between the public authorities and the private contractors are not formalised. One finds that cooperation or interactions between the public and the private parties are allowed because they are not prohibited, because they do not fall under an interdiction or specific procedures in the public procurement process (e.g. the case of market analysis). Sometimes, the statutory provisions provide steppingstones to cooperation or exchange of information in encouraging bidders to ask for information or clarification. Sometimes, the statutory provision emphasises the need for soft formalisation with a code of ethics setting standards for professional conduct – yet, only encompassing the public officials. This stage is still difficult to implement. The overall picture of Belgian cooperation does not find one single focal point of attention.

[1] Eg: CE, nr. 181.351, 19 March 2008, Dalkia.

On the other hand, there are situations which are to a large extent parallel in the UK and in Belgium. The typical case this paper brings up to illustrate this is the commercial confidentiality issue. Because of the large EU procurement requirements in this area, the basic pattern is similar in terms of the interests in tension: commercial confidentiality vs. transparency and competition. Yet the ways in which the interests are articulated bear the marks of the different legal cultures relating to discretion. In England, the judge recognise that parties have a part to play in working out a solution to commercial confidentiality. In Belgium, the administrative judge carries a wider discretion in shaping the solution. This may bring in an expert which then, on his turn, exercises discretion.

This paper suggests that in mapping the tensions between competition and cooperation tensions arise around transparency and trust. However, questions of priority may be asked in addressing the key issues underlying arguments in favour of full transparency and competition. Both aim at eradicating endemic problems of bad use of public discretion to the detriment of the public purse (and in parallel of an efficient market where players are fully competing). However, there are alternatives to full transparency which may also contribute to reducing these practices or fears. In this respect, a strengthening of ethics within organisations may be at least an important factor. The codes of ethics may help but, taken on their own, they may not be enough, too weak or too recent (the Belgian case). Developing layers of structures with each one supposed to help achieve transparency does not necessarily result in clearly articulated public control: rather, this probably disturbs more than provides the trust that transparency is supposed to bring about (the English case).

This analysis suggests that a legal analysis of complex construction contracts may benefit from a comparative approach, highlighting how these projects are embedded in an institutional context in which project management and ethical norms are more or less acknowledged and welcome. Conversely, as management research seeks to develop a better understanding of partnering, the legal and institutional contexts in which it interacts may need close attention.

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Participant implementation of the EU Tendering Laws in the Building Industry

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Abstract:
Since around the millennium a tendency has been that more and more tendering cases in Denmark are brought to The Danish Board of Complaints on Tendering (In Danish: Klagenaevnet for Udbud). During the last two years there has been a stagnation in the number of cases, but this tendency started already in 2004. Many cases are going to arbitration because the parties in the tendering process do not know how to handle the tendering process in a proper way.

A prior analysis of cases from The Danish Board of Complaints on Tendering from 2000 until 2008 shows that the number of cases which ended up in The Danish Board of Complaints on Tendering were increasing in these years and that the types of topics were fundamental items, among others, assignment criteria.

A new examination going from 2000 until 2010 shows that there is a sort of stagnation in the number of cases in 2009 and 2010, but more and more cases are on topics like purchase and purchasing of service provided. If cases concerning the Building Sector are selected the examination shows that the stagnation in the number of cases already from 2004, which shows that some participants have learnt to use the Danish Tendering Act and the European tendering legislation even when criteria such as interpersonal and technical competencies are used instead of the price.

Keywords:
assignment, tendering laws, building sector, communication

1 Introduction

1.1 History

From 1993 the European Union began to make rules for the tendering process. Before, Denmark had its own special Competitive Tendering Act very different from the EU law. The Danish Competitive Tendering Act was changed in 2001 to make sure that the Danish tendering laws are like the EU tendering law, which means that now European as well as Danish legislation are in force for the process (Fabricius, 2006).

When the European Union in 1993 started making rules about tendering, the Danish Parliament also established The Danish Board of Complaints on Tendering in 1993 to take care of potential complaint cases in Denmark.

1.2 Now

Until the late 1990s the Court of the European Union had only a few cases, but since then the number of cases has increased (Nielsen R. and Treumer, S., 2005). In Denmark the trend is the same (Ussing, L.F., 2008). At the same time it has become more and more normal that instead of using only the price, clients combine other assignment criteria together with price.

In the beginning the rules were not very well known in Denmark, but during the last years nearly everyone know, that EU rules exist, which you have to follow in a tendering process. Therefore The Danish Board of Complaints on Tendering is now generally known as well. So if a bidder finds, that the supplier does not follow the rules, then he will complain.

In the last few years a significant changes can be observed in the topics in the complaint cases. An analysis of cases from The Danish Board of Complaints on Tendering from 2000 until 2008 shows a change in the total number of cases ended up in The Danish Board of Complaints on Tendering where an increase in fundamental topics, such as others assignment criteria appear (Ussing, L.F., 2008).

These topics are still some of the biggest problems, but a new investigation shows a stagnation in cases relating to the building and construction sector, but a big increase in the total number of cases relating to purchase and purchasing of service provided.

2 Literature Review

The references in this article are mainly based on work and results from a PhD project (Faber Ussing, L., 2010) finished in 2010. In this PhD study, a literature study was made, but the findings were that only very little journal articles deal with the EU bidding law and the building sector, but to discuss the analysis and the conclusion in this paper a literature review for international journal articles has been made. The search has been made systematic mainly based on (Pittaway, L., Robertson, M., Munir, K., Denyer, D., Neely, A., 2004) and (Cankaya, A., Lassen, A., Wandahl, S., Poulsen, S., 2010). The search was made in the following database for journal articles: Academic Research Library, IBZ, Emerald and Web of Science. Tendering law was the first search word and this lead to around 450 articles. Following, the search words: building sector and EU were added. Building sector reduced the number of articles to 220 and following, EU to 43. Articles from after 2008 reduced the number of articles to 10. The 10 articles have been studied and 3 are found relevant for the paper, but only 1 deals directly with cases inside EU.

3 Research Methodology

The purpose of this paper is to show the changes in the Danish building sector over time by using facts from court decisions made by the Danish Board of Complaints on Tendering.

The investigation is made by counting all cases conducted by The Danish Board of Complaints on Tendering. Afterwards the cases are dividing into two groups; relating to the building and construction sector and not relating to the building and construction sector.

An investigation is also made of how many cases were submitted to The Danish Board of Complaints on Tendering but in the end withdrawn again, which means that they do not count in the total number of cases.

4 Findings and Discussion

4.1 Decisions taken by the Danish Board of Complaints on Tendering

The main task for the Danish Board of Complaints on Tendering is to investigate complaints in the tendering process. That means all sort of tendering processes in the building sector, but also in other sectors. The Board is not a court of justice but similar, which means that the decisions can with few exceptions be presented to The Court of Justice.

Decisions taken by the Board can have the following rulings: The tender can be annulled. The tender can be made legal. Compensation can be decided and some of the cases can have a delaying effect. (Ussing, L.F., 2008)

4.2 Number of cases from the Danish Board of Complaints on Tendering

An earlier paper (Ussing, L.F., 2008) shows the topics in all cases brought for the Board of Complaints from the beginning of the Board of Complaints until the 16. April 2008. The paper also shows the total number of cases.

The most presented topics are on fundamental legislations items; a tender has to be transparent and treat all bidders equally (Fabricius J. and Offersen, R., 2006). Details from (Ussing, L.F., 2008) show problem with fundamental topics items as e.g. assignment criteria.

The investigation from the paper (Ussing, L.F., 2008) includes all cases, but during the last years more and more cases have been on topic like purchase and purchasing of service provided. Therefore it can be interesting to investigate the cases concerning only the building sector.

A new investigation on the cases from the Danish Board of Complaints on Tendering has been made. It includes all cases from 2000 until the end of 2010 brought before the Danish Board of Complaints on Tendering and ending with a ruling.

4.2.1 Total number of cases conducted at the Danish Board of Complaints on Tendering

Figure 1 shows the total number of cases conducted at the Danish Board of Complaints on Tendering and also the total number relating to the building and construction sector.

The figure shows an increase in the number of cases in total, but when the building and construction sector are selected a stagnation in the number occurs from 2004.

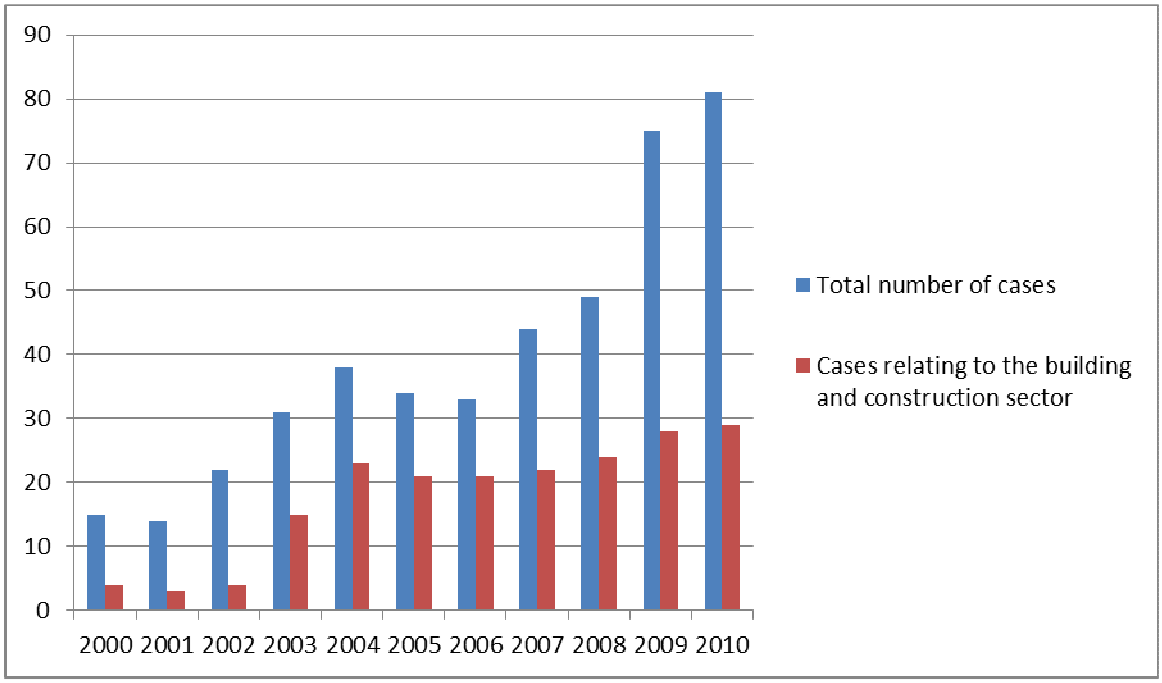

Fig. 1 Number of cases conducted at The Danish Board of Complaints on Tendering (Klagenævnet for udbud, 2011)

The increase from 2000 until 2004 can be explained with the fact that more and more bidders are aware of EU tendering rules and demand the supplier to use the rules in the right way. From 2004 until 2006 a stagnation appears, which can be explained by the fact that bidders and supplier now know the rules and also have learned to use them.

In 2006 the European Commission published the Commission's rendering announcement (2006/C179/02). This announcement means that a public client has to be careful if not following the EU-directives, because in practice this means that the EU-treaty from 1993 at all times is in force and basic rules and principle as free movement / flow of goods and services, no discrimination and equal treatment, transparency, proportionality and reciprocal recognition, also when the project is lower than the threshold values. (Ussing, L. F., Wandahl, S., Bejder, E., 2010)

The European Commission's rendering announcement about the community law can explain the increase from 2006 until now. Suddenly a lot of small suppliers and bidders have to use some rules they did not know before. They have to learn the rules and learn to use them. At the same time a lot of cases relating to purchase and purchasing of service provided are under the thresholds values and therefore not directly covered by the EU directives.

4.2.2 Number of cases conducted at the Danish Board of Complaints on Tendering relating to the building and construction sector

Figure 2 shows the total number of cases in the building and construction sector. You can see the stagnation going from a few in 2000, 2001 and 2002 to 15 cases in 2003 and then a rise to 23 in 2004. After 2004 the number has been nearly stable on 21, 21, 22 and 24, respectively. In 2009 and 2010 an insignificant increase to 28 and 29 cases can be found.

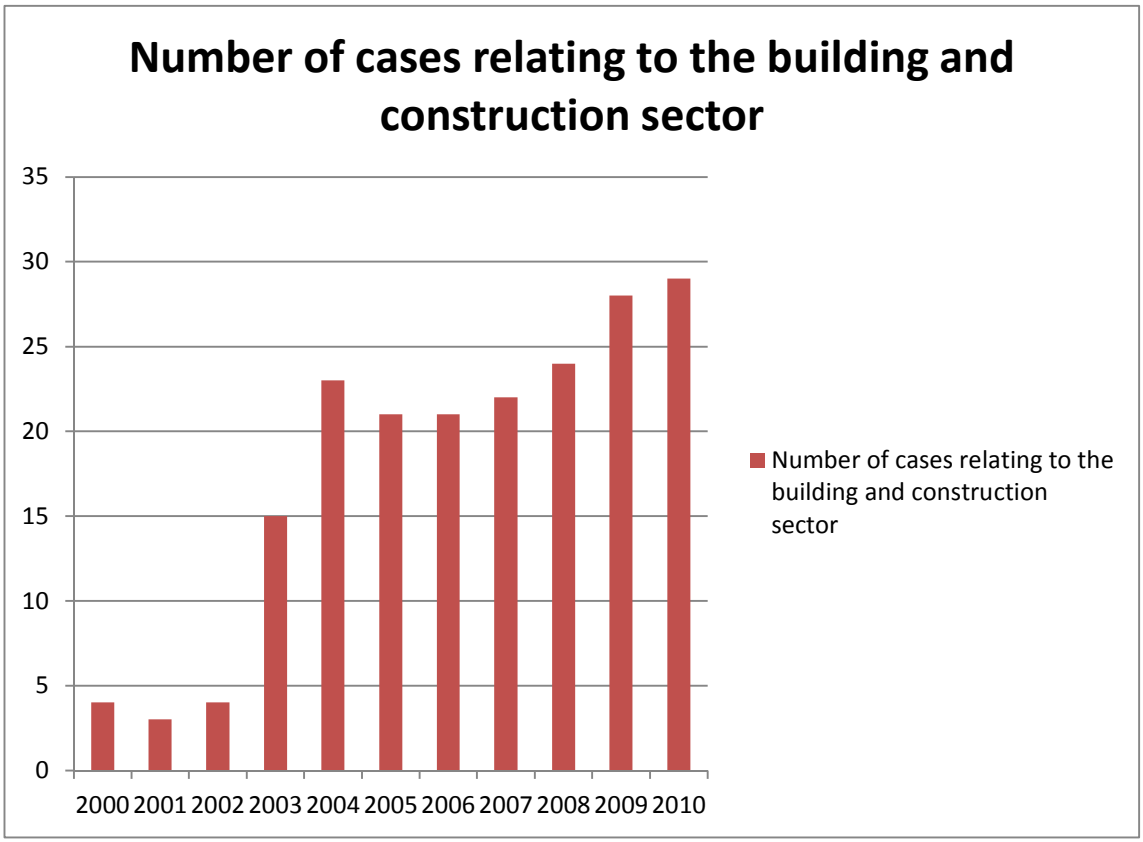

Fig.2. Number of cases conducted at the Danish Board of Complaints on Tendering relating to the building and construction sector
(Klagenævnet for udbud, 2011)

The stagnation in 2000, 2001 and 2002 can be explained with that the rules in the late 1990's became well known in the Danish building sector because of the EU case about the "buy Danish clause" on the Storebaelt Bridge. (Konkurrencestyrelsen, 2008)

Because of the case on the Storebaelt Bridge in 2001, the Danish Parliament changed the Danish Tendering Act. The new Tendering Act follows the rules from the European Union, so now almost the same rules have to be followed at all times in Denmark, if you are a public client (Ussing, L.F., 2008), even when you are under the threshold value for the EU directives.

The new tendering act which is valid only for the building and construction sector can be reflected in the increase in the number of cases in 2003 and 2004. Small building projects are suddenly included by the rules, and new players have to learn the rules.

From 2005 the numbers of cases seem to be steady. Two reasons can explain this; in Denmark a building boom happened and all the participants had a lot of work and therefore no time for complaints. Another reason can be that the participants in the building and construction sector now had learned to use the rules properly.

The little increase in 2009 and 2010 can be explained with an overheated market in the building and construction sector in 2007 and 2008 followed by a significant decline in the building and construction activities in 2009 and 2010 (The Danish Construction Association, 2011).

With a decline in activities in the building and construction activities more cases are presented to the Danish Board of Complaints on Tendering. The explanation can be that the bidders have more time to look at the rules, more time to find slips and then complaint. (Faber Ussing, L., 2010)

If the number of cases are examined which have been conducted at the Danish Board of Complaints on Tendering in 2011 until now (15. April 2011), and the year will end as the first part (Klagenævnet for udbud, 2011), a 20% increase in the total number of cases from 2010 to 2011 can be found, but still almost a stagnation in the cases relating to the building and construction sector.

The reason why the number of complaint cases in the building and construction sector seems nearly stable in 2011 regardless of an ongoing crisis in the sector can be that the participants have learned to use the rules.

4.2.3 Number of withdrawn cases submitted to the Danish Board of Complaints on Tendering

Before discussing why the total number of cases increases as the same time as a stagnation in the cases relating to the building and construction sector occurs, it can be interesting to take a look at the number of withdrawn cases submitted to the Danish Board of Complaints on Tendering.

Figure 3 shows the number of withdrawn cases submitted to the Board of Complaints from the beginning of 2004 until the end of 2009. In 2004 there were 9 retired cases, in 2005 the number declines to only 5, in 2006 the number increases to 10, finally in 2007 and 2008 the number increases to 24 and 24 respectively. In 2009 the number of withdrawn cases was as big as 36.

None of the withdrawn cases can be seen in the official list of total number of cases submitted to the Danish Board of Complaints on Tendering. The cases are withdrawn because the Danish Board of Complaints on Tendering estimated them to have no substance for a case, and the parties have settled and therefore was given the permission towithdrawn. (Klagenævnet for udbud, 2010)

The increase of withdrawn cases submitted to The Danish Board of Complaints on Tendering can be explained with the total number of cases submitted to the Board of Complaints. When the total number of cases increases it is logical that the graph for withdrawn cases will follow the graph for the total number of cases, and therefore increases too.

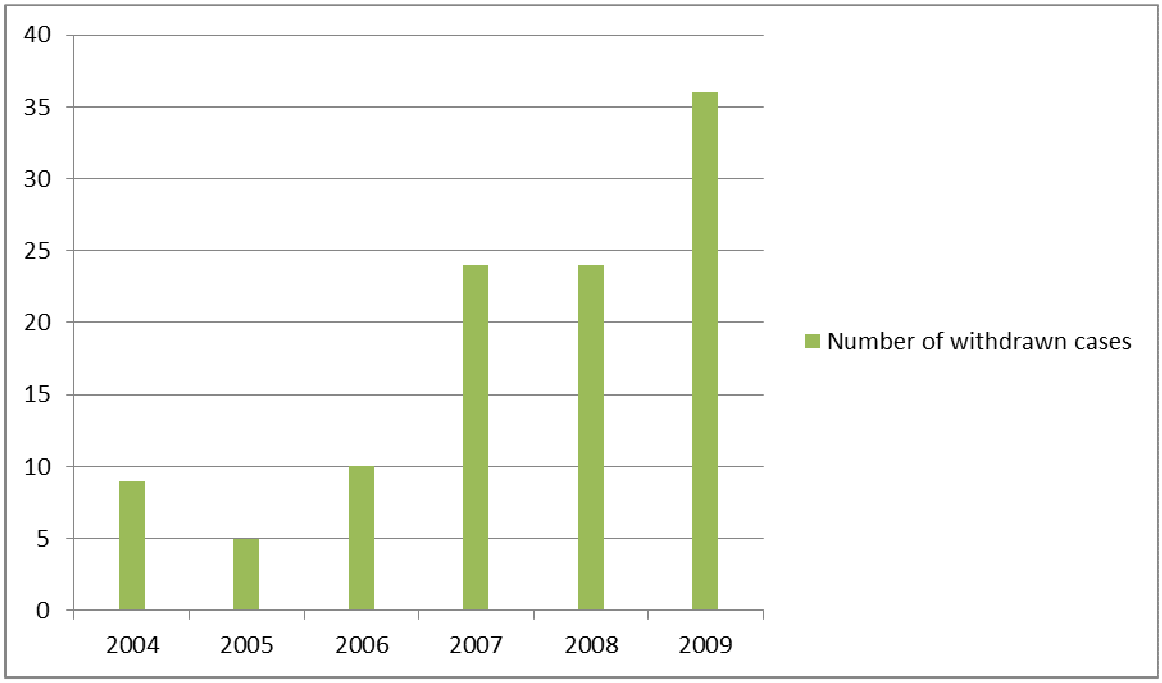

Fig. 3 Number of withdrawn cases submitted to the Danish Board of Complaints on Tendering (Klagenævnet for udbud, 2010)

The number of withdrawn cases includes all topics of cases, which gives a little problem. The part directly related to the building and construction sector, may develop differently. But it is not known how many of the cases are related to the building and construction sector, therefore it must be assumed that the graph for withdrawn cases related to the building and construction sector also follows the graph for the total number of cases related to the building and construction sector.

5 Conclusion and Further Research

5.1 Changes in making a public procurement in Denmark

After changing the Danish Tendering Act in 2001 with the last revision in 2007, Denmark has change the procedure for making a public procurement. Before 2001 the building and construction sector was assigned to a tendering law where the only assignment criterion was the lowest price. This changes after 2001 where you were now allowed to use the assignment criterion: economically most advantageous bid. (Nielsen R. and Treumer, S., 2005)

The cases from the Danish Board of Complaints on Tendering have been divided in two parts; cases related to the building and construction sector and cases not related to the building and construction sector. The last part is mainly cases related to purchase and purchasing of service provided.

Before 2001 parties related to purchase and purchasing of service provided outside the building and construction sector were not assigned to any law or rules except the Danish Sale of Goods Act. The result was that they could make agreements nearly in the way they wanted with no involvement.

From 1993 all parties over the threshold value were with the EU directives assigned to the directives. But the Danes did not realise this, because it was small jobs. In 2001,

with the new Tendering Act which is adjusted to the EU-directives a lot more participants were assigned to rules and at a lower threshold value. But the Tendering Act is only valid for the building and construction sector. The result was that everyone else could do as usual. In 2006 when the European Commission published the Commission's rendering announcement (2006/C179/02), it was suddenly serious for the Danes; they all had to follow the EU directives. (Nielsen R. and Treumer, S., 2005)

Before the Danes began using the EU directives, they made a lot of contracts according to; who do we know, and who do we trust? (Ebbesen, R. M. and Ussing, L. F., 2007) This is perhaps special for agreements in Denmark and the other Nordic countries (Camén, C., Gottfridsson, P., Rundh, B., 2011), but the result is that the Danes in a lot of projects use the assignment criterion: economically most advantageous bid (Faber Ussing, L., 2010). Because it fits best the approach: whom do we know, and whom do we trust?

5.2 Using economically most advantageous bid as criterion

When using economically most advantageous bid as criterion some problems arise. You have to make the selection and the assignment to be free movement / flow of goods and services, no discrimination and equal treatment, transparency, proportionality and reciprocal recognition. It is quite easy when you use lowest price as criterion, but when you use economically most advantageous bid, and want to work together with whom you know and whom you trust, it is not easy anymore.

You have to find selection and the assignment criteria as cooperation, personal skills, interviews and organisation. They are not the easiest in the world to make measurable and unambiguous, but it is possible. (Faber Ussing, L., 2010)

5.3 The building sector has begun to learn to use the EU directives

In the last few years more and more suppliers in Denmark use economically most advantageous bid with selection and the assignment criteria as cooperation, personal skills, interviews and organisation (Faber Ussing, L., 2010). It is getting accepted to do the bidding process in that way, but it takes time to learn it.

Therefore the conclusion must be; the building and construction sector has started before the other sectors because of the rules, and the cases conducted at the Danish Board of Complaints on Tendering relating to the building and construction sector are in stagnation. Research shows that the building and construction sector wants to use economically most advantageous bid with selection and the assignment criteria as cooperation, personal skills, interviews and organisation, and it is getting accepted in the field. Those two things must mean that the participants in the building sector have started to learn to follow and use the rules of the EU Laws and the Danish Laws. (Faber Ussing, L., 2010)

The participants related to purchase and purchasing of service provided outside the building and construction sector have, if you look at the total number of cases conducted at the Danish Board of Complaints on Tendering, not learnt to follow and use the rules yet.

5.4 Further Research in cases conducted at the Danish Board of Complaints on Tendering

In the next years it will be interesting to follow the development of the number of cases conducted at the Danish Board of Complaints on Tendering to see if it still increases, declines or gets stable. And moreover to see if is it possible to find out why.

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Challenges of Spent Nuclear Fuel Management in Korean Nuclear Plant Construction: Can Pyroprocessing Be a Solution?

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Abstract:
This paper explores the extent to which difficulties in spent nuclear fuel management constrain the continued expansion of nuclear plant construction in Korea, and analyzes the legal issues surrounding pyroprocessing, a new method of recycling spent nuclear fuel that makes it extremely difficult to produce weapon-grade plutonium at the end. Whereas nuclear power enjoys renewed attention because of its near-zero carbon emission, cost concerns on disposing of spent nuclear fuel conflict with the prospect of vigorous nuclear plant construction in Korea. Those cost concerns come from the fact that recruiting a geologically stable storage site is confronted with opposition from local population, while reprocessing spent fuel within the Korean territory is not possible without U.S.'s consent under the Agreement for Cooperation between the Government of the Republic of Kore and the Government of the United States of America Concerning Civil Uses of Atomic Energy[1] (hereinafter Nuclear Cooperation Agreement). Pyroprocessing, meanwhile, is potentially an attractive option because it is proliferation-resistant and could in the long run lead to lowering the cost of spent nuclear fuel management compared to reprocessing or transboundary movement of spent nuclear fuel. The question is whether this new technology of advanced fuel cycle also falls under the same rubric of "reprocessing," which is effectively blocked under the current Nuclear Cooperation Agreement. In light of the upcoming negotiations for the terms of a new nuclear cooperation agreement, this paper suggests a balance test in interpreting the relevant treaty provisions, which takes into account both proliferation concerns and potential benefits from continued research on such a new advanced fuel cycle as pyroprocessing. This paper concludes by proposing several applications of the balance test that would allow pursuit of research in that technology along with research sharing between the two countries, in exchange for assumed prior consent on pyroprocessing.

Keywords:
Korea, Spent Nuclear Fuel Management, proliferation, pyroprocessing, balance test, assumed prior consent

1 Introduction

Not many power generation sources receive so much attention as nuclear power, for reasons ranging from nuclear safety to near-zero emission of greenhouse gases. While

[1] Entered into force on 19 March 1973, United Nations Treaty Series, Vol. 911, I-12986.

controversies surrounding nuclear power will intensify in the wake of the Fukushima nuclear accident in March, 2011, nuclear power will likely remain as one of the main sources of power for major economies, and Korea will no doubt be one of them, because of its climate-friendliness, significant efficiency in terms of land to be used (Bryce 2011), and fuels to be spent. In fact Korea is set to increase nuclear power's share in national generation portfolio from around twenty-four per cent in 2008 to forty-one per cent in terms of generation capacity by 2030 (Ministry of Knowledge Economy and Korea Hydro & Nuclear Power, 2009; World Nuclear Association 2010). Considering Korea's commitment to voluntarily reduce greenhouse gas emissions for thirty percent compared to business-as-usual emissions by 2020 (Kang 2009), nuclear power will likely expand even further.

The cost concerns of various kinds may hamper nuclear power's smooth expansion in generation portfolio, however. While there are several cost items related to nuclear generation, the cost concerning spent nuclear fuel management is conspicuous in two ways. On one hand, long-term storage and ultimate disposal of such spent nuclear fuel involves acquiring a large swath of geologically stable land, a requirement that is not easy to meet in many cases. On the other hand, since spent nuclear fuel still contains uranium that can be converted into weapon-grade nuclear material through reprocessing, a careful watch on what to do with spent nuclear fuel is a requisite from nuclear non-proliferation perspectives. This is why reprocessing, which extracts pure plutonium from the spent fuel and makes it usable for a certain type of nuclear reactors (Greenberg 2009; World Nuclear Association 2011), is often looked upon suspiciously because plutonium is useful for military purposes.

As storage and reprocessing will not present themselves as ideal solutions for spent nuclear fuel management in Korea, discussion on "pyroprocessing" gains more traction in the field of Korean academics and policymakers. This technology is relatively free from concerns on proliferation as it will make extraction of plutonium difficult compared with reprocessing, while the end outcome could be fabricated for fuels on a new type of nuclear reactors. If this technology proved to be economically viable, it would work greatly towards solving a difficult question of how safely and cheaply to dispose of spent nuclear fuel.

The biggest legal hurdle facing pyroprocessing in Korea's context is the Nuclear Cooperation Agreement. According to this agreement, the United States' consent is a prerequisite when Korea hopes to reprocess, or alter in form or content nuclear material received from the United States,[1] effectively blocking Korea from reprocessing spent nuclear fuel and subjecting Korea's freedom of action to the United States' political criteria (Hahm 2009). The question relevant here is whether "pyroprocessing" falls under the rubric of "reprocessing", requiring the United States' prior consent on a case-by-case basis. Incidentally the agreement will expire in 2014[2], and while the Korean government is negotiating with U.S. on the terms of renewal, hopes are high on the Korean side that the agreement will be revised so as to allow Korea more freedom to pursue pyroprocessing without being too concerned about the treaty provisions.

To address this question of whether to allow pyroprocessing under the new Nuclear Cooperation Agreement, one should carefully look at what pyroprocessing exactly means, as well as its potentials and limitations, before jumping into the investigation of

[1] Article 8 of the Nuclear Cooperation Agreement.
[2] Article 15 of the Nuclear Cooperation Agreement stipulates that it "shall remain in force for a period of forty-one (41) years". Since the said agreement entered into force in 1973, the agreement is interpreted to expire in 2014.

the language in the agreement and coming up with possible solutions. In addition, more information needs to be provided on other methods of managing and disposing of spent nuclear fuel, to put pyroprocessing in perspective with cost concerns duly taken into account. Therefore this paper starts with the discussion on the options of spent nuclear fuel management, which are storage, reprocessing and transboundary movement. It then proceeds to discuss pyroprocessing in more detail, followed by the analysis of the Nuclear Cooperation Agreement with a focus on the provisions governing reprocessing and alteration in form and content of U.S.-origin nuclear material. It concludes with suggestions on how best to interpret pyroprocessing in view of both non-proliferation and nuclear waste management, followed by some possible applications of a balance test that will altogether accommodate due concerns on proliferation as well as on cost control.

2 Spent Nuclear Fuel and Cost Concerns for Nuclear Plant Construction in Korea

Korea has relied much on nuclear energy to power vigorous economic growth in the past three decades, and it plans to build more nuclear power plants in the next few decades or so. However, this rapid expansion of nuclear capacity in Korea generated excessive amounts of radioactive waste material, and spent nuclear fuel is one of them. Since its highly radioactive character, spent nuclear fuel should be put under tight control measures, which will necessarily incur huge costs. This section describes the currently available management options for spent nuclear fuel in Korea, which is on-site and interim storage, and explains why it has to be the order of day over other available solutions.

2.1 Current Approach to Spent Nuclear Fuels: On-Site and Interim Storage

Currently Korea runs a total of 20 nuclear power plants, and the amount of spent nuclear fuels taken out from those nuclear reactors keeps increasing, marking 10,083 tons of spent nuclear fuel in 2008 with an annual increase of 700 tons expected as well (Park 2009). To deal with such a vast amount spent nuclear fuel, Korea has relied on a measure of storing them on each nuclear plant site, using both wet and dry storage facilities. Since their planned storage capacity is almost full, a new work on expanding interim storage capacity for each nuclear plant is under way, so that on-site storage of spent nuclear fuel can continue until 2016 (Ministry of Knowledge Economy and Korea Hydro and Nuclear Power 2009). A recent research finds that by a simple technique of "re-racking," making storage denser by adjusting the distances among storage racks, the interim storage may continue into 2023.[1] While impressive, such a technique is neither going to be a permanent solution to the problem of spent nuclear fuel management nor so intended. It was simply a precautionary measure just in case finding a location for centralized interim storage becomes difficult or takes longer than expected. Unfortunately this is becoming a reality, given the delay in even starting out on a public discussion of setting out a national policy on spent nuclear fuel management (Hippel 2011).

2.2 Other Options and their Limitations

On-site and interim storage are not the only technical options to deal with spent nuclear fuel. Speaking purely from a technical viewpoint, there are indeed a couple more routes

[1] Interview with Myung Seung Yang, Senior Research Fellow, Korea Atomic Energy Research Institute (Daejeon, 15 March 2011).

available, which are reprocessing within the Korean territory and transportation of spent nuclear fuel to other countries for reprocessing or storage. Each of these methods, however, is subject to certain limitations, which are legal and economical in nature.

2.2.1 Reprocessing

Reprocessing refers to a technique that extracts plutonium from spent nuclear fuel and turns it into a reusable state for fuel fabrication to use for a specific type of nuclear reactor, such as fast breeder reactor. Since this technique requires enormously high level of technical maturity and costs more than simple storage, only a few countries have succeeded in reprocessing spent nuclear fuel, and a much smaller number of countries currently use such technique as a way of disposing of spent nuclear fuel, such as Canada, France, United Kingdom, Russia and Japan (OECD and Nuclear Energy Agency 2005; World Nuclear Association 2011).

A bigger hurdle that reprocessing is confronted with is the possibility that the substance that is produced as a result of reprocessing, especially plutonium, will easily be converted to weapon-grade material. Such a possibility is in direct conflict with the spirit of non-proliferation, which international organizations such as the International Atomic Energy Agency (IAEA) will take very seriously should Korea choose to reprocess spent nuclear fuel. Now that North Korea is under suspicion of having developed nuclear weapons through reprocessing, it would be not advisable for Korea to resort to the technique that clearly has military use. It is also questionable that Korea has secured technology needed for reprocessing. Furthermore, the Nuclear Cooperation Agreement also restricts the extent to which Korea could reprocess spent nuclear fuel, as the article 8 clearly stipulates. At least when it comes to reprocessing U.S.-origin spent nuclear fuels, the United States' prior consent on a specific case is a requisite, which cannot be guaranteed at all times.

For the reasons noted above, reprocessing spent nuclear fuel within the Korean territory will not be a realistic option to pursue.

2.2.2 Transboundary Movement of Spent Nuclear Fuel

If reprocessing within the Korean territory cannot constitute an option for managing spent nuclear fuel, one may wonder if such spent fuel could be shipped out of the country for reprocessing or, assuming that there exist some countries willing, for permanent geological disposal by way of burying it a few hundred meters underground (LaTourrette et al 2010).

There is indeed an international agreement covering this issue, namely the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management[1] (hereinafter Joint Convention). Since Korea is a contracting party in the Joint Convention by means of ratification (Louvat 2006)[2], it is possible at least in theory that Korea's spent nuclear fuel would be shipped out of the territory for reprocessing or permanent disposal, under a mutual agreement between Korea and the recipient country.[3]

[1] Entered into force on 18 June 2001, United Nations Treaties Series, Vol.2153, I-37605.
[2] Korea became a contracting member of the Joint Convention by way of ratification, which took effect on 15 December, 2002. Article 39 of the Joint Convention.
[3] Article 27 of the Joint Convention.

The practical importance of such an international convention for Korea is, however, limited at best. First of all, the United States, which supplies most of the nuclear material for generation purposes, will effectively have a final say on whether Korea may ship such nuclear material to a third country, as the United States' prior consent on a case-by-case basis is essential for that to take place (Compton 2009).[1] In addition, the United States has taken the position that it would not take back the nuclear material that it provided to other countries to its own territory (Burkart and Gorn 2008). Part of the reason is perhaps the fact that the United States has not successfully found the site for permanent geological disposal. Even though the U.S. government designated Yucca Mountain in Nevada as a locale for such geological disposal, such decision has not been implemented effectively due to the lawsuits at the courts of various levels (Kessler 2008). The earliest that the Yucca Mountain area should be ready for taking in spent nuclear fuel and other high radioactive waste was projected to be 2017 (Ministry of Knowledge Economy and Korea Hydro and Nuclear Power 2009), but after the Obama administration took office in 2009 such a plan for permanent geological disposal was put on hold (World Nuclear Association 2011).

In addition, there is no guarantee that shipping out the spent nuclear fuel from the Korean territory for other disposal methods will make economic sense. Even if we count out reprocessing in a third country as expensive, since the reprocessing cost itself is deemed as twice as high as direct disposal (Bunn et al. 2003; Orszag 2007), the shipping cost involved, with all the supplementary cost required for safeguarding the spent nuclear fuel until it arrives at a final destination, will easily become prohibitive. If Japan's case serves as an example, the remaining waste after the reprocessing overseas would be returned to Korea, not necessarily helping with reducing nuclear waste (Kusunose 2008; World Nuclear Association 2011). The situation would not be much different if the shipping out were for direct disposal, as it would involve payment per unit of spent nuclear fuel to a country willing to take it inside its territory, aside from transportation costs (Compton 2009).

For these reasons, shipping out spent nuclear fuel for reprocessing or direct disposal elsewhere will not be an appealing option for Korea either.

3 Pyroprocessing: Can It Deliver?

Since neither of the methods in section 2 could represent a long-term solution to the issue of spent nuclear fuel, efforts must be made to seek out other technologically sound options. One such possibility, as often discussed in the Korean context, is pyroprocessing. The following subsections will grapple with pyroprocessing's concept, its potential benefits and limits, and the prospect for the future.

3.1 Spent Nuclear Fuel Question Reframed: Disposed of or Recycled?

According to the conventional view spent nuclear fuel is radioactive waste; discussion will then focus on the safe disposal of such nuclear material, permanently if possible, without envisioning the possibility of reusing it in the future. On the other hand, if spent nuclear fuel is viewed as a still valuable resource containing fission material, then the question turns into how best to take advantage of the spent fuel's potential value, which turns the spent nuclear fuel into an object of recycling (Committee on Science and Technology 2009). With the advance of extraction technology and other supplemental

[1] Article 10 of the Nuclear Cooperation Agreement.

methods, recycling or "advancing fuel cycle" slowly becomes a possibility in the near future, and it is in this context that pyroprocessing is put forward as a future solution for spent nuclear fuel, as it opens the possibility of reusing spent fuel for nuclear power generation.

3.2 Pyroprocessing: Definition

Pyroprocessing is, to put it simply, a way of recycling spent nuclear fuel to use some residual active nuclear material for nuclear generation purposes. It starts with breaking down the spent fuel rods into pieces, eventually made into powder, and then placed in a bath of molten salt. In this an electric current is transmitted, thereby separating radioactive material from the solution of motel salt. The end result of this process is the concentration of actinides – radioactive elements with long half-lives – mixed with plutonium and other nuclear material (Inoue and Koch 2008). This end result can then be used for nuclear fuel fabrication designed specifically for a certain type of new generation reactors, such as fast neutron reactors or sodium-cooled fast reactors that Korea is intent on developing (Song et al. 2010).

3.3 Pyroprocessing's Advantages, Limits and Prospect for Future

Pyroprocessing's advantages are twofold. First, since this technology allows spent nuclear fuel to be reused in nuclear energy generation, it will help reduce the volume of highly radioactive nuclear waste. In Korea's case, all the spent nuclear fuel under the current circumstances would have to be stored somewhere on site or in a centralized interim storage, which will not come in the foreseeable future. Pyroprocessing would, if proven successful, convert a significant volume of nuclear waste into a usable resource, contributing to a complete fuel cycle and efficient use of nuclear energy as well. Second, pyroprocessing is highly proliferation-resistant (Inoue and Koch 2008). With pyroprocessing, it is difficult, although not entirely impossible, to produce weapon-grade plutonium out of the mixture of actinides and plutonium that comes as an end outcome. Therefore it helps mitigating fears of nuclear proliferation that is often the case with reprocessing technology, which produces pure plutonium that could easily be tapped for making nuclear weapons.

However, the level of maturity in this technology is low to say the least. Given the present state of pyroprocessing in terms of efficiently extracting nuclear material from spent nuclear fuel, this technology will at least be decades away from becoming up and running on a commercial basis (Hippel 2011). Another point of weakness in this technology is the fact that the fabricated fuel that comes from pyroprocessing's end outcome should be used for a specific type of nuclear reactors, such as fast breeders. The pace with which such reactors are researched and developed is also slow, and one should expect such reactors to come fully operational in around 2030 (Hippel 2011). In essence, pyroprocessing is currently not the readily available technology for commercialization, and still is left at the stage of R&D and demonstration. The media hype in Korea surrounding pyroprocessing as if it were a technology of immediate use is, in a sense, misplaced. Such is the case that the potential economic benefits in waste management cost reduction will not become easily established, until a number of sodium-cooled fast reactors with commercial capacity begin running (Chen 2010; Committee on Science and Technology 2009).

This does not mean that pyroprocessing is of no practical value, and one should not dismiss such a promising technology as simply experimental, as it shows a measure of promise for waste reduction and fuel recycle in the future. However, such a prospect

must be qualified with the fact that pyroprocessing has not reached its economic potential, so that a strict assessment of pyroprocessing's value and potential benefits may not be conclusively made at present. It is important in this context that one should not get carried away by rosy pictures of pyroprocessing's potential, but be ready to take a more guarded approach, basing decisions only on the best available scientific evidence and well-structured research on its economic costs and benefits.

4 Negotiations on a New U.S.-Korea Nuclear Cooperation Agreement

The following subsections summarize the background against which pyroprocessing has hit headlines, and also look into the different perspectives by United States and Korea in terms of pyroprocessing. Such discussion on differences of views will lay the groundwork for suggestions to be made in the next section on how to accommodate pyroprocessing in a new Nuclear Cooperation Agreement.

4.1 Background: Prior Consent on "Reprocessing"

The relevant provisions of the Nuclear Cooperation Agreement are article 8 and article 11, respectively. Article 8(C) provides that:

> "When any special nuclear material received from the United States of America Pursuant to this Agreement or the superseded Agreement requires *reprocessing*, or any irradiated fuel elements containing fuel material received from the United states of America pursuant to this Agreement or the superseded Agreement are to be removed from a reactor and are to be *altered in form or content*, such reprocessing or alteration shall be performed in facilities acceptable to both Parties upon a joint determination of the Parties that the provisions of Article 11 may be effectively applied." (italics added)

Furthermore, article 11(B) stipulates that:

> "B. . . . the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights:
>
> . . .
>
> (3) To require the deposit storage facilities designated by the Commission [author's note: United States Atomic Energy Commission] of any of the special nuclear material referred to in paragraph B(2) of this Article which is not currently utilized for civil purposes in the Republic of Korea and which is not transferred pursuant to Article 8 or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties; "

When interpreted in combination with each other, these two provisions strengthen the proposition that the United States has a strong say in reprocessing or altering in form and content of U.S.-origin nuclear material, and that it even has power to designate storage facilities for spent nuclear fuel. In other words, these provisions require prior consent from the United States when Korea attempts a certain form of "reprocessing" or "alteration in form or content" (Hahm 2009). These provisions may be effectively used against Korea's experimentation with pyroprocessing, if the concerns on nuclear

proliferation outweigh its other potential benefits in deciding upon the United States' negotiation stance.

4.2 Pyroprocessing: Reprocessing or Not?

4.2.1 U.S. Perspectives on Pyroprocessing

Since the official negotiations between Korea and the United States for a new nuclear cooperation agreement began only recently, it will be too early to tell what the United States government will say about Korea's pyroprocessing technology. However, if a recent remark by a U.S. government official serves as any indication, it does not bode well for Korea' hope for gaining a freer hand on pyroprocessing under a new agreement. Richard Stratford, an official from the U.S. Department of State, said in a conference that the U.S. Department of Energy "states frankly and positively that pyroprocessing is reprocessing. Period. Full stop." He even suggested that the key features in pyroprocessing "moved to the point that the product is dangerous from a proliferation point of view. So, for that reason, pyroprocessing is reprocessing, and that's part of the problem" (Horner 2011).

If the view that Mr. Stratford described at that conference should become the United States' official position, then it would be difficult for Korea to persuade the United States to accept pyroprocessing as a technology that would do without prior consent from the United States, as it would still see potential for nuclear proliferation from the end outcome of pyroprocessing, and it would wish to maintain the country's strong say in reprocessing and alteration in form and content of nuclear material, including spent nuclear fuel.

4.2.2 Korean Perspectives: Need for a Long-term Solution on Spent Nuclear Fuel

Korea's insistence on pushing ahead with pyroprocessing is understandable, in view of the political difficulties of securing an interim or permanent nuclear waste storage. The economic value of pyroprocessing is still not established, however, and this technology will not go past the experimental phase until a few decades later. Given the technology's limited potential in the foreseeable future, it may seem strange for Korea to enter into a bilateral negotiation with the United States on such a weak rationale.

Nevertheless, if one takes into account that nuclear power plant expansion in Korea is continuing and will continue even with the recent Fukushima nuclear accident in 2011, Korea's hope of holding onto every possibility of providing a long-term solution on spent nuclear fuel is not to be swept away too quickly. Even if pyroprocessing should take a long period of time to demonstrate its feasibility as well as commercial viability, the related research and development efforts ought to continue, at least to give the technology an appropriate environment to prove itself. The fact that pyroprocessing is highly proliferation-resistant should also serve toward more permissive approach from both the United States and Korean governments, as the technology represents only a minor risk factor when assessing proliferation risks. Considering that Korea is a contract party of the Nuclear Non-Proliferation Treaty[1] and has faithfully complied with many safeguard requirements mandated by the International Atomic Energy Agency (hereinafter IAEA), the concern for Korea's violation of nuclear proliferation duty may be overblown.

Seen from this perspective, pyroprocessing is not to be viewed as reprocessing with a high risk for military purposes but as a form of a peaceful use of nuclear material for

[1] Entered into force on 5 March 1970. United Nations Treaty Series, Vol. 729, I-10485.

civil purposes, with a small potential for conversion to weapon-grade material that could be dealt with by other safeguard agreements with the IAEA.

5 Suggestion of a Balance Test on Pyroprocessing

Summing up the discussion covering the diverse issues related to pyroprocessing, this paper suggests a balance test for assuming the United States' prior consent on pyroprocessing technology, if certain conditions are met. This approach will alleviate the United States' concern on nuclear proliferation that may follow from pyroprocessing, while supporting Korea's effort to refine and further develop pyroprocessing for future applications on reduction of nuclear waste as well as on efficiency increase in nuclear fuel use.

5.1 Balance Test's Guiding Principles

First of all, the balance test should contain a principle that permitting pyroprocessing must contribute to promotion of civil nuclear technology, not of military one. In this context, a constant outside watch on the technical advance of pyroprocessing should be established, in the form of a United States-Korea joint commission combined with Korea's duty to report significant developments or anomalies. In other words, the principle should require that pyroprocessing proceed as long as it would not present an increased risk of nuclear proliferation.

Secondly, an economic test should be attached to assessments of the relevant technology, assuming that such a technology would be wholly devoted to civil purposes. If it turns out that pyroprocessing technology will not make much economic sense in terms of reducing nuclear waste or of advancing fuel cycle, then the said joint commission should be able to debate the usefulness of such technology before deciding upon its continuation. A reduced financial support could also be envisioned as an exit strategy should pyroprocessing fail to show sufficient economic viability.

5.2 Application of Balance Test

5.2.1 Assumed Prior Consent contingent on Proliferation Risk Assessment

As it is likely that the United States will not give up its strong say on many aspects of nuclear cooperation with Korea, the structure of prior consent in nuclear reprocessing and other alterations would better be maintained. Instead, the two sides could agree on certain exceptions related to pyroprocessing, by inserting a clause on "advanced fuel cycle research and development," which would assume the United States' prior consent. To guard against abuse, this clause may be supplemented by a joint periodic assessment on proliferation risk, so that the assumed prior consent could be explicitly withdrawn should the assessment clearly show a significant increase in proliferation risk due to technical developments. This approach will therefore reconcile the need for constraining proliferation risks and the need for providing technological possibility for nuclear waste reduction and efficiency enhancement in nuclear fuel use.

5.2.2 Shorter Expiration Term

Consistent with the above point, the expiration term of the new nuclear cooperation agreement also needs to be shortened. When the agreement first entered into force in 1973, quite possibly the rationale behind the 41 year-term provision was that nuclear technology would not see much change within such a period. Now that such assumption

is arguably no longer tenable, a shorter expiration term for the agreement will provide more opportunities for the two parties to review the technical aspects of pyroprocessing comprehensively, allowing for significant revision of the agreement if situations so require. This shortened term will also mitigate the United States' concern that the assumed prior consent would perpetuate the path toward higher proliferation risk. Considering that most nuclear cooperation agreements remain in force for an average of 30 years, this paper suggests a 15-year expiration term to give both parties a relatively easy access to the review procedure.

5.2.3 Research Cooperation and Sharing

Korea is not the only country interested in pyroprocessing. Several other nations, including the United States, are currently involved in advanced fuel cycle research and development (LaTourrette 2010), although Korea is relatively ahead of other countries in terms of technical maturity and the scalability. If the research outcome from Korea's pyroprocessing research and development could be shared with the United States to the extent that doing so would not severely dilute the intellectual property values from those researches, it may give one more reason for the United States to grant assumed prior consent for pyroprocessing technology.

In fact the Korean Atomic Energy Research Institute (KAERI) recently agreed to conduct a 10-year feasibility study jointly with counterparts in the United States (Horner 2011), which may mark a good start toward research cooperation and sharing in this field. This paper suggests a more inclusive approach, providing possibilities for research sharing in areas that are insensitive to concerns on infringement of intellectual property, such as basic research that are not subject to patent awards.

6 Conclusion

Management of spent nuclear fuel is an area where concerns for nuclear waste and interests in fuel recycling collide. The implications that a successful management of spent nuclear fuel will have on smooth expansion of nuclear plant construction will be enormous. Pyroprocessing, by way of providing a potential for reducing nuclear waste through fuel recycling, can be considered as a prominent technology for the future, while the proliferation-resistant nature also makes it more acceptable than other reprocessing methods. Because of the technology's lack in commercialization records it should not become an immediate solution to the problem of spent nuclear fuel, but it recently received much attention combined with the fact that the Nuclear Cooperation Agreement would expire in 2014 and that the negotiations between the two parties would deal with several outstanding issues, including pyroprocessing. This paper suggested a balance test in reconciling differences between the United States and Korea concerning pyroprocessing, seeking to alleviate concerns on proliferation while ensuring continued research and development in the technology.

While pyroprocessing alone will not completely face up to the challenges of spent nuclear fuel management in Korea's expansion of nuclear plant construction, in the long run it will provide an opportunity for addressing the core problem of cost control in a comprehensive manner. The ideal package of solutions should combine all the necessary measures concerning nuclear waste management, including but not limited to on-site storage, centralized interim storage, permanent geological disposal and continued research on other advanced fuel cycles, among which is situated

pyroprocessing. Then the goal of supplying nuclear power to the Korean economy at reasonable costs would be made more within reach.

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Cartels on the construction market in Poland

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Abstract:
Antitrust regulations concern mainly two types of actions, which may restrict competition on a particular market: conclusion of competition-restricting agreements, and abuse of a dominant position. The first group of actions infringing competition, includes agreements between competitors, of a cartel nature. It manifests itself mostly by price-fixing, market sharing, and discrimination of specific entities. Recently in Poland, several cartels on the construction market were detected by the Office for Competition and Consumers Protection. The case of price fixing and market sharing by cement producers was particularly famous. Such illicit activity, affects the competition and harms other entities, and indirectly consumers. This paper highlights the issue of cartels occurring on the construction market in Poland. It places especial emphasis on the cement cartel which is a good examples of a prohibited agreement that has drastically limited competition on the construction market. Hence, this paper analyzes the significant decision of the President of the Office for Competition and Consumers Protection in the case of the cement cartel.

Keywords:
cartels, prohibited agreements, cement market

1 Introduction

1.1 The scope of protection of the competition in Poland

The President of the Office of Competition and Consumer Protection (hereinafter "the Office") aims at safeguarding intact functioning of the competition. If he detects a competition-restricting practice, in his decision he may order abandonment of such practice and impose penalties[1]. There are three types of activities which are harmful for competition, and are subject of interest of the Office.

Antitrust regulations concern mainly two types of actions which may restrict competition on a particular market: conclusion of competition-restricting agreements, and abuse of a dominant position. The first group of actions infringing competition includes agreements of a cartel nature, concluded between competitors. It manifests itself mostly by price-fixing, market sharing, and discrimination of specific entities.

[1] See art. 10 and 106 of the Act (Dz.U. 2007 nr 50 pos. 331)

With regard to abuse of a dominant position, *the Act of 16 February 2007 on competition and consumer protection* (hereinafter "the Act") constitutes that such practices are prohibited. The Act includes also a non-exhaustive list of activities, which are abuses of a dominant position. It consist of such activities as imposition of unfair prices, limiting production, creation of diversified conditions of competition, tying agreements, hampering the development of competition, imposition of onerous terms and conditions, and division. It is significant that legal actions which concern such abuses, are void entirely or in their respective part[1].

Besides the abovementioned practices, the Office has goals also in the area of control of concentrations. It can occur in such forms as merges and acquisitions. Excessive consolidation on a particular market may lead to achievement of a dominant position, what may be detrimental factor for a proper competition. In a situation when statutory conditions are fulfilled, entities which act with an aim of concentration have to report such intention to the Office. President of the Office has significant powers in this matter, also when unauthorized concentration took place[2].

1.2 Relation between the Polish and EU legislation on competition

With respect to both cartels and abuses of dominant position, Polish legislation is similar to the EU law[3]. At the EU level corresponding regulations are contained respectively in art. 101 and 102 of the Treaty on the Functioning of the European Union (hereinafter "TFEU")[4] [5]. These rules were specified in several regulations, and non-binding notices and guidelines of the European Commission (hereinafter "EC")[6].

In the field of the EU competition law application, two paths of proceedings exist. Of course when a particular competition-restricting practice may affect the trade between EU member states, the EC can initiate adequate procedure. On the other hand, appropriate domestic authorities can and even have to carry on antitrust proceedings in this area[7].

Thus, President of the Office can directly apply art. 101 and 102 TFEU. He employs both domestic and EU competition law, and may impose sanctions on undertakings violating these rules. However, according to the art. 5 of the Council's Regulation 1/2003[8] and to Court of Justice decision in the case *Tele 2*, domestic antitrust authorities can not deliver a decision finding no infringement of the EU competition rules: "*Empowerment of national competition authorities to take decisions stating that there has been no breach of Article 102 TFEU would call into question the system of cooperation established by the Regulation and would undermine the power of the Commission. Such a 'negative' decision on the merits would risk undermining the uniform application of Articles 101 TFEU and 102 TFEU, which is one of the objectives of the Regulation highlighted by recital 1 in its preamble, since such a decision might*

[1] Art. 9 of the Act.
[2] See Section III (art. 13-23) of the Act.
[3] However it should be stated that the interpretation of these provisions may differ. See: K.Kowalik-Bańczyk, *Pojęcie "wpływu na handel" jako kryterium stosowania przez sądy krajowe wspólnotowego prawa konkurencji*, Przegląd Ustawodawstwa Gospodarczego, Nr 2/2008
[4] Consolidated version of the Treaty on the Functioning of the European Union (OJ C 83, 30.03.2010, p. 47)
[5] The main source of EU law for mergers is the Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (OJ L 24, 29.01.2004, p. 1)
[6] Notices and guidelines are not binding, but serve an important role in interpretation, and in fact set standards which EC applies.
[7] See art. 10 of the Act
[8] Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty, OJ L 1, 04.01.2003, p.1-25

prevent the Commission from finding subsequently that the practice in question amounts to a breach of those provisions of European Union law."[1].

1.3 Prohibition of the competition-restricting agreements

Cartels are defined as monopolistic agreements between a number of entities, which aim is to restrict or even eliminate all competition on the relevant market. What promotes the formation of cartels is oligopolistic shape of the market[2]. Small number of competing undertakings creates an opportunity for them to enter into conspiracies, harmful for other competitors and consumers. Cartels cause great losses to the economy. Their harmfulness manifests itself mostly in unnaturally high prices, economical inefficiency, and prevention of cost-saving technological advances[3].

Regulations concerning prohibition of cartels contain two important elements. First of all, they prohibit such agreements. Secondly, they exclude certain agreements from the general prohibition.

The Act constitutes that prohibited are agreements, which have as their object or effect elimination, restriction, or other infringement of competition on the relevant market[4]. Article 101 par. 1 TFEU was constructed slightly different and broader. According to it prohibited are: "*all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market"*. Of course with respect to the EU competition law, it is crucial that their object or effect may concern the internal market.

Further the Act constitutes that such agreements are entirely or in their respective part void[5], while art. 101 par. 2 TFEU, that any agreements or decisions prohibited pursuant to it are automatically void.

Regarding the exclusion from application of the rules on prohibited agreements, the Act in art. 7 and 8 provides two such exceptions. First of them concern *de minimis* agreements[6]. Second, agreements which impact technical and economical progress. Four conditions have to be fulfilled for art. 6 of the Act not to be applied. Such agreement has to contribute to improvement of the production or distribution of goods or to promote technical or economic progress. Subsequently they have to allow the buyer or user a fair share of benefits, which result from an agreement. Then they can not impose on the undertakings concerned restrictions which are not indispensable to the attainment of these objectives. And also they can not afford such undertakings the possibility of eliminating competition in the relevant market in respect of a substantial part of the goods in question[7]. Art. 101 par. 3 TFEU contains correspondent regulations.

Both art. 6 par. 1 of the Act and art. 101 par. 1 TFEU contain exemplary enumeration of the prohibited agreements. According to art. 101 par. 1 TFUE, they are:

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[1] Judgment of the Court in the case Tele 2 of 3.05.2011, C-375/09
[2] Kartel, *Encyklopedia Wiem*, available at: http://portalwiedzy.onet.pl/3340,,,,kartel,haslo.html
[3] Cartel (economics), *Britannica Online Encyclopedia*, available at: http://www.britannica.com/EBchecked/topic/97205/cartel
[4] Art. 6 par. 1 of the Act.
[5] Art. 6 par. 2 of the Act.
[6] The prohibition does not apply to agreements between undertakings whose market share does not exceed 5% for competitors, or 10% for other entities. See art. 6 par. 1 of the Act.
[7] Art. 8 par. 1 of the Act.

"(a) directly or indirectly fix purchase or selling prices or any other trading conditions;

(b) limit or control production, markets, technical development, or investment;

(c) share markets or sources of supply;

(d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;

(e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts."

The Act provides two more examples of such prohibited agreements. They are: limiting access to the market or eliminating from the market undertakings which are not parties to the agreement, and collusions between undertakings entering a tender, or by those undertakings and the undertaking being organizer of the tender, concerning the terms and conditions of bids to be proposed, in particular as regards the scope of works and the price.

2 Findings and Discussion

Cartels on the construction market tend to be among the most frequent and biggest ones. In recent years, many cases concerning cartels in the construction industry have emerged, e.g. in the United Kingdom, the Office of Fair Trading imposed huge fines on biggest building companies in the country, such as Balfour Beatty and Kier Group, for bid rigging and cover pricing[1], in South African construction company Aveng faced fines for collusive behavior on the rebar and wire mesh construction markets[2], while in the EU more than 0,5 bln has been levied from the steel companies for price fixing and market division[3]. In Poland, collusions of a cartel nature involving construction businesses constituted the largest group of the detected prohibited agreements[4].

Most of the cases concerning prohibited agreements on the construction market in Poland involved price fixing. In a number of cases, the Office detected cartels on the paints and varnishes[5], wholesales of doors[6], ceramic tiles[7], and carpenter markets[8]. Generally the scheme of detected misconduct was similar. The reselling prices were fixed directly in trade agreements. Similarly on the tile and sandstone market price fixing consisted of an obligation to sell products for the suggested prices, not lower than

[1] See: T. Webb, Building firms braced for £200m fines after OFT cartel inquiry, Guardian.co.uk, available at: http://www.guardian.co.uk/business/2009/sep/21/construction-industry-cartel-ft-fines

[2] *See: H. Wright*, Aveng hit with US$ 18.7 million cartel fine, *available at: http://www.khl.com/magazines/international-construction/detail/item62401/Aveng-hit-with-US$-18-7-million-cartel-fine/*

[3] See: A. Roguski, *Komisja Europejska ukarała stalowy kartel*, Rzeczpospolita, available at: http://www.rp.pl/artykul/501923.html?print=tak

[4] See: *Na uczestników karteli nakładane będą surowe kary*, Interview with the President of the Office, available at: http://biznes.interia.pl/news/na-uczestnikow-karteli-nakladane-beda-surowe-kary,1488840.

[5] See Decisions of the Office nr RKT-43/2009 of 28.12.2009, nr DOK-4/2010 of 24.05.2010, nr DOK-12/2010 of 31.12.2010, nr DOK-107/2006 of 18.09.2006, nr RKT-79/2007 of 31.12.2007

[6] See Decision of the Office nr RKT-44/2009 of 30.12.2009, nr DOK-1/2008 of 07.04.2008

[7] See Decision of the Office nr RWR-20/2007 of 29.06.2007

[8] See Decisions of the Office nr RKT-43/2010 of 20.12.2010, nr RKT-47/2010 of 27.12.2010, nr RKT-48/2010 of 30.12.2010

those included in the producers' price-list, discounted not more as provided in the distribution agreement[1]. In the *Xella* case agreement included a provision constituting prohibition of using prices lower than the purchase price from the products' manufacturer[2].

However, in this paper I would like to focus on the cartel, which has occurred on the cement market. It was the biggest case, where a record penalty was imposed on the entrepreneurs in collusion. But not only the total sum of the imposed fines demonstrates the importance of this case. It is also a clear example of high level of cartel organization and its effect on the market. Moreover, the case was thoroughly analyzed by the Office and its decision regarding cement cartel presents the standpoint of the Office in numerous issues of competition law enforcement. The conclusions may be therefore relevant for the entire system of protection of the competition in Poland.

2.1 Cement cartel

In its decision nr DOK-7/09 of 8 December 2009, the President of the Office has found that the practices of 7 biggest Polish cement producers (Lafarge Cement S.A., Górażdże Cement S.A., Grupa Ożarów S.A., Cemex Polska S.A., Dyckerhoff Polska S.A., Cementownia Warta S.A., Cementownia Odra S.A.) were restricting competition on the domestic market of production and sales of the grey cement. Accordingly, the President found that these practices have constituted an infringement in terms of art. 81 of the Treaty establishing the European Community (hereinafter TEC; art. 101 TFEU at present). The President of the Office has ordered infringers to abandon such practices and imposed the heaviest fine possible (10 % of the profits) on them[3]. Jointly they have paid 414 mln PLN, what makes this fine the largest that was yet imposed[4], and indicates importance of this decision for the construction market, as well as its significance for the competition protection system.

The proceeding that was pending before the Office concerned such practices as fixing of the prices and other conditions of cement sales, division of the cement production and sales market, and exchange of the confidential information about trade[5].

2.2 Cement sector in Poland

After the downfall of the communist regime in Poland the cement industry has undergone dynamic transformations. As a result of the process of privatization a number of leading foreign companies have entered the Polish cement market. Afterwards, competing undertakings tried to strengthen their position on the market, what has resulted in restructuring and consolidation in the sector[6].

In 2006 at least 13 plants were producing cement in Poland. Several of those that were functioning in the '90 were closed, and their production capacity was marginal. On the contrary those which have remained on the market were subject to privatization,

[1] See Decision of the Office nr RKT-35/2009 of 08.12.2009
[2] See Decision of the Office nr DOK-3/2008 of 04.07.2008. However in this case participants have escaped punishment because they obliged not to use such practices in the future.
[3] Lafarge Cement S.A. is an exception. The fines were not imposed on them since they have disclosed relevant facts about the cartel and participated in the leniency procedure.
[4] See: *Rekordowe kary za cementową zmowę cenową*, Rzeczpospolita, available at: http://www.rp.pl/artykul/404118.html
[5] Only the first two are specified in particular subsections of the Art. 5 par. 1 of the Act, but the list included in this article does not have an exhaustive nature.
[6] See Decision of the Office DOK-7/09 of 8 December 2009, point 31

restructuring, and modernization. Currently they are among the most modern in Europe, and their production capacity in longer perspective is growing[1].

Before the regime has changed, all cement producers were associated in the Association of the Cement Producers. This body managed entire production of the cement in Poland, and obviously there were no conditions for competition. After privatization and ownership changes took place, this has changed, and in 1990 a new association has emerged. Currently its aims are very different, comparing to situation before the transformation, and concentrate on development and promotion of cement industry, as well as representation of its interests[2].

Bearing in mind such structure of the cement market in Poland there are no doubts that a cartel between major undertakings had to negatively influence the competition on this market. Additionally, prohibited horizontal agreements are always harmful for the market, whether by its distortion, restriction or elimination of the competition, and therefore they violate the interest of the general public[3].

2.3 Relevant market

It has to be noted that negative effects of a prohibited agreement must have their impact on the market, which is relevant in terms of a particular case. Relevance of the market concerns its subject (products), geographical, and temporary aspects.

Market should be specified narrowly, and defined as market of goods, which because of their purpose, price, and properties, including quality, are treated by theirs purchasers as substitutes (product market), and are offered on the area, where because of their nature and properties, existence of barriers in the access to the market, consumer preferences, significant differences in prices, and transport costs, conditions of the competition are similar (geographical market)[4]. In the case of cement cartel, which has been subject to the interest of the Office, both the product and geographical market were identical. Often the activity of the cartelists can itself determine the relevant market.

In this case the relevant market is the market of grey cement[5]. It is a homogenous product, for which clinker constitutes common component, and also its basis. Therefore, different types of the grey cement may be used as substitutes. In addition, it is possible to use preparations of the construction chemicals, and still achieve the same product. What is important is the fact that as a result, one can obtain the concrete which strength is the same[6]. There are no substitutes of grey cement, and in particular this applies to specialist products, such as white cement and aluminous cement[7].

[1] DOK-7/09, points 32-36
[2] DOK-7/09, points 96-107
[3] DOK-7/09, point 370
[4] See art. 4 par. 9 of the Act
[5] DOK-7/09, point 376
[6] DOK-7/09, points 377-379
[7] DOK-7/09, point 383

The cement price is determined by the amount of clinker in it. The competition between the cement producers is however of a minor significance, since although raw materials used in production may vary, the final product has to meet certain quality level, contained in specific standards[1].

With regard to the geographical market of the grey cement, in this case it was limited only to the Polish territory, forasmuch the cement is definitely a heavy product, and *ipso facto* the its transportation expanses are high. It has its reflection in the statistics of import and export of the cement products, which are systematically dropping, and constitute only a few percent of the entire cement market in Poland[2].

Figure. 1 Cement Plants in Poland. Source: *Cement Industry in 2007*, http://www.polskicement.pl/3/3/artykuly/13_89.pdf

There is also no local market in this case. Cement plants are localized in the southern part of Poland (as shown in Fig. 1), what is linked with the fact, that there are relevant deposits of natural resources. Areas in close rage of these plants, which would normally constitute their basic markets, are overlapping, so cement producers can not ignore reciprocal actions. Their localization indicates also that the costs of transport to the north are similar. Therefore, on such market conditions of competition are also similar[3] .

An important issue in the determination of the relevant market is the level of precision in its indication. In terms of prohibited agreements, in contrary to abuses of a dominant position and control of concentration, it is not necessary to indicate precisely the relevant market. When a prohibited agreement has as its aim restriction of the competition, it is not necessary to assess its effects on the relevant market. However, if these effects were to be analyzed (because such agreements did not aimed at restriction of the competition), then the relevant market should be precisely specified[4].

[1] DOK-7/09, points 380-381
[2] DOK-7/09, points 387-388
[3] DOK-7/09, point 390
[4] DOK-7/09, points 392-394

2.4 Influence on the trade between member states of the European Union

According to the decision of the President in the cement cartel case, this agreement has affected the trade between the Member States of the EU. To assess whether Polish cement cartel has affected the trade between the Member States, the Office has based its findings on *the Commission Notice - Guidelines on the effect on trade concept contained in Articles 81 and 82 of the Treaty*[1].

Regarding the concept of "trade" it should be interpreted broadly, including not only the exchange of goods and services, but also any cross-border commercial activities. It is enough, that such activities can influence the structures of the competition in the EU, and it can occur even when the relevant market has a national or a local range[2]. Strengthening of the market along the borders hinders other entities entering it, and therefore it means that the competitors from other countries are excluded from it[3]. In this case the aim of the agreement was to stabilize the market situation, particularly in scope of the quantity of shares on the market and level of prices. Members of the cartel wanted to avoid great competition or a "war" on the market, as the Office noted. Their activities were targeted at company that has entered the market – Ekocem Sp. z.o.o., and which could significantly reduce prices, and hence the cartel members wanted to control its sales. As the Office remarked, barriers of market entry caused that in effect the common market could be divided[4].

The expression from art. 101 TFEU *may affect* should denote the possibility of foreseeing, basing on objective legal or factual premises, that a particular agreement may affect directly or indirectly, actually or potentially on the model of the trade in the EU. Such possibility of foreseeing must have a high degree of likelihood, what means that the nature of the agreement and products in question, and the status of the undertakings have to be taken into account. Again, it is a broad interpretation of the TFEU, since even an indirect and potential impact on the market can be treated as affecting the trade in the EU. Moreover, such influence does not have to necessarily mean that the trade is limited or stopped. It simply means that this impacts the model of trade in a way that it starts to develop differently, even if it related with its increase[5]. In this case the grey cement potentially can be a subject of import and export, although currently such activities are marginal[6]. It should be noted that all members of the cement cartel were related with international capital groups operating throughout the EU. Therefore, the change of the market position of a certain entity in one state would affect the market status of the entire group[7].

Finally, influence on the trade has to be substantial. Therefore the nature of the competition-restricting practice and the market status of the undertakings participating in a cartel have to be taken into account. In the case of cement cartel in Poland, its members shared almost 100% of the market[8].

[1] See: *Commission Notice - Guidelines on the effect on trade concept contained in Articles 81 and 82 of the Treaty* OJ C 101, 27.04.2004, p. 81-96
[2] DOK-7/09, point 399
[3] DOK-7/09, points 406-407
[4] DOK-7/09, points 410, 412-413
[5] DOK-7/09, points 400-403
[6] DOK-7/09, point 411
[7] DOK-7/09, point 414
[8] DOK-7/09, points 404-405

2.5 Prohibited agreement in the cartel case

Such an agreement should be regarded as joint plan of colluding undertakings, which limit or can limit their individual commercial activities by specifying the framework of their harmonized activities or self-restraint on the market. What matters is their shared intent of competition-restricting activity, a concurrence of will, regardless of legal form[1]. Hence, such agreements do not have to have a written form, contain sanctions, be finalized, or be detailed. On the contrary, they may have a provisional nature and be general[2]. Moreover, such prohibited practices do not have a form of a contract. Also concerted practices are prohibited in terms of the competition legislation. Even when a party has not joined the agreed plan, but is using with an intent collusive devices facilitating coordination of their commercial practices, such a behavior can be treated as a concerted practice and therefore constitute an infringement of antitrust policies[3]. Often it is difficult to indicate whether specific misconduct has a form of an agreement or concerted practice, since the cartel could have features of both, however not the form is relevant, but the scope of the solutions[4].

It is required that the undertakings operating on a certain market must act according to its independent policy. Thus, to some extent they have a duty of independent decision making on the market[5].

Activities of the cement cartel members included price fixing, limitation of the sales, and exchange of the information. They were making decisions on numerous meetings, where they expressed their intention of a specific market behavior, and established a joint plan of activities, creating common framework, and limitation of their market autonomy. As the Office has found, even when a particular representatives were not present at the meeting, such decisions were passed also to them. Therefore, the risk of competition was replaced by practical cooperation between the competitors. Such meetings, talks, and exchange of standpoints led to the conclusions, agreements and concerted practices[6]. Since cartels are unstable, the fact that some of cement producers which were members to it did not complied with its provisions is irrelevant[7].

It has to be noted that the Office has assessed that in the case of cement cartel there were no grounds for exclusion of such practices from the general prohibition of anti-competitive activities, whether according to the *de minimis* doctrine, or whether as a group or individual exclusion[8].

2.6 Fixing of prices and other conditions of cement sales

Price fixing is regarded as an example of hard core cartel. It influences the higher prices, and reduction of the supply and consumers welfare. In fact, goods for which there is a demand are not produced[9]. Price fixing can manifest itself in different forms,

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[1] It is essential that the agreement between the cartelists is voluntary. See: *Komentarz do art.6 ustawy z dnia 16 lutego 2007 r. o ochronie konkurencji i konsumentów (Dz.U.07.50.331)*, [w:] K. Kohutek, M. Sieradzka, *Ustawa o ochronie konkurencji i konsumentów. Komentarz*, LEX, 2008.
[2] DOK-7/09, point 422
[3] DOK-7/09, point 426
[4] DOK-7/09, point 443
[5] DOK-7/09, point 441
[6] DOK-7/09, points 439-440
[7] DOK-7/09, point 444, see also: DOK-7/09, point 484, and DOK-7/09, point 485 where the Office noticed that even passive members of the cartel took park in the exchange of the information
[8] DOK-7/09, points 537-550
[9] DOK-7/09, point 454. See also: *Communication from the Commission: Guidelines on the application of Article 81(3) of the Treaty*, (***OJ C 101, 27.4.2004, p. 97–118)***

e.g. fixing equal prices, price formulas, minimal prices, target prices, recommended prices, discounts, and increases in prices[1].

As the Office has found, the scheme of arrangements consisted of two stages. In the primary stage, the cartel members have introduced a complex system of prices in individual districts. Such system included maps, tables, and distances from particular cement plants, which eased the calculation of the transport costs. They also have set regular differences in prices of respective cement types in relation to the base cement[2].

In the latter part of the cartel activity, its participants have withdrawn the system of district prices, but regular differences in prices of particular cement types were still used. They also have fixed the increases of cement prices and the period of their introduction. This consisted of communications to competitors details about the rise of prices. Therefore other entities knew how they should act in order to keep the market stabilized[3].

The dominant aim of the cartel was to secure the status quo the market. Hence, when an undertaking applied an aggressive price policy, what was related with its increase in general sales or to a particular customer[4], members of the cartel tried to influence such entity. However the goal was not to enforce identical prices, since they knew that those are negotiated individually, and were agreed with reference to general level of prices[5]. The form of such agreements on price levels was evolving according to the current circumstances. Their contacts became more formal, and went beyond simple signalization of price policies, after detecting that one of the members applied more competitive prices than signalized[6].

The misconduct of the cartel members consisted also of fixing of sales conditions. The cement producers restrained themselves from supplying bagging and mixing plants. Therefore, they have collectively boycotted these companies because such businesses were selling cement for lower prices. Cartelist justified this boycott, claiming that bagging and mixing plants, by selling the cement of a lower quality, committed acts of unfair competition. In the opinion of the Office, even if such was the case, it would be a subject for investigation of respective public authorities, but it can never justify the violation of competition law.

2.7 Market division

Agreements concerning division of a certain market are also regarded as hardcore cartels. They can have numerous forms, e.g. fixing of market shares of particular entities, or allocation of specific territory or customers to them[7]. Division of the market is harmful for the competition because it leads to elimination of the competition on the particular market[8].

In this case, cartelist fixed the individual shares in the Polish cement production and sales market on the basis of historical shares (before the transformation of the regime).

[1] DOK-7/09, points 455-456
[2] DOK-7/09, points 459-460
[3] DOK-7/09, points 459-460
[4] When a specific customer was supplied by a number of cement producers, they have fixed prices specially for him
[5] DOK-7/09, point 461
[6] DOK-7/09, point 462
[7] DOK-7/09, points 476-477
[8] See: *Komentarz do art.6 ustawy z dnia 16 lutego 2007 r. o ochronie konkurencji i konsumentów (Dz.U.07.50.331),* [w:] K. Kohutek, M. Sieradzka, *Ustawa o ochronie konkurencji i konsumentów. Komentarz*, LEX, 2008.

The emergence of a new competitor on the market, namely Ekocem Sp. z o.o. has change the situation on the market and the cartelists reacted by modification of the shares. Members of the cartel were concerned about potential excessive loses of theirs shares in the market. Finally, Ekocem Sp. z o.o. was taken over by Górażdże Cement S.A. This acquisition and requests from 2 other entities of increasing their shares, in exchange for limitation of their export to Germany, resulted in stabilization on the cement market, with respect to the shares of particular companies[1].

Cement cartelists had also tools to enforce the status quo in shares on the market. They transferred their clientele to competitors, as a compensation for loses in shares. Furthermore, those who achieved the biggest increase in shares on the cement market were obliged to increase the price in the next period first. Also powerful cement plants made advantageous offers to clients of other undertakings, in order to reclaim the market. The exchange of information and meaningful measures made the stabilization on the market easier[2].

2.8 Exchange of confidential commercial information

The exchange of the confidential information was not included in the exemplary list of prohibited agreements in terms of competition law. However, if the general premises of these agreements are fulfilled, also such act can be regarded as infringing the rules of competition.

Such actions may be a part of the trade contracts of a cartel nature, or constitute an independent infringement of antitrust law[3]. Nevertheless, they usually derive from the violation of these regulations[4].

The Office in its decision in the cement cartel case, invoked the judgment of the Court of Justice in *the Asnef-Equifax*[5], where it was stated that the agreements concerning the exchange of the information are inconsistent with the protection of the competition, when they limit or eliminate the level of uncertainty about the activity of the certain market.

In the cement cartel, the information that was a subject to the exchange between its members included monthly (sometimes even more frequent) sales results. It aimed at monitoring of the entire market and adaptation of production, what as the Office has noticed, has reduced the level of uncertainty on the market. Further it has noticed, that assessment of such practice on the grounds of accordance with legislation on competition, should not be done *in abstracto*, but basing on the circumstances of the case in question, such as properties of the market, nature of the exchange of the information, their frequency and significance.

The type of the information is relevant in this context as well, e.g. its accessibility for the customers? Also it has to be noted, that only up-to-dated information about the tariffs, transportation capacity and costs, is relevant in this context. For instance

[1] DOK-7/09, points 478-479
[2] DOK-7/09, points 480-481
[3] However in the cartel case the exchange of the information about the price rises, was not an independent infringement because it was used in assistance for price fixing
[4] DOK-7/09, points 488-489
[5] See: Judgment of the Court of 23 November 2006 in the *Asnef-Equifax* (C-238/05)

information from one year before was regarded as historical, and therefore irrelevant. In the cement cartel its members exchanged the information with consistency[1].

Such assessment should take into account and predict how the market would look like without this exchange. In this case the exchange of the secret information was used to control the sales, and therefore could have a negative effect on the scope of supply. The level of concentration and quantity of the products should be also bared in mind. The more competitors and diversity of the products there is on the market, the adjustment of prices is more difficult and expensive[2].

In the cartel case the market was highly concentrated, actually of an oligopolistic nature. The market seemed transparent to a certain extent, since cement companies had numerous regional sales representatives. This facilitated the economic intelligence, but it could only complement the data collected. It could not replace the information about the entire sales market[3].

3 Conclusion and Further Research

Although in recent years the Office has detected many cases of cartels on the construction market, the decision made with regard to the cement cartel is of a particular importance. Not only because of the amount of the fines imposed on the cartelists, which was the heaviest levied in the practice of the Office, but primarily because of the structure, scope, and effects of this prohibited agreement for the competition. Particularly, the described scheme of competition law infringement and the level of its organization indicate the degree of negative consequences for the entire construction market (cement is a basic product for most investments). Moreover, the decision analyzed in this paper (DOK-7/09 of 8 December 2009) is significant also for the entire system of the competition protection, since it contains relevant deliberations on some fundamental issues of antitrust law. The comprehension of this case, makes it impossible to describe it in a paper of such size, with all details. Therefore, only most important legal issues and examples of infringement were presented and selected for analysis. However, there are still some issues to be considered and analyzed, especially with respect to the leniency procedure, its fairness, and potential consequences for the market. Also the issue of private enforcement of the competition law is interesting in the context of these case, since the size of harm, that was made to the economy.

4 References

Legislative Acts:

1. *The Act of 16 February 2007 on competition and consumer protection* (Dz.U. 2007 nr 50 pos. 331)
2. *The Treaty on the Functioning of the European Union* - consolidated version (OJ C 83, 30.03.2010, p. 47)
3. *Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings* (OJ L 24, 29.01.2004, p. 1)

[1] DOK-7/09, points 490-492
[2] Ibidem
[3] DOK-7/09, point 495

4. *Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty (*OJ L 1, 04.01.2003, p.1-25)
5. *Commission Notice - Guidelines on the effect on trade concept contained in Articles 81 and 82 of the Treaty (*OJ C 101, 27.04.2004, p. 81-96)
6. *Communication from the Commission: Guidelines on the application of Article 81(3) of the Treaty,* (***OJ C 101, 27.4.2004, p. 97–118)***

Decisions and Judgements:

1. Decision of the President of the Office for Competition and Consumers Protection nr DOK-107/2006 of 18.09.2006
2. Decision of the President of the Office for Competition and Consumers Protection nr RWR-20/2007 of 29.06.2007
3. Decision of the President of the Office for Competition and Consumers Protection nr RKT-79/2007 of 31.12.2007
4. Decision of the President of the Office for Competition and Consumers Protection nr DOK-1/2008 of
07.04.2008
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Law Postgraduate Student Forum

Evaluation of the Standard Contract Forms in Turkey

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Abstract:
In the Turkish construction industry, KIK standard contract forms, which are published by Public Procurement Authority, are used. Although there is an existence of standard contract forms, they are not sufficient and useful both in scope and content. Due to the lack of the nature of these standard forms, many problems and difficulties arise in the completion of a construction project within the desired time, cost and quality. In order to solve these problems, standard contract forms in Turkey are needed to be restructured both in scope and content. In this context, analyzing other standard contract forms, which are commonly used and accepted throughout the construction industry, is necessary and helpful. In this paper, AIA, FIDIC and JCT standard contract forms are reviewed and compared with the standard forms of contract used in Turkey. The differences between these standard forms are determined with the help of the comparison. The problem areas of Turkish standard contract forms are presented and appropriate suggestions are improved.

Keywords:
AIA, FIDIC, JCT, KIK, standard contract forms

1 Introduction

Construction market is the leading one in which the world's largest scale companies compete. By the help of the increasing numbers of construction project opportunities around the world, operating internationally is rapidly increasing day by day. Turkish contractor firms also operate internationally and undertake private and public projects in international construction market. Furthermore, the process of Turkey's accession to the European Union has a positive effect not only on the business potential of international contractor firms in Turkish construction market, but also on the entries of Turkish contractor firms to the international ones.

With the increase of international construction projects which are executed by different partners from different geographies, participants from different specialties need to work together and use huge amounts of money, materials and equipments in order to reach the desired purpose. In this process, correct and complete documentation is very important such as managerial skills. Correct and complete documentation means to prepare necessary documents in order to manage and control the construction project process by determining the roles and responsibilities of all participants of the construction project, defining the relationships between them and presenting appropriate solutions to the problems encountered. These documents are defined as contract documents in the construction industry. Contract documents need to be prepared by

using clear and explicit statements which are not open to interpretation. Correct and completely designed contract documents are essential and necessary for the successfully completion of a construction project within the desired time, quality and budget. In this context, using standard contract forms which serve a common language and common understanding all around the world is necessary and helpful.

The aim of this paper is to review the standard contract forms which are commonly used and accepted throughout the construction industry and to compare them with the standard contract forms used in Turkish construction industry. In order to reach this aim firstly, AIA, FIDIC and JCT standard contract forms are reviewed. The review of these standard contract forms helped to define and differentiate between the Turkish standard contract forms. The differences between these standard forms are determined, the problem areas of Turkish standard contract forms are presented and appropriate suggestions are improved.

2 Standard Contract Forms

The need for a standard form of building contract became apparent in the 19th century at a time when most building work was procured by an approach that has become described as the traditional or conventional method (Hibberd, 2007). In the Latham Report it is recommended that "all parties in the construction process should be encouraged to use standard forms" (Latham, 1994). Because of the complexity of rights and liabilities, it was seen as desirable to use standard forms in order to avoid the expense and problems of bespoke contracts (Furst and Ramsey, 1995).

There are many advantages to using standard contract forms. First of all, using a standard form avoids the cost and time of individually negotiated contracts. As they are written by legal experts, it will be generally more convenient to use a standard form. Therefore, ambiguities and inconsistencies are reduced to a minimum. The rights and obligations of both parties are set out clearly. Because of standardisation owners, architects, consultants and contractors who use a standard form contract become familiar with the rights and obligations. This improves communication and efficiency in contract administration. Especially, it is very important in international construction projects where communication is more difficult and misunderstandings are more likely to arise.

There has been a proliferation of standard forms in the construction industry in recent years, and there are many organisations which publish standard contract forms. Some of the examples of these published standard contact forms are AIA (The American Institute of Architects), AGC (The Associated General Contractors of America), EJCDC (The Engineer's Joint Contract Documents Committee), FIDIC (International Federation of Consulting Engineers), JCT (The Joint Contracts Tribunal Limited), ICE (Institution of Civil Engineers), NEC (The New Engineering Contract) and ACA (The Association of Consultant Architects). These standard forms are based on similar purposes, applications and provisions and are commonly used and accepted throughout the construction industry.

2.1 AIA Standard Contract Forms

The American Institute of Architects (AIA) was founded in the USA in 1857 by a group of 13 architects. Since then, AIA has been the leading professional membership association that represents member architects and related professionals. The main

approach of this association is to promote the scientific and practical perfection of its members and to elevate the standing of the profession (www.aia.org). Within the framework of this approach, AIA publishes standard contract forms (documents) for the design and construction industry in order to manage the relationships involved in construction projects. The first standardised contract form was published in 1888. Since that time, AIA attempts to revise and update its documents every seven to ten years to reflect trends, changes and developments in the construction industry.

AIA organises its standard contract forms into two main groups. The first group is AIA series, which is based on the use of the document and the parties of the agreement. Two second one is AIA families, which is based on the types of projects or particular project delivery methods.

2.1.1 AIA Series

AIA standard contract forms are divided into six alphanumeric series according to document use or purpose and parties of the agreement.

A Series: A series cover owner / contractor agreements. There are 25 different standard owner / contractor agreements and their general conditions in the A series. The most commonly used forms are A101–2007 Standard Form of Agreement between Owner and Contractor and AIA Document A201-2007 General Conditions of the Contract for Construction.

B Series: B series involves owner / architect agreements. There are 38 different standard owner / architect agreements and standard forms of architect's services. The most commonly used agreement is B101–2007 Standard Form of Agreement between Owner and Architect.

C Series: C series cover the other agreements except owner / contractor and owner / architect agreements. In the C series, there are 12 different standard agreement forms.

D Series: D series are miscellaneous documents. There are only 3 standard forms in the D series.

E Series: E series are called as exhibits. There are 2 standard forms which are Digital Data Protocol Exhibit and Building Information Modelling Protocol Exhibit.

G Series: G series cover contract administration and project management forms. In the G series, there are 39 different standard contract forms.

2.1.2 AIA Families

AIA standard contract forms are divided into eight families based on project type or delivery method. Standard forms in each family provide a consistent structure to support the major relationships on a design and construction project.

Conventional (A201) Family: This is the most commonly used family of documents because it is suitable for the conventional (design-bid-build) project delivery method. It is suitable when there are separate contracts for the design and the construction of the project. In conventional family, there are 40 different standard contract forms from A, B and C series.

Construction Manager as Adviser (CMa) Family: This family consists of standard contract documents for the construction projects which are delivered by the construction management project delivery method. There is a construction manager who acts as an independent adviser through the course of both design and construction. In construction manager as adviser family, there are 11 different standard contract forms from A, B, C and G series.

Construction Manager as Constructor (CMc) Family: In this family, the owner employs a construction manager who will complete the construction and also provide construction management services. There are 2 different standard contract forms from the series A.

Design-Build Family: The Design-Build family is used where the project delivery method is design-build. The owner enters into a contract with a contractor who is obligated to design and construct the project. In this family, there are 7 different standard contract forms from A, B, C and G series.

Integrated Project Delivery (IPD) Family: This family concerns integrated project delivery method, which utilizes the talents and insights of all project participants through all phases of design and construction. AIA provides three levels of standard contract forms for integrated project delivery family. These are transitional forms, the multi-party agreement and the single purpose entity. There are 9 different standard contract forms from A, B and C series.

Interiors Family: It is appropriate for furniture, furnishings and equipment procurement services which are combined with architectural interior design and construction services. In this family, there are 5 different standard contract forms from A and B series.

International Family: The International family is for US architects working on projects located in foreign countries. There are 2 different standard contract forms from the series B.

Small Projects Family: This family is used when the project is of simple content, low cost and short duration. There are 2 different standard contract forms from the series A and B.

2.2 FIDIC Standard Contract Forms

The International Federation of Consulting Engineers (in French, Fédération Internationale of Consulting Engineers des Ingénieurs-Conseils, FIDIC) was founded in 1913 by three countries – Belgium, France and Switzerland. It has 86 national member associations representing over 1 million professionals. FIDIC aims to represent globally the consulting engineering industry by promoting the business interests of firms supplying technology based intellectual services for the built and natural environment (www.fidic.org). FIDIC published its first standard contract form in 1957 under the title of Conditions of Contract (International) for Works of Civil Engineering Construction. Since then, FIDIC forms are one of the most widely used standard forms of contract in international construction. Subsequent editions of the Construction contract were published in 1967, 1973, 1977, 1987, 1992 and 1999 respectively. Up to 1999, FIDIC standard contract forms followed the ICE (Institute of Civil Engineers) form of contract. In September 1999, FIDIC updated its standard contract forms by publishing entirely

new standard forms designed to take account of developments in the international construction industry.

FIDIC has a suite of different standard forms of contract, most of which has been ascribed a colour, often referred as the “FIDIC rainbow”.

The Red Book: It is the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer. The red book is the traditional form for civil engineering construction in which the contractor constructs to the employer's design. This is the most commonly used standard FIDIC form in the international construction projects. The Red Book consists of general conditions, guidance of the preparation of particular conditions, forms of letter of tender, contract agreement and dispute adjudication agreement. In 2006, FIDIC introduced a variation of the Red Book, which is the MDB (Multilateral Development Bank) Harmonised Edition.

The Yellow Book: It is the Conditions of Contract for Plant and Design-Build for Electrical and Mechanical Plant, and for Building and Engineering Works, designed by the contractor. It is intended as its name suggests to be used for design and build contracts and for plant contracts. The Yellow Book involves general conditions, guidance for the preparation of particular conditions, forms of letter of tender, contract agreement and dispute adjudication agreement.

The Green Book: It is FIDIC’s short form of contract. It is used when the price for the contract is relatively small (under US$ 500.000), the construction time is short (less than 6 months), or the work involved is relatively simple or repetitive. It covers the agreement, general conditions, rules for adjudication and notes for guidance.

The Silver Book: It is the Conditions of Contract for EPC (Estimated Prime Cost) Turnkey Projects. The Silver Book transfers more risk onto the contractor than FIDIC’s traditional forms. The contractor takes total responsibility for the design and construction of the project. Similarly, the Green Book involves general conditions, guidance for the preparation of particular conditions, forms of letter of tender, contract agreement and dispute adjudication agreement.

The Orange Book: It is the Conditions of Contract for Design-Build and Turnkey. Although it is intended that the Orange Book be replaced by the entirely Silver Book and Yellow Book, it is still used within the construction industry. The Orange Book consists of two parts. The first part is general conditions. The second part gives the guidance of the preparation of conditions of particular application. It also involves forms of tender, agreement and FIDIC model terms for the appointment of a dispute adjudication board.

The White Book: It is the Client/Consultant Model Services Agreement. It is intended to used in conjunction mainly with FIDIC’s Red and Yellow Books. The white book consists of agreement, general conditions, particular conditions and appendices.

The Gold Book: It is the Conditions of Contract for DBO (Design, Build and Operate) Projects. FIDIC introduced the Gold Book in 2008. Its approach is to combine design, construction, and long-term operation and maintenance of a facility into one single contract awarded to a single contractor. It involves general conditions, particular conditions and sample forms.

2.3 JCT Standard Contract Forms

The Joint Contracts Tribunal (JCT) was established in 1931 and became incorporated as a company limited in 1998. For 80 years, JCT has produced standard forms of contracts, guidance notes and other standard documentation for use in the construction industry (www.jctltd.co.uk). The JCT's approach is to produce standard forms that meet clearly defined needs and apportion risk in a way that is appropriate for the procurement approach it reflects. Although the forms were not called as JCT until 1977, The RIBA (Royal Institute of British Architects) formed the first standard form of contract in 1931. New editions of JCT standard contract forms followed in 1939, 1963, 1980, 1998 and 2005. The JCT standard contracts are fundamentally building rather than civil engineering contracts but are used for projects where both building and civil engineering works are involved.

JCT provides a wide range of forms of contract to meet the various and diverse needs of the UK construction industry. The policy of the JCT is to produce a discrete standard form of contract for each type of project or procurement route commonly used in the UK (Griffiths, 2010). The JCT 2005 suite consists of contract families made up of main contracts and sub-contracts. There is a practice note which is prepared by JCT in order to help to decide the appropriate JCT construction contract concerning the choice of procurement and the type of contractual arrangement (JCT, 2009).

Standard Building Contract (SBC): This is the most commonly used standard contract form because it is suitable for the conventional project delivery method. It is appropriate for use on building contracts where the employer appoints an architect to be the interface between him and the contractor. It has 3 main contracts Standard Building Contract with Approximate Quantities (SBC/AQ), Standard Building Contract with Quantities (SBC/Q) and Standard Building Contract without Quantities (SBC/XQ). Under the SBC, there are 2 different sub-contract agreements and conditions document.

Minor Works Building Contract (MW): It is one of the smallest and simplest forms of JCT standard contract forms. It is appropriate on projects where the work is of a fairly simple nature. Another version is the Minor Works Building Contract with contractor's design (MWD). There is also a sub-contract agreement for minor works in the JCT suite.

Intermediate Building Contract (IC): The IC form is more detailed and contains more extensive control procedures than the Minor Works Building Contract (MW) but is less detailed than the Standard Building Contract (SBC). An alternative version is the Intermediate Building Contract with contractor's design (ICD). Similarly, there are 2 different sub-contract agreements and conditions documents.

Design and Build Contract (DB): This form is used where the project delivery method is design-build, where the employer wants a contractor to take on the responsibility for both the design and construction works. Under the DB, there exists a sub-contract agreement and conditions document.

Major Project Construction Contract (MP): MP is suitable for and major projects and experienced users who regularly procure large-scale construction works. In this type of contract the contractor takes greater risk than under other JCT contracts. Similarly, there is a sub-contract form and conditions document.

Constructing Excellence Contract (CE): This form is one of the newer standard contract forms produced by JCT and is used where the project delivery method is partnering. Its format and style are significantly different from the traditional JCT standard contract forms. It encourages collaborative working and the formation of integrated teams. In the CE there is a separate contract for project team agreement.

Construction Management Contract (CM): CM is the main contract for the construction management project delivery method. It is suitable for projects where there is a construction manager for managing the project on behalf of the employer. There are 2 different contracts under the CM, which are construction management appointment and trade contract.

Management Building Contract (MC): This form is used when the management project delivery method is applied. This form is appropriate for use with large scale and complex projects where an early start on site is required and where it is not possible to prepare full design information before the work commences. In the MC there is an agreement and conditions document.

Measured Term Contract (MTC): It is suitable for regular works such as repair and maintenance which normally run for a set period of time. In this contract the employer and contractor will enter into an agreement to carry out an unknown amount of construction work.

Prime Cost Building Contract (PCC): This form is appropriate for projects requiring an early start on site, but where it is not possible to prepare full design information before the works commence. This contract is most often used for alteration works and for urgent repair works.

Repair and Maintenance Contract (RM): It is used when the work involves the repair and maintenance of a building. RM is a single document, comprising both the tender and the conditions.

2.4 KIK Standard Contract Forms

In Turkey today there is only one current standard forms of contract for construction industry. These forms are published by Public Procurement Authority (Kamu Ihale Kurumu-KIK) (www.ihale.gov.tr), which is a governmental authority. These standard contract forms are the government contracts which are developed based on the Turkish Public Procurement Law- 4734. The purpose of this law is to establish the principles and procedures to be applied in procurements held by all public entities and institutions governed by public law or under public control or using public funds. Although participants of construction projects are free to use any other contract forms in their private construction works, KIK standard contract forms are compulsory for the public construction works in Turkey. There are apparently absolute rules about KIK standard contract forms should be used in the public construction projects. Standard contract forms that are published by KIK as follows:

Standard Contract for Construction Works: This standard form is the agreement which is used in the public construction works. It is an owner / contractor agreement. This form is the only and common agreement and is used with all project delivery methods. Besides, it is used with all contract types such as lump-sum, measurement and cost reimbursement.

General Specifications for Construction Works: This standard form is the general conditions of the construction contract. The purpose of this standard form is to establish the general principles and procedures that will be applied in performance of the works that are contracted as per Turkish Public Procurement Contracts Law- 4735. There is one and only general condition document and it is used with all types of project delivery methods and contract types.

Administrative Specifications: Administrative specifications are prepared on the basis of the Standard Administrative Specification annexed to the Regulation on Implementation of Construction Works Procurements hereby according to the procedure applicable in the construction works procurement.

3 Comparison of the Standard Contract Forms

The review of AIA, FIDIC and JCT standard contract forms helped to define and differentiate between the KIK forms used in Turkish construction industry. When KIK standard contract forms compared with those forms several evaluations can be made.

First of all, KIK standard contract forms are designed by a governmental authority for public construction works in Turkey. As they are written by government for government, their primary mission is to protect the government's rights. The risk allocation between the parties is not fair. They transfer the risk more onto the contractor. This characteristic makes it impossible to use these standard forms in private construction works or international construction projects.

Secondly, KIK forms do not have a clear language which can be easily understood. The statements and provisions are not clear and explicit, so it is open to interpretation. This makes it difficult to understand the rights and obligations between the parties. Besides, many references to different documents make it hard to follow the content.

In AIA, FIDIC and JCT there are different standard contract forms which are adopted for different project delivery methods such as conventional, design-build, construction management, design-build-operate and partnering. However, in KIK there is only one type of standard form for only conventional project delivery system. Furthermore, in AIA, FIDIC and JCT standard contract forms vary in terms of contract types such as lump-sum, measurement and cost reimbursement. In KIK there is only one type of contract which is used with all contract types.

Moreover, in AIA, FIDIC and JCT rights and obligations of the participants of the construction projects are clearly set out with the help of the different types of agreements. There are many different types of agreements between different parties such as owner, contractor, architect, quantity surveyor, contract administrator, construction manager, sub-contractor and consultant. In KIK, there is only one type of agreement and this agreement is an owner / contractor agreement. There is not any agreement or provision for the other participants of the construction project.

In AIA, FIDIC and JCT there exist general conditions, which serve as the definitive or explanatory document, and supplementary conditions which are amendments and modifications of and additions to statements which are made in the general conditions. In KIK although there is a general conditions document, there is not any supplementary of partial conditions document for amendments. General conditions usually are basic to

most projects, but there is a need of supplementary conditions which enable special and peculiar requirements of a particular owner and project.

Finally, in AIA, FIDIC and JCT there are guidance notes and commentaries which help to clearly understand the contract provisions or help to decide the appropriate standard contract form for the right procurement method. In KIK, there is not any guidance or commentary for the usage of standard contract forms.

4 Conclusion and Further Research

In conclusion, when the Turkish standard contract forms are compared with the AIA, FIDIC and JCT standard contract forms, it can be seen that KIK standard contract forms are not sufficient, comprehensive and useful both in scope and content. There is a need of a new family of standard contracts which provides a wide range of forms of contract to meet the various and diverse needs of the Turkish construction industry.

This new family of standard contracts needs to involve different types of contracts for different project delivery systems. Moreover, it needs to concern different types of contractual arrangements. The rights and obligations are needed to clearly set out for all the project participants.

This paper aimed to review the standard contract forms which are commonly used and accepted throughout the construction industry and to compare these forms with Turkish standard contract forms. It is the first stage in a PhD research project which aims to restructure standard contract documents used in Turkish public construction works. Further research will involve the development of required standard contract documents by proposing a new, comprehensive and up-to-date model for the successfully completion of the public construction works in the Turkish construction industry.

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Towards design and application: an investigation into how mediation can complement existing planning practice

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Abstract:
The purpose of this paper is to identify issues and foster suggestions for further investigation in considering how mediation can complement existing planning practice. It begins with a short illustration of how globalisation is impacting upon the nature of conflict in planning practice, leading to a discussion on how land-use and development disputes are currently resolved within the United Kingdom (UK) planning system. Taking into account government proposals for planning reform and drawing upon discussions with key informants, the paper outlines opinions as to how mediation may potentially lend itself to planning practice. Attention then focuses on the practices and procedures characterising dispute resolution programs operating in a number of Anglophone jurisdictions, before discussion turns to the investigations already undertaken regarding the use of mediation in the UK planning system. In summarising the issues to drive further investigation, it is suggested that more than one approach will be needed if mediation is to complement existing planning practice.

Keywords:
alternative dispute resolution, environmental dispute resolution, mediation, planning, Anglophone jurisdictions

1 Introduction

Mediation involves "the intervention in a negotiation or conflict of an acceptable third party who has limited or no authoritative decision-making power, who assists the parties to voluntarily reach a mutually acceptable settlement of the issues in dispute" (Moore, 2003: 15). Interest in mediation is gaining momentum but substantial investigation is required to assess how best mediation can be designed and applied to planning practice. In this undertaking it is necessary to consider not only the practices and procedures of established mediation programmes but the challenges for mediation in planning presented by an increasingly pluralist and ever changing society and space. This paper outlines issues emerging for further investigation in considering how mediation can complement existing planning practice in the UK. Conscious of the alignment of mediation to the communicative turn in planning theory and collaborative philosophy this paper outlines current opportunities for stakeholder engagement in planning practice and decision-making process. Through qualitative inquiry with key informants working within the planning profession and those having an interest in dispute resolution discussion focuses on the potential role of mediation in planning practice.

2 Globalisation and Planning

Contemporary globalisation, progressively intense and inherently complex, impacts significantly on planning practice and the role of planners. Murtagh et al. (2008: 43) note how "urban spaces have become more differentiated and contested, in response to technological change, globalisation and social restructuring." Increasingly planning finds itself enmeshed in a fragmented web of economic, cultural, political and technological attributes that contribute society and space. Globalisation continues to change the dynamics and nature of conflict in planning arenas.

The challenge presented to planning is how to mediate between global and local tensions. As Newman and Thornley (2002: 21) suggest: "pressures on planning come from both the need to integrate city economies with global forces and from the need to integrate fragmented interests within the city." Moreover, planning must contend with conflict between the regional and the local. In responding to such conflict and the wider impact of globalisation, planning will:

> "...need to be more sensitive to [the pressures it faces] and develop a more flexible form of practice. It will need to live with the uncertainties arising from ... multiple forces operating at multiple levels; 20 century forms of comprehensive and rational planning are less likely to work in a globalised context." (Thornley and Rydin, 2002: 10).

3 Planning in the UK

Significantly different from systems in operation throughout the European Union and largely uniform across its constituent countries, the UK planning system operates within a unitary state. It is subject to 'a radical distinction between local and central government, and a high degree of centralised monitoring and control' (McKay, 2010: 116). Variations exist, insofar as Northern Ireland (NI) and Scotland retain separate legal systems and legislation, and Wales, an administration detached from England. Statutory provisions and legislative change in NI largely follow those introduced in England, and powers granted to local government are decided and controlled by central government. Contrary to the administration of planning functions in mainland UK, which remain the responsibility of local councils, planning powers in NI are administered by the Department of Environment (DOE), which has 8 offices spread across 5 planning areas, (see Figure 1).

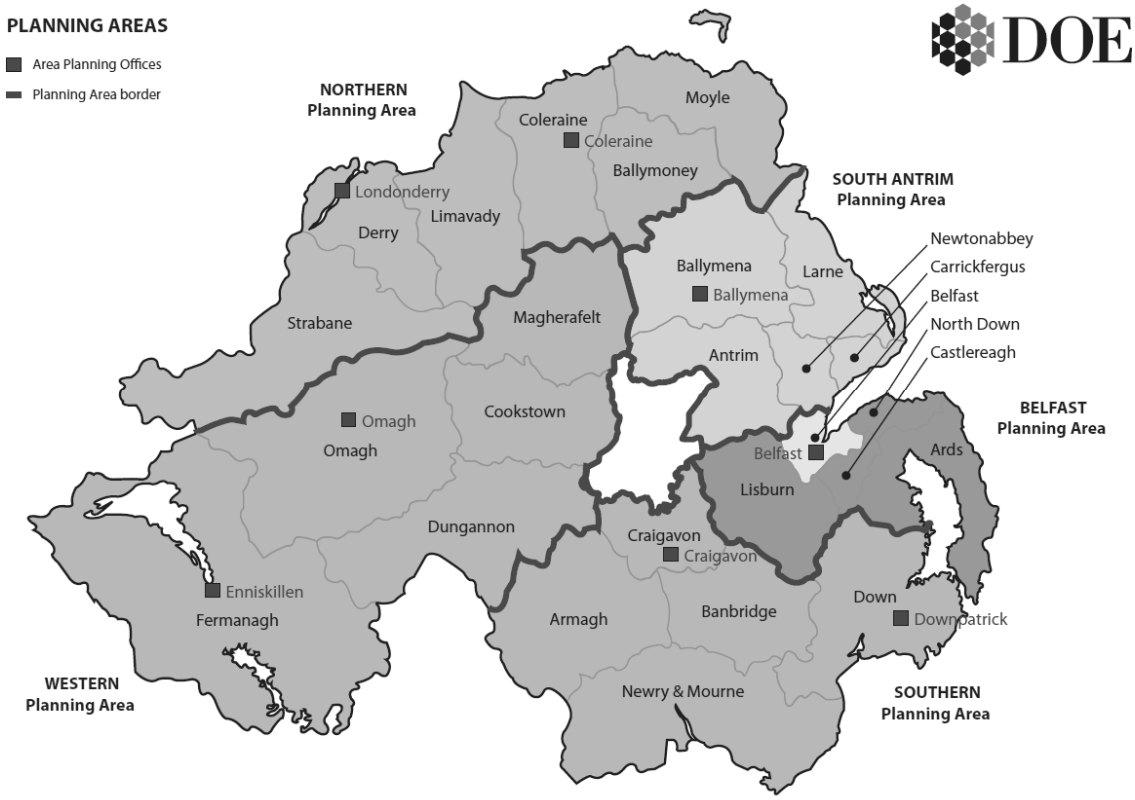

Figure 1. Planning Areas
(Source: DOE, 2011)

Opportunities for public engagement in planning practice are limited by procedural constraints. Largely involved through consultative processes, individuals and communities can: (1) attempt to influence planning policy; (2) comment on development plans for their area and participate in public examinations; (3) comment of planning applications likely to affect them; and (4) report alleged breaches of planning control. The role of facilitating public engagement in mainstream planning falls largely to the DOE and the Planning Appeals Commission (PAC).

The PAC is an independent appellant body established under Article 88(1) of The Planning (NI) Order 1972, and continues by virtue of Article 110(1) of The Planning (NI) Order 1991. Equivalent to the Planning Inspectorate in England and Wales, the PAC has 81 functions in regard to land-use planning and other related matters. In addition to its decision-making appellant role the PAC has responsibility for public examination of development plans, and in conducting and reporting on public inquiries into major planning applications.

At an initial level of engagement, the planner is often positioned between the applicant and members of the public making representations to an application. Many consider the role of the planner to 'mediate' disputes at this level, but during discussions with members of the community and voluntary sector, questions were raised regarding the appropriateness of planners 'wearing two hats', and suggestions made that it is impossible for planners to be mediators and decision makers. Although stepping outside the UK context, a recent report by the Law Reform Commission of Ireland is not without relevance to this issue, and jurisdiction. In considering the role of mediation in

the planning application process, a number of submissions received by the Commission suggested:

> "...the informal negotiation process between an applicant and a local planning authority is working sufficiently within the planning application process to resolve many potential issues or disputes and there was no role for mediation in [this] process." (LRC,2010: 177)

Interestingly these respondents fail to consider individuals making representation to an application and therefore fail to acknowledge their significance to disputes, which has resonance to issues raised during discussion of planning practice in NI. For members of the community and voluntary sector, the concerns of individuals and community were not fully appreciated. Stories relayed the reluctance of planners to meet with the community, yet happy to hold discussions with developers. Members of this sector went as far as suggesting, at best individuals and communities could do little more than constrain the application process, and argue the DOE needs a "culture shift" to account for the needs of individuals and community.

Further, members of the community and voluntary sector expressed opinion, that "planning processes encourage confrontation." The quasi-judicial character of proceedings before the PAC, arguably do little to quail such assumptions. Although McKay (2010: 122) recognises "the inspector is not a judicial arbitrator but an inquisitor whose role it is to responsibly seek out all relevant information to reach the best possible solution", the proceedings before the PAC, are not particularly informal. Practitioners within the wider planning field suggest the PAC come from a more adjudicatory background and have substantial knowledge of all aspects of planning, especially planning law. In discussions on the appeals process, practitioners felt there were instances of informal mediation taking place within hearings but suggested an appeal is concerned with investigating the soundness of a decision made before the appeal, and concluded in any event a decision would have to be made. Therein, concerns were raised as to how far mediation could be introduced to the appellant system, and if it is possible for inspectors to combine adjudicatory and mediatory roles, should mediation be introduced as a precursor to appeal.

4 The Changing Landscape of Planning Practice

The reform of the planning system in NI is set within the context of an on-going Review of Public Administration (RPA). The Planning Bill, passed through the Northern Ireland Assembly (NIA) on 23 March 2011, provides a framework for the future of planning in NI. Principally, it provides for the transfer of many planning powers and functions to district councils, whereby decisions on local planning matters will be taken by elected representatives. A key objective of the planning reform agenda in NI seeks to address 'community participation and involvement in order to allow full and open consultation and actively engage communities' (DOE, 2010: 103). Offering a largely reactive form of engagement whereby communities have opportunities to respond to initiatives forwarded by the DOE and district council, 'the Bill provides ... for relatively minor improvements in consultation' (NIA, 2011a: 10).

In introducing new classifications for development, the Bill establishes a requirement for pre-application consultation by applicants for those proposals classified as a 'major' form of development. Both planning practitioners and members of the community and

voluntary sector expressed opinion that mediation could potentially lend itself to this stage of the planning process in which responsibility lies with the developer to consult with the community in advance of lodging a planning application. It was suggested, the Bill offers the opportunity to establish and promote to all parties, the standards and procedures expected to be met in consultation processes but more so that the 'community' would welcome the presence of an independent facilitator in such consultation processes. This, it was argued, would provide the community with more confidence in the process.

Before deciding on major planning applications, the Bill provides for pre-determination hearings where 'the applicant and any person so prescribed' (NIA, 2011b: 16) can appear before a council committee and have their respective cases heard. It is feasible to assume mediation could be incorporated at this stage in the process to help parties express their case but also to identify areas of consensus or help foster agreement on issues that would permit the application to be approved.

Despite being a prominent issue during consultation, the Bill dismisses the introduction of third party rights of appeal to NI; the DOE, having earlier concluded "that further consultation of third party appeals should be deferred until the extensive changes to the planning system under planning reform and the transfer of planning functions have settled down and are working effectively" (DOE, 2010: 5). The Bill also fails to consider provisions currently being proposed in mainland UK under the Decentralisation and Localism Bill, specifically neighbourhood development plans and neighbourhood development orders. As components of neighbourhood planning, it is envisaged these proposals will facilitate the Government's move towards decentralisation of power to the local level, providing local councils, and more specifically communities with responsibility for decisions affecting their area.

Under current proposals, a local planning authority (LPA) must respond to any initiation by a parish council or neighbourhood forum undertaking to produce a neighbourhood plan. Neighbourhood plans are developed by the community, who together, with parish councils or forums formulate priorities for the local area. An important aspect of "neighbourhood development plans is that their contents must have regard to national policies and advice in guidance from the Secretary of State and be in general conformity with strategic policies in the development plan for the area" (Stephens, 2011: 1). The draft neighbourhood plan is submitted to the LPA who arrange for an independent examiner to assess the proposals and make public a report or recommendation, concerning the submission of proposals to a local referendum. If the majority of the local community vote in favour of the neighbourhood development plan, the LPA must initiate it.

Both practitioners of planning and the voluntary and community sector felt mediation may lend itself particularly well in helping communities reach a draft neighbourhood plan. The earlier discussion on globalisation and the changing nature of conflict within planning has particular relevance to mediating between diverse community realities and interests. With increased migration and fractured intra and inter-community relations in many urban areas, difficulties are sure to arise in any attempt to develop neighbourhood plans.

5 The Emergence and Development of Alternative Dispute Resolution (ADR) and Mediation

Mediation is now a feature in many Anglophone jurisdictions, being used in the resolution of labour disputes, employed within the civil justice system and introduced in public disputes involving environmental and land-use issues. The early colonial experiments with dispute resolution reflect to a large extent the situation today in that "models of dispute resolution can be grouped into two familiar categories: either ... ethnocentric and community-based and completely distinct from mainstream adjudicative models, or ... court-connected models to dispose of claims that would otherwise fall to the courts to resolve" (Hanycz, 2007: 178). Models of dispute resolution in the United States (US), Canada, Australia and New Zealand are discussed below before attention turns to investigations undertaken into 'Mediation in Planning' in the UK. Not surprising a number of intra and inter-jurisdictional variations exist between dispute resolution programs.

6 ADR and Mediation in the United States (US)

Largely regarded as the founding moment of the modern ADR movement, the American 'Pound Conference' of 1976, convened in response to dissatisfaction with the administration of justice. The address by Frank Sander focused attention on the use of alternative ways for resolving disputes outside the courts as a means of reducing judicial caseload. He envisaged a transformation from the courthouse to a "Dispute Resolution Centre where the grievant would first be channelled through a screening clerk ... to the process ... most appropriate to his type of case" (Sander, 1976: 84). As Menkel-meadow (1997: 1616) gathers from Sanders thinking, "different kinds of disputes might require different treatments, and if we could triage ... cases the way that doctors and nurses triage medical cases perhaps the caseload could be better and more efficiently handled."

Various land use dispute programs in the US approach the resolution of conflict differently; some undertaking to screen disputes in a process similar to that advanced by Sander (1976), others imposing mandatory attempts at mediation, and many offering voluntary mediation, for example:

In Connecticut, parties appealing decisions of the Planning and Zoning Commission must file a statement with the Court stating the appeal can be resolved through mediation before any attempt to resolve the case in this way can be initiated;

Any request for mediation under the Local Land-use Planning Act in Idaho deems the first session mandatory for all parties and thereafter optional;

The Land-use Mediation Program in Maine mandates state agencies to participate in mediation when required by the Court ADR Service;

In the Massachusetts Land Court Program, judges may refer parties to attend orientation sessions where their case is determined to see if referral to a dispute resolution service is appropriate;

In Minnesota disputes are referred to a mediation service provider if the dispute is not resolved after 30 days and then to binding arbitration if it is not resolved after 60 days; and

In Vermont, pre-trial conferences are held to see if mediation is appropriate for the dispute. If so, the judge orders mediation.

More recently, Kitsap County, Washington adapted an ordinance requiring mediation as a pre-requisite to appeal certain land-use decisions (Smith, 2010). The ordinance is codified in Title 21.04.120 of the Kitsap County Code which states "Kitsap County and the hearing examiner encourage the use of mediation where possible to resolve any disputes that arise at any time during the processing of land use applications or appeal..." (KCC, 2010). The Kitsap County land-use mediation process "when successful should result in a disclosable mediation agreement consistent with the comprehensive plan, adapted codes and ordinances, and the general public interest" (KCC, 2010). The Director, during development application review, may offer voluntary mediation, and if accepted, the mediation must commence within 14 days and be completed within 21 days of its agreement. If an agreement is reached the parties sign a mediation agreement which is then forwarded to the appropriate body for approval. Where an appeal is made in respect of Ministerial (Type 1) or Administrative (Type II) decisions, mediation is mandatory prior to being heard by an examiner. In appeals of quasi-judicial (Type III) decisions, mediation is encouraged but not mandatory. Mediation will be paid for by the County "if the parties choose to use the dispute resolution centre of Kitsap County, but parties must share mediation costs if they decide to use a different mediator" (Smith, 2010).

7 ADR and Mediation in Canada

Not dissimilar to the American situation, a number of variations exist between dispute resolution programs in Canada. Principally concerned with civil mediation, the Canadian experience has sought to improve access to justice. In this respect the introduction of court-connected mediation programs are regarded as the most significant development. In Saskatchewan's Court of Queen's Bench, the Department of Justice assigns a mediator to the parties in dispute and it is mandatory that all parties attend the mediation sesson(s) before further steps can be taken. Should a party fail to attend mediation, a Certificate of Non-Attendance can be filed at which point "the court may either order the party to attend mediation, order another mediation with specific terms, or under certain conditions, strike the proceedings of the party that failed to attend" (Keet and Salamone, 2001: 61). If the mediation process is completed however, the mediator will file a Certificate of Completion.

In contrast to the province of Saskatchewan, mediation services under the Ontario Mandatory Mediation Program, 'are largely provided by practitioners, chosen by the parties to the dispute' (Winkler, 2010: 237). Under this system, the mediation session must take place within ninety days of the filing of the first defence. A second contrast between Ontario's procedures and those of Saskatchewan exist in that parties to a dispute in Ontario must submit a 'Statement of Issues' in advance of the mediation session outlining the issues in dispute, their position and their interests. A Certificate of Non-Compliance will be issued by the mediator if this statement is not provided or if a party fails to appear, and the matter will be referred to the case management master or judge who will decide what action is to be taken. The master of judge may "convene a case conference and either establish a timetable for action, strike out any document filed by a party, dismiss the action or strike the defence, order a party to pay costs, or make any other 'just' order" (Keet and Salamone, 2001: 63).

Whereas mediation is mandatory under the programs operating in Saskatchewan and Ontario, “the process of judicial mediation [in Quebec] is entirely voluntary (...) and is invoked only when parties show they are ready to reach an amicable settlement” (Otis, 2010: 247). Parties in dispute are notified of the possibility of entering into mediation before a statement of defence is filed and again before filing a certificate of Readiness for Trial.

8 ADR and Mediation in Australia

Recently, in Australia, a burgeoning field of ADR and mediation has developed in relation to environmental disputes. Sipe (1999: 1) suggests the history of environmental dispute resolution (EDR) in Australia ‘begins in the early 1990s, when the Australian Resource Assessment Commission considered using mediation in its inquiry process.’ Although the Commission decided not to pursue the process, the Land and Environmental Court (LEC) of New South Wales began to offer mediation. In addition to EDR process being run in the LEC of New South Wales, ADR practices are common in the Planning and Environmental Court (PEC) of Queensland, the Environment, Resources and Development Court (ERDC) of South Australia, the Victorian Civil and Administrative Tribunal (VCAT) and the State Administrative Tribunal (SAT) of Western Australia. As is the case in America and Canada slight variations exist between Australian Court and Tribunal dispute resolution processes. The two most widely recognised programs are those of the LEC of New South Wales and the SAT of Western Australia.

As one of the oldest specialist environmental courts in the world, the LEC of New South Wales has a two-tier structure allowing it to review the merits and decisions of particular bodies and to declare and enforce the law. Further the LEC has a mixed jurisdiction, dealing not only with merit appeals relating to environmental and land-use matters but also with civil and criminal enforcement cases, and judicial reviews. This jurisdiction is divided into 8 classes accruing to subject matter (See Table 1).

Table 1. Classes of the LECs Jurisdiction
(Source: LEC, 2009)

Classes of the Courts Jurisdiction	
Class 1	Environmental planning and protection appeals (merits review appeals)
Class 2	Local government, trees and miscellaneous appeals (merits review appeals)
Class 3	Land tenure, valuation, rating and compensation matters (merits review appeals)
Class 4	Environmental planning and protection (civil enforcement and criminal review)
Class 5	Environmental planning and protection (summary criminal enforcement)
Class 6	Appeals against convictions or sentences relating to environmental offences (appeals as a right from Magistrates in Local Court prosecutions for environmental offences)
Class 7	Appeals against convictions or sentences relating to environmental offences (appeals requiring leave from Magistrates in Local Court prosecutions for environmental offences)
Class 8	Civil proceedings under the mining legislation

Recourse to mediation at the request of the parties or the Courts volition is permissible in respect of Classes 1, 2, 3, 4 and 8 at any stage in the process. Anything said in mediation is confidential and cannot be used if recourse is transferred to court or tribunal, and any presiding judge will not be informed of anything having occurred during the mediation conference. However, if parties reach an agreement through mediation, "they can either have an informal agreement or have it given the force of a court order so that it is binding" (Lyster et al., 2007: 40).

The SAT of Western Australia, established on 1 January 2005 under the State Administrative Tribunal Act 2004, has jurisdiction of town planning review applications[1], with authority to undertake ADR processes. The SAT have developed two types of directions hearing for planning cases; Class 1 directions hearings for "planning review applications involving developments with a value of less than $250,000, or single houses with a value of less than $500,000, and subdivisions to create not more than three lots" (Parry, 2009: 3), and Class 2 directions for all other planning review proceedings. In respect of Class 1 directions hearings, the setting is generally relaxed and usually involves an explanation of the planning review process, identification of the issues in dispute and consideration of alternative solutions. The presiding member has the power to convert the directions hearing to a mediation process if it is perceived this will help discussion and effect resolution of the dispute.

Unlike Class 1 directions hearings, the complexity of Class 2 directions hearings – often requiring preparations and wider participation in order to facilitate resolution – mean that such hearings do not normally discuss the merits of the application or alternatives to it. Rather, "to facilitate resolution of the application or issues, there is a presumption that cases will be referred from a Class 2 directions hearing for mediation..." (Parry, 2009: 4).

9 ADR and Mediation in New Zealand

Prior to the use of EDR and particularly mediation in the resolution of disputes within New Zealand, ADR was a feature of Family Courts. Criticism of the handling of family disputes within the legal system gave rise to the Family Court in 1981 in which 'the process of dispute handling has a three-tiered system which distances disputants from the option of litigation' (Wilson, 1993: 363) The first of the three tiers in most cases is counselling provided either by the court or through a private agency. Should the parties fail to reach settlement at this stage, the dispute then moves to the second tier in the system during which a mediation conference is held. It is only in extreme cases that parties will be permitted to move to the third tier of adjudication.

Not unlike the criticism against the handling of family disputes prior to the introduction of the Family Court, "the adversarial approach that tended to dominate most [Planning] Tribunal hearings was a source of concern to many who felt that this method of dispute resolution was often inappropriate and not conductive to an efficient or just method of determining many planning and environmental disputes" (Rive, 1997: 206). In the mid-1980s, a comprehensive review and reform process began in relation to New Zealand's environmental management framework. As part of this process, "the [Resource Management Act (RMA)] policy formulation process of 1988-90 ... [called] for better integration of mediation and other [ADR] approaches into the statutory framework." (Montgomery and Kidd, 2004: 106).

Rive (1997: 208) describes how the "coming into force of the Resource Management Act 1991 brought with it a statutory recognition of the appropriateness of employing techniques other than the traditional adversarial model of the resolution of disputes coming before Consent Authorities and the Planning Tribunal." In particular 'Section 268 [of the RMA] allows mediation ... to be used before or during an Environmental Court[2] hearing' (Mitcalfe, 2001: 206). Bollard and Wooler (1998: 711) note, "in practice, once proceedings are lodged an Environmental Judge considers the file and determines whether the matter may be suitable for mediation." If so, the parties are invited by the registry to participate in the mediation process. Should the parties choose to engage a private mediator they are liable for associated costs and expenses, but "if a Commissioner acts as a mediator, the parties would not be required to pay expenses, as the Environmental Court provides mediation as a free service" (Voigt, 2002: 937).

Where parties engaged in mediation fail to settle their dispute, Section 268(2) of the RMA does not disqualify a member of the Environmental Court:

> "...from resuming his or her role to decide the matter ... if: (1) the parties agree that the member should resume his or her role and decide the matter; and (2) the member concerned and the court are satisfied that it is appropriate to do so" (RMA, 1991).

In practice, this rarely occurs with Bollard and Wooler (1998: 711) suggesting "the Court's own approach tends to regard that course as inappropriate – a prime concern being to avoid any suggestion (however) belated that what was said in confidence during the mediation somehow played a part in arriving at the Court's eventual decision."

10 Investigations into ADR and Mediation in the UK Planning System (England and Wales)

Heavily influenced by and largely following the emerging debates of ADR in the US, discussions of alternative forms of dispute resolution in the UK began in the 1960s, concentrating on criticism of state institutions and the role of the state, before progressing in the 1970s to a focus on criticism of litigation and the merits of settlement. A further turn of discussion occurred in the 1980s; the result of growing interest in ADR within the legal and academic professions. Such discussions inevitably led to developments in practice with pilot projects and court-connected mediation schemes, along with further investigation into ADR and civil justice reform with the publication of the Woolf Report in 1996 and more recently the Jackson Report in 2010.

Whilst developments of ADR in the civil justice system in the UK have grown considerably since the mid 1990s, investigations of the potential use of ADR and mediation in the planning system have been somewhat slower. In May 1996, "Chris Shepley the Chief Inspector [of the RTPI], proposed that the mediation of planning disputes merited discussion, and speculated there might even be a role for the Inspectorate in organising mediation services" (Harrison, 1997: 79).

Over two years later, a report into the use of 'Mediation in the Planning System' was commissioned by the Department of the Environment, Transport and the Regions (DETR), with the aim of establishing the viability of introducing mediation effectively in the planning process and to determine if this would speed up decision making, reduce the pressure on public funds and the number of disputes which might otherwise result in appeals (Wellbank et al., 2000: 6). A study prior to the production of the report included a pilot project of 48 cases and led to the formation of six recommendations. The first three of these recommendations focus on the use of mediation in the planning system, arguing:

the use of mediation should be encouraged on a voluntary basis but under formal arrangements;

in the first instance there are benefits in establishing a mediation service with trained volunteer mediators; and

best practice guidance should be made available on the use of mediation in the planning system.

The final three recommendations relate to proposed changes to the planning system developed from experiences gained in the pilot project, and suggest:

the effectiveness of the existing communication arrangements between parties in the planning system, (i.e. the applicants and planning departments), should be reviewed;

a separate planning application regime for 'householder' applications should be introduced; and

there is a need for further study into the use of additional forms of ADR in the planning system, and additional research into the application of mediation to processes in the planning system other than planning appeals.

Following these recommendations the DETR commissioned 'Further Research into Mediation in the Planning System'. Published in November 2002, the report identified five additional recommendations concerning mediation in the planning system, namely:

a National Planning Mediation Service be established;

an Implementation Program for Mediation be launched;

the use of Mediation be incorporated as a Best Value Indicator;

incentives to encourage the use of Mediation be provided; and

the remit of the National Planning Mediation Service be drawn to cover 'stakeholder dialogue' services. (Wellbank et al, 2002: 67-70).

Published in September 2003, the report by the then Office of the Deputy Prime Minister (ODPM) entitled, 'Participatory Planning for Sustainable Communities: International experience in mediation, negotiation and engagement in making plans', called for a move from public participation to participatory planning in which mediation may be used to resolve conflicts and objections to development plans. The paper suggests there is a spectrum of processes within participatory planning: engagement, negotiation, pre-mediation (planning authority-led, seeking to resolve potential disputes between other parties and reach agreements that can be built into the plan), and mediation by a neutral third party when the planning authority is a party to the dispute (ODPM, 2003: 4).

There has been little progress made on the recommendations of the aforementioned reports with Barker (2006: 169) under Recommendation 25 reiterating the Department for Communities and Local Government (DCLG):

> "should establish a planning mediation service to act as an alternative dispute resolution mechanism within the planning system [and advancing the Planning Inspectorate] should also explore further means of reducing demand for the appeals system [and suggesting] this should include greater use of powers to charge for unreasonable behaviour leading to unnecessary expenses."

In November 2008 the final report of the Killan Petty Review "recommended that greater use of alternative dispute resolution should be encouraged at all stages of the planning application process where this can deliver the right decisions in a less adversarial and cost efficient way" (Killen and Petty, 2008: 118) suggesting two options to achieve this. The first argues that steps need to be taken by planning authorities and applicants to identify areas in which recourse to alternative dispute resolution mechanisms during the planning process are possible, and the second suggests further research is required to discover if the costs in introducing a formal mediation scheme outweigh the potential time and cost savings of less appeals.

In response to the suggestion by the Killen Petty Review, urging investigation of the use of ADR in all stages of the planning process, a final report on 'Mediation in Planning', jointly commissioned by the Planning Inspectorate and the National Planning Forum for England was launched on 29 June 2010. The report identified three key recommendations containing in total 10 sub-recommendations:

developing and building a market for mediation to include: developing awareness, assessing the value of mediation, developing practice, selling the idea and assessing the effectiveness.

providing advice and guidance on mediation to include: developing understanding; quality assurance;

developing skills and creating capacity for mediation to include: providing a framework and developing the infrastructure to support the use of mediation, and developing the skills and knowledge of all players in the planning system. (Rozee & Powell, 2010: 29).

Whilst welcoming the report Grossman (2010) comments that the planning community is behind in the game when it comes to mediation suggesting

"mediation has been a real, viable and - to a large extent - available option for the last decade and it is time that the planning community caught up with other sectors, both private and public, who have been using it to resolve their disputes and assist in better communications and dialogue."

He advocates the need to develop a strategy for introducing mediation to the planning system rather than simply taking an exploratory stance.

Although now, no specific provision for ADR and mediation appears in planning policy or legislation, Parmiter & Phillips (2008) suggest "some tools and guidance already exist in the planning system to allow planners to make more use of mediation." For example Rule 14(1) of the Town and Country Planning (Inquiries Procedure) (England) Rules 2000 requires the planning authority and the applicant to "prepare an agreed statement of common ground and ensure that the Secretary of State [and any] statutory party receives a copy of it not less than four weeks before the date fixed for the holding of the inquiry" (TIE, 2000). Whilst acknowledging this does not always happen, the use of ADR practices may facilitate parties in preparing their agreed statement and limiting the number of issues going to inquiry with Parmiter & Phillips (2008) suggesting "the nature of mediation is ideally suited to identifying existing areas of consensus, which are often surprisingly broad."

11 Investigations into ADR and Mediation in the UK Planning System – (Scotland and NI)

Whilst there has been no investigation in NI into the potential use of ADR and mediation in the Planning System there have been some investigations in Scotland. In 2003, the Planning Division of the Scottish Executives Development Department produced a Consultation Paper into 'Modernising Public Local Inquiries' stating "planning authorities must work harder to reduce the number of objections that reach inquiry, through mediation and negotiation leading to agreed changes to the plan before the inquiry is requested" (SE, 2003: 19).

In questioning if the process of development planning could be improved the paper asked if improvement could be brought by reducing the number of objections to plans though negotiation and mediation prior to calling an inquiry and by adapting a hearing format as the norm for all plan inquiries and applying other relevant improvements. An analysis of the 'Digest of Responses to the Consultation Paper' reveals mixed views

from respondents on the use of mediation to reduce the number of objections to the plan, (See Table 2).

Table 2. Views of the use of mediation to reduce the number of objections to plans (Source: Created by Author from an analysis of responses to the Consultation Paper on Modernising Public local Inquiries)

	Respondent	In favour of Mediation	Recognised Positives & Limitations of Mediation	Against Mediation
Breakdown of Respondents & Responses	Local Authority (LA)	5	6	1
	Other LA Organisation	0	1	0
	Public Bodies	3	0	0
	Development Industry	1	0	0
	Other Business / Business Group	2	1	0
	Professional Organisation	2	1	0
	Planning Consultant, Architect or Lawyer	1	3	0
Totals number of Respondents		**14**	**12**	**1**

In favouring the use of mediation prior to the public examination of objections, Western Isles Council suggested "it may be worth considering whether there would be a role, either in mediation, or even in a hearing or inquiry, for local environmental courts" (SG, 2003: 206). The sub-committee of the Law Society of Scotland whilst agreeing that there is potential for the use of mediation to reduce the volume of objections, indicated this should not be the norm adding they are very cautious about compulsory mediation in this area. The legal practice of Archibald, Campbell & Harley commented that "all parties to the local plan process should be encouraged to recognise that mediation and negotiation have their parts to play" (SG, 2003: 212) but indicated in practice this may not be easy as too many 'planning authorities are trapped into defending their plans at all costs' (SG, 2003: 212).

Later, the Scottish Government produced a guide on the matter in 2009. Entitled 'A Guide to the Use of Mediation in the Planning System in Scotland', "the purpose of the guide is to help those involved in the planning system in Scotland to understand how mediation can be used to enhance the planning process" (SG, 2009: 1). The report identified a number of areas in the planning system in Scotland where the use of mediation may be appropriate, including: (1) the consultation phase of national planning projects; (2) the pre-plan and post-draft plan publication phases of the development plan process; (3) the pre-submission consultation stage for planning applications; (4) the pre-decision phase in the planning application process; (5) the post-refusal stage of the application process; and (6) prior to the planning authority undertaking full enforcement measures.

12 Issues Emerging for Further Investigation

The analysis of dispute resolution programs operating in a number of court and tribunal based settings, has demonstrated a number of differences in practice and procedure, both within and between jurisdictions. These differences have identified a number of issues for further investigation in considering if mediation can lend itself to planning

practice in the UK. Notably, it will be necessary to consider how disputes in planning are decided applicable to mediation. Is it the case that this should be left to the parties to file a statement stating their appeal can be dealt with by mediation as is the case in Connecticut, or should parties attend orientation or screening sessions to have their dispute assessed, as suggested by Frank Sander? Some options pre-suppose that mediation is voluntary, others that mediation is mandatory, but which is most appropriate to planning disputes and most applicable to the existing planning system. If mandatory mediation is viable should this be in all cases or for certain types of dispute as identified in the Kitsap County Code? Is it the case, particularly with a back-log of planning appeals that a tiered system can be introduced as exists on Minnesota or the Family Court in New Zealand? Further, who mediates and who enforces mediation agreements? Is there a need to consider the role of environmental courts in the UK?

Both planning practitioners and members of the community and voluntary sector have expressed concern about local authority planning officers and commissioners functioning as mediators and decisions makers. Mediation practitioners, when questioned on this issue suggested the possibility of incorporating in planning, practices similar to that introduced by the NI Parades Commission who facilitate disputes concerning public processions. Under this system, independent 'Authorised Officers' contracted by the Parades Commission work on the ground to mediate public procession disputes and if mediation fails a decision on the matter is taken by Commissioners. This is similar to the system Bollard and Wooler (1998) have shown to operate in the Environmental Court of New Zealand.

Despite this and the use of mediation in courts and tribunals some planning practitioners questioned the appropriateness of introducing mediation in the tribunal system. In expressing that this was their opinion, they did make an interesting suggestion that further investigation on this matter could be undertaken by approaching organisations such as the Industrial Relations and Employment Tribunal who may have different views of mediation in the tribunal setting. Whilst labour models of mediation may be beneficial for appeals and some enforcement disputes, where parties in dispute are easily identifiable, the issues in dispute are easily defined and usually involve legal representatives or experienced negotiators in bilateral negotiations, Susskind and Ozawa (1983: 186) suggest:

> "There are strong indications that in the larger realm of public resource allocation disputes, the labour model may prove ... inappropriate."

The earlier discussion on globalisation and planning practice becomes important in considering that conflict in public sector land-use disputes often involves a number of vague issues held by many different interest groups with un-equal access to resources. For Susskind and Ozawa (1983) the international model of mediation may be more applicable to public sector disputes in that the mediator has a more overt role in the process. How blatant, this role should be is a matter for further investigation, but it may be appropriate to consider moving away from the role of the mediator as an impartial and neutral third party to that of an advocator who takes into account power inequalities of the parties to dispute. Some planning practitioners and members of the community and voluntary sector suggested it may be appropriate for community organisations to undertake the role of mediators in the planning system as much advocacy work is already undertaken by these bodies which often facilitate negotiations between communities and developers regarding land-use activity.

It is apparent that no single approach to mediation can be applied to the nature of conflict within the planning system and whilst procedures and practice drawn from programs used elsewhere may be tailored to apply to the planning system, nuanced approaches to mediation will be required to facilitate the resolution of disputes considered more complex and hindered by diverse interests and contestation.

13 Notes

[1] "'Planning review applications' and 'planning cases' in the State Administrative Tribunal refer to applications for review of decision of local and state government authorities to refuse to grant approval for, or to grant conditional approval for, development or subdivision applications or strategic planning proposals under planning schemes, and to give landowners and other directions or notices in relation to the carrying out of development or other activities." (Parry, 2009: 1)

[2] The Planning Tribunal was replaced by the Environmental Court with the introduction of the Resource Management Act 1991.

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The Shared Ownership Lease: Can the Wrong be Righted?

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Abstract:
The Coalition Government continues to support the use of "shared ownership" to provide an affordable route into home ownership. Yet there is a significant problem with the shared ownership scheme; as *Richardson v Midland Heart* [2008] L & TR 31 shows, in the event of the home "owner" falling into rent arrears, he or she may lose not simply his or her home, but also the equity in the property. This paper examines whether there is some way of using existing legal principles to avoid this unjust outcome by either; first, protecting the use value of the home by relying on Convention rights under the Human Rights Act 1998 to prevent termination of the "shared ownership" lease; or, secondly, recouping the investment value of the home by using human rights, public law and private law arguments to enable the home "owner" to retain the equity even if the home is lost.

Keywords:
Shared Ownership, Human Rights, Housing Law

1 Introduction

An Englishman's home is his (or her) castle. In England the majority of householders live in homes that they own, with surveys demonstrating repeatedly the population's strong preference for home ownership over renting. Yet rising housing prices have meant that traditional home ownership – the purchase of a home funded through the buyer's own resources and a commercial mortgage – has become the impossible dream for many. As a result, successive governments have sought to make this dream a reality by filling the affordability gap through Low Cost Home Ownership (LCHO) schemes.

One legal model for such schemes is "shared ownership", or "part-buy part-rent". Shared ownership schemes aim to place the purchaser somewhere along spectrum of home ownership, but are in fact a misnomer; there is no sharing of ownership at all. What the purchaser gets in reality is a "shared ownership lease". This is a lease of a 99-year term (if necessary, purchased using a commercial mortgage); the premium paid for the lease is calculated according to the percentage of the market value the purchaser is able to afford (generally between 25-75%), and a sub-market rent is paid on the "un-purchased share". The freehold is retained by the housing provider (most typically a housing association).

Shared ownership properties necessarily constitute a dwelling-house which is let as a separate dwelling, as the purchaser's only or principal home. The shared ownership lease therefore falls within the definition of an assured tenancy under section 1 of the Housing Act 1988.[1] As a result, the lease attracts certain statutory protections, including

[1] As rent is being paid on the un-owned share, the lease will not fall into the exceptions in schedule 1 to the Act for leases in which there is no or low rent.

fetters upon the termination of the tenancy which can occur only by court order and on the grounds provided in schedule 2 to the Housing Act 1988. Crucially, this means that the lease is subject to Ground 8.

Ground 8 entitles the landlord of an assured tenant to a possession order if two months' rent is unpaid;[1] provided that condition is satisfied both at the time notice is served under section 8 of the 1988 Act and at the date of the hearing, the court must make the order. Possession under Ground 8 is thus mandatory, not discretionary.

Use of Ground 8 and its draconian consequences has the potential to turn the ownership dreams of shared ownership tenants into nightmares, exemplified by the following case:

Richardson v Midland Heart [2008] L & TR 31

- 99-year shared ownership lease; Miss Richardson "owned" 50% share of the property.
- House worth £60,000 in 1995 (when the lease was granted).
- By 2005 this has risen to £150,000; the rent payable on the "non-owned share" was approximately £1,500 p/a.
- Miss Richardson subsequently fled the property to a women's refuge; rent arrears began to accrue.
- The housing association successfully applied for possession under Ground 8.
- Miss Richardson tried to recover her 50% "share" of the property. She failed.
- She lost: her home, her share of the uplift of the property's value (£45,000) and her initial premium (£30,000) (although the housing association made an ex gratia payment of this amount, less rent arrears).

The injustices:

- Use of Ground 8; albeit that loss of the home was inevitable once the arrears began to mount up.[2]
- But she also lost the investment value tied up in the home. Is Miss Richardson any different to a standard renter? Where is her "ownership"?
- Do such consequences fundamentally undermine the aim of the scheme to deliver home ownership to those who otherwise couldn't afford it?

This paper looks at ways to avoid these injustices; first, by protecting the "use value" of the property by preventing possession. Three avenues will be explored: using Article 8 of the European Convention on Human Rights (ECHR); using Article 1 of the First Protocol to the ECHR (A1P1); and using judicial review to challenge the decision to seek possession. Secondly, means of recouping the "investment value" of the property will be discussed, to deal with the situation where the tenant is unable to prevent the housing association from obtaining possession and therefore wishes to recoup his or her "share" of the monetary value of the property. Again, three areas will be explored in depth (with arguments of private law also discussed in outline): using A1P1; claiming

[1] The entitlement based on two months' unpaid rent is for rent payable monthly; if payable weekly, the requirement is eight weeks' unpaid rent; if payable quarterly or yearly, the requirement is one quarter's rent in arrears of more than three months and three month's rent in arrears of more than three months respectively.

[2] A significant feature of the *Richardson* case was that Miss Richardson had not used a mortgage to buy her 50% share, but had paid this sum outright. If a mortgagee had been involved, then it would have intervened to protect the security (eg, by discharging the arrears). But it appears that it is not uncommon for shared ownership leases to be purchased without a mortgage; this happens in around 15% of cases: see Tenant Services Agency, 'Existing Tenants Survey 2008: Shared Owners' (2009) p 25.

under the public law doctrine of legitimate expectations; and making recourse to Ombudsmen.

2 Protecting the use value: Article 8, A1P1 and Judicial Review

This section looks at whether possession can be delayed or prevented in order to give the tenant under a shared ownership lease ("the tenant") time to sell his or her share in the property and thus recover the money invested.[1] Clearly, this argument can only assist the tenant if it is brought prior to the possession order being granted.

2.1 Article 8

There has been much activity in recent years involving Article 8 being used to challenge possession proceedings brought by social landlords. A sustained clash between the European Court of Human Rights (ECtHR) and domestic courts has finally been brought to an end by the Supreme Court in *Manchester City Council v Pinnock*,[2] where it was decided that domestic courts must be permitted to examine the proportionality of a possession order in order to comply with the procedural requirements of Article 8 (although in the overwhelming majority of cases, the substantive challenge based on Article 8 will likely fail – unlike Ground 8, some grounds for possession already carry a condition of "reasonableness"; if granting the order is "reasonable", it is highly unlikely to then be disproportionate).[3]

R (Weaver) v London Quadrant Housing Trust[4] established that housing associations could be classified as hybrid "public authorities" under the Human Rights Act 1998 (HRA 1998), meaning they would be under a duty to comply with Convention rights through the operation of section 6(3)(b) of the HRA 1998.

Following the principles laid down in *Weaver*, housing associations offering shared ownership leases would appear to constitute a hybrid "public authority" for HRA 1998 purposes. This is because; first, they will most likely be in receipt of social funding in the form of social housing grants; secondly, they provide subsidised housing (a "governmental function"), which has been promoted by successive governments; thirdly, they most likely will have charitable status and therefore have charitable objects and act in the "public interest"; finally, if a housing association constitutes a "non-profit registered provider of social housing", it will be able to exercise certain statutory powers, such as applying for Anti-Social Behaviour Orders.[5]

It must also be shown that the act of taking possession proceedings under Ground 8 is an act of a "public" nature. Following *Weaver*, it probably is: the act of terminating a social tenancy[6] is so bound up in the function of providing social housing that, if the latter constitutes a "public function", the former must constitute a "public act".[7]

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[1] Shared ownership tenants do have alienation rights in relation to the property. However, the lease is structured in a way that encourages the shared owner to notify the housing association that they intend to sell. The housing association then enjoys a period of exclusivity (usually two months) to nominate a purchaser. Only if that period expires without a buyer being found, or if the nominated buyer fails to proceed, is the tenant able to offer the property on the open market.

[2] [2011] UKSC 6, [2010] 3 WLR 1441.

[3] *Pinnock* (n 5) [55] and [56].

[4] [2009] EWCA Civ 587, [2010] 1 WLR 363.

[5] Crime and Disorder Act 1998, s 1(1A).

[6] Housing and Regeneration Act 2008, ss 68 and 70 explicitly classifies shared ownership as social housing.

[7] See *Weaver* (n 7) [76] to [80]. Although *Weaver* involved termination of an assured tenancy, the argument applies equally to the allocation and termination of low cost home ownership products.

2.1.1 The substantive challenge under Article 8

Article 8 reads:

> Everyone has the right to respect for his private and family life, his home and his correspondence.
>
> There shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

Where a public authority seeks possession of a person's home, Article 8 is engaged due to the interference with the tenant's "home" rights.[1] Any measure which interferes with Article 8 rights must pursue a legitimate aim in accordance with the law by answering a "pressing social need" and the measure used to pursue that aim must be "necessary in a democratic society".

In practice this is now taken to mean that it is necessary to show both that possession pursues a legitimate aim and is a proportionate means of achieving that aim.

2.1.2 Pursuit of a legitimate aim?

In *Pinnock* it was said that "there will be no need, in the overwhelming majority of cases, for the local authority to explain and justify its reasons for seeking a possession order."[2] This view was based on the fact that, in the majority of cases, the twin aims identified in *Pinnock* are satisfactory for Article 8 purposes. The twin aims were: a) vindicating the authority's ownership rights; and b) enabling the authority to comply with its public duties in relation to the allocation and management of its housing stock.

But shared ownership cases are different. Shared ownership operates very differently from the social housing statutory regime under consideration in the *Pinnock* and *Hounslow London Borough Council v Powell*[3] cases.[4] It is clear that in *Powell* Lord Hope places emphasis on the fact that Parliament has already carefully decided who is to have security and who is not under the Housing Act 1985 to reflect the perceived housing management needs of local authorities.

This conclusion does not apply in the same way to shared ownership tenants. First, no particular Parliamentary attention has been given to the way in which shared ownership works. Secondly, shared owners have not been deliberately placed into a class of occupiers for whom there is no security, unlike the occupiers under consideration in *Pinnock* and *Powell*. The absence of security is probably an unanticipated consequence of the legal models used to deliver shared ownership. It is likely that prior to *Richardson* most people would have assumed that termination of a shared ownership lease would be

[1] "The loss of one's home is the most extreme form of interference with the right to respect for the home"; see *Kay v United Kingdom* [2011] HLR 2 [68].
[2] *Pinnock* (n 5) [53].
[3] [2011] UKSC 8, [2011] 2 WLR 287. *Powell* was heard a few months after *Pinnock* was handed down, and was billed in the latter case as providing more specific guidance as to the nature of the proportionality inquiry to be undertaken by the courts.
[4] The demoted and introductory tenancies under consideration in *Pinnock* and *Powell* were set up to deal with the problem of anti-social behaviour; the licence granted under the homelessness legislation in *Powell* was part of the response to the need for housing authorities to be able to respond flexibly and quickly to homelessness situations.

governed by the usual rules on forfeiture giving the possibility of relief against forfeiture being available.[1] Thirdly, the first aim in *Pinnock* is to do with vindication of ownership – in shared ownership cases, ownership itself is split between the housing association and the tenant.[2] Fourthly, account should be taken of the aim of shared ownership: unlike rental social housing it is about more than simply providing a roof over one's head; it is also intended to enable a capital asset to be built up.

2.1.3 Proportionality

Adapting the language from the leading immigration case of *Huang v Secretary of State for the Home Department*,[3] the balance required by Article 8 requires consideration of whether the grant of possession, taking full account of all considerations weighing in favour of the occupant, prejudices the occupier's right to respect for the home in a manner sufficiently serious to amount to a breach of the fundamental rights protected by Article 8.

The onus is therefore on the tenant to demonstrate that possession is, in the context, disproportionate and prejudices his or her right to respect for the home. This presents a significant challenge, because (absent special personal circumstances), the crux of the shared ownership tenant's case is that it is (usually, not exceptionally) disproportionate because it means losing not simply the use value but also the *investment value* of the home.

However, whilst "home" has an autonomous meaning in the ECtHR jurisprudence and has been interpreted broadly,[4] it has never previously been argued that it extends to the investment value of the home. Nevertheless, in the particular context of shared ownership, taking account of the policy reasons underlying the promotion of LCHO and the intangible values associated with ownership, the argument could be run that "home" should be understood not simply to cover the roof over the head but all of the other benefits associated with ownership – including the investment value. As Hopkins and Bright have argued elsewhere, home incorporates much more than simply a roof over the head and in the context of low cost home ownership products the ability to build a capital asset (investment) is integral to the meaning of home.[5]

2.2 A1P1

A1P1, entitled "protection of property" reads:

> Every natural or legal person is entitled to the peaceful enjoyment of his possessions. No one shall be deprived of his possessions except in the public interest and subject to the conditions provided for by law and by the general principles of international law.

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[1] For full details on relief against forfeiture, see K Gray and S F Gray, *Elements of Land Law* (5th edn, OUP 2009) para 4.4.52 and following. Put briefly, there are various statutory grounds through which the tenant can obtain relief from forfeiture, in addition to the residual equitable discretion of the courts; in the case of non-payment of rent the tenant is effectively entitled to relief if he or she pays all arrears and costs.

[2] For more detailed information on this point, see S Bright and N Hopkins, 'Home, Meaning and Identity: Learning from the English Model of Shared Ownership' (2010) Housing, Theory & Society DOI: 10.1080/14036096.2010.527119.

[3] [2007] UKHL 11, [2007] 2 AC 167.

[4] *R (Countryside Alliance) v Attorney General* [2007] UKHL 52, [2008] 1 AC 719, 745, citing *Niemietz v Germany* (1993) 16 EHRR 97 to illustrate that the expression "home" can "… cover premises other than the place where a person lays his or her head at night".

[5] S Bright and N Hopkins, 'Home, Meaning and Identity: Learning from the English Model of Shared Ownership' (2010) Housing, Theory & Society DOI: 10.1080/14036096.2010.527119.

> The preceding provisions shall not, however, in any way impair the right of a State to enforce such laws as it deems necessary to control the use of property in accordance with the general interest or to secure the payment of taxes or other contributions or penalties.

Using Article 8 to protect the investment value is a novel argument. It is much easier to show that it comes within A1P1, the ambit of which extends significantly further than simply "home" rights. The protection of "possessions" in the first sentence of A1P1 guarantees, in substance, the right to property.[1] Within its scope fall all rights and interests constituting assets, broadly understood, as explained by the ECtHR in *Stretch v United Kingdom*:

> The Court recalls that, according to the established case law of the Convention organs, "possessions" can be "existing possessions" or assets, including claims, in respect of which the applicant can argue that he has at least a "legitimate expectation" of obtaining effective enjoyment of a property right.[2]

For a claim to succeed, there must be an interference with "possessions" (the "interference" question), which is not "in the public interest and subject to the conditions provided for by law" (the "justification" question); in substance, the justification question leads to a proportionality analysis.

As a preliminary point, it should be noted that the reasoning of the Supreme Court in *Pinnock* and *Powell*, in the context of Article 8, would apply in a similar way to A1P1. In other words, the conclusion in the *Pinnock* line of jurisprudence was that, where Article 8 is engaged, domestic courts are required to consider the effect of making a possession order on the rights guaranteed by that provision; it seems highly unlikely that a different result would obtain in the case of A1P1, or that the ECtHR would take a softer approach in terms of the procedural requirements for compliance with A1P1 as compared to Article 8.[3]

2.2.1 The "interference" question

In practice, the ECtHR has treated A1P1 as containing three rules:

> The *first* rule, which is of a general nature, enounces the principle of peaceful enjoyment of property; it is set out in the first sentence of the first paragraph.
>
> The *second* rule covers deprivation of possessions and subjects it to certain conditions; it appears in the second sentence of the same paragraph.
>
> The *third* rule recognises that states are entitled, amongst other things, to control the use of property in accordance with the general interest, by enforcing such laws as they deem necessary for the purpose; it is contained in the second paragraph.[4]

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[1] *Marckx v Belgium* (1979) 2 EHRR 330 [63].
[2] (2004) 38 EHRR 12 [32].
[3] It may be the case that the ECtHR would allow a wider margin of appreciation in the case of A1P1, as a less "fundamental" right than Article 8; in other words, states would be afforded a wider degree of discretion in relation to measures which interfere with A1P1 rights. However, that margin of appreciation would very much depend on the specifics of the individual case; the more fundamental the substance of the right claimed, the narrower the margin of appreciation.
[4] *Sporrong and Lonnroth v Sweden* (1983) 5 EHRR 35 [61] (emphasis added).

The approach of the ECtHR is to classify an interference with possessions under one or more of these three rules. The second rule ("deprivation" of possessions) is said to apply to someone who is deprived of ownership, meaning "the *extinction* of all the legal rights of the owner by operation of law or the exercise of a legal power to the same effect".[1]

In contrast, the third rule ("control of use" of possessions) typically involves the elimination of one of the sticks from the bundle of rights comprising ownership, thus constituting interference with possessions, but not to the extent required under the second rule. Examples of measures which have been held to constitute a "control of use" include import and export laws[2] and planning controls.[3]

The analytical value of approaching A1P1 on the basis of three separate rules has been questioned; in some cases, the ECtHR has taken the view that it is unnecessary to decide whether an interference falls within the second or third rules (for example). However, in other cases the classification as to which "rule" the case falls under has been influential on the outcome, because interferences falling under the second rule *may* be subject to a proportionality inquiry of a greater intensity than those falling within the third rule.

The most conspicuous illustration of the difficulties in this area is *JA Pye (Oxford) Ltd v United Kingdom*,[4] where the Grand Chamber held that the operation of the rules on adverse possession in English law were not in violation of A1P1. One of the reasons for this finding was because the scheme of adverse possession was ruled to constitute a "control of use" of property under the third rule.[5] This result is highly surprising, and demonstrates the difficult task in drawing the line between the three rules. It has been commented in relation to this case that "it is highly unsatisfactory that an essentially unprincipled classification exercise should have substantive consequences".[6]

Further difficulties have been seen in domestic case law. First, there are cases where classifications under domestic law are not consistent with those in Strasbourg.[7] Secondly, there is a potential hurdle for cases involving an apparent deprivation of ownership, which has come about as a result of one of the incidents of that ownership.[8]

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[1] See R Clayton and H Tomlinson, *The Law of Human Rights: Volume 1* (2nd edn, OUP 2009) para 18.104, citing *Lithgow v United Kingdom* (1986) 8 EHRR 329 [107].

[2] *Allgemeine Gold-und Silberscheideanstalt v United Kingdom* (1986) 9 EHRR 1.

[3] *Pine Valley Developments v Ireland* (1991) 14 EHRR 319.

[4] (2008) 46 EHRR 45.

[5] The case was decided on the basis that the proportionality test was satisfied: a fair balance *had* been struck between the interests of the individuals and the community. However, the court was split 10:7, with a dissenting judgment arguing that a fair balance *had not* been struck, in large part down to the absence of compensation for the holder of the paper title. However, the majority was of the opinion that compensation is only an important factor in second rule (deprivation of possessions) cases; the dissenting judgment disagreed. Arguably, then, if the case were categorised as falling within the second rule, the absence of compensation may have tipped the balance in the proportionality inquiry.

[6] R Clayton and H Tomlinson, *The Law of Human Rights: Volume 1* (2nd edn, OUP 2009) para 18.110.

[7] For example, English courts have held that the imposition of penalties and taxes falls under the second rule, whereas the ECtHR treats such interferences as falling within the third rule.

[8] For example, in *Wilson v First County Trust Ltd (No 2)* [2003] UKHL 40, [2004] 1 AC 816, statute had provided that where specific formality requirements were not fulfilled, certain loan agreements were unenforceable. A loan agreement which fell foul of these requirements came before the House of Lords: was the operation of the statute which rendered the agreement unenforceable in violation of A1P1? Lords Hope and Scott held that it was not; the agreement was from the outset improperly executed, and therefore the lender *never* held the rights to enforce the agreement. As those rights were never vested in the first place, there was no deprivation of possessions, and consequently A1P1 was not engaged. In contrast, Lord Nicholls held that A1P1 would have been engaged; on delivery of the chattel which provided security for the loan, the lender acquired a proprietary interest which was extinguished when the court refused to make an enforcement order pursuant to the state. Whether A1P1 was engaged was, according to his Lordship, "a matter of substance rather than form". The approach of the Court of Appeal in *CA*

This involves a complex idea. The nature of the "possession" owned will often be defined by the contract creating that right and if this contract contains limitations then any termination in accordance with those limitations can (arguably) be said not to involve a "deprivation of possessions". However, this "inherent limitation" point seems surmountable in the context of termination of leases on statutory grounds, on the basis that from the moment of grant the tenant has all the powers of a leaseholder; it is the legislation which provides the means by which these powers can be extinguished and Ground 8 (for example) is therefore not a limitation inherent to the lease.[1]

The termination of a lease using Ground 8 falls either under the second or third rules. Under domestic law, where there has been very little analysis of "control of use",[2] the courts have taken a common-sense approach stating (in a context outside of A1P1) "whether a law or exercise of an administrative power does amount to a deprivation of property depends of course on the substance of the matter rather than upon the form".[3] This would seem to indicate that a domestic court would treat the termination of a lease as falling within the second rule of deprivation of possessions; a conclusion supported by the judgment of the Court of Appeal in *Pennycook v Shaws (EAL) Ltd*.[4]

On the other hand, it is difficult to distinguish the Grand Chamber's decision in *Pye*, where it was held that the extinguishment of freehold title by operation of statute[5] was simply an exercise of rules which governed the regulation of land use, and therefore fell within the third rule of "control of use" (a point on which both the majority and dissent were in agreement).

2.2.2 The "justification" question

Any interference with the rights protected by A1P1 must be justified. In *Stretch*, the ECtHR explained:

> According to the Court's well-established case law, an interference must strike a "fair balance" between the demands of the general interests of the community and the requirements of the individual's fundamental rights … .[6]

There are two connected issues here. First, any deprivation must be in the public interest; legislative measures which effect an interference with possessions must be subject to conditions provided for by law and pursue a legitimate aim. Secondly, the interference must strike a "fair balance" between the interests of the community and individual rights. In substance this amounts to a proportionality analysis: the means employed must be proportionate to the aims pursued and not impose an excessive burden on one individual.

Webber (Transport) Ltd v Railtrack Plc [2003] EWCA Civ 1167, [2004] 1 WLR 320 and *Pennycook v Shaws (EAL) Ltd* [2004] EWCA Civ 100, [2004] Ch 296 appears closer to Lord Nicholls' view (although there are difficulties reconciling the cases with either analysis – see T Allen, *Property and the Human Rights Act 1998* (Hart Publishing 2005) pp 236-237).

[1] This conclusion is consistent with *Pennycook v Shaws (EAL) Ltd* [2004] EWCA Civ 100, [2004] Ch 296, where the operation of a statute to extinguish a statutory right to renew was classified by the Court of Appeal as a deprivation of possessions.

[2] Although it has followed the Strasbourg jurisprudence in treating adverse possession as a "control of use", following *JA Pye (Oxford) Ltd v United Kingdom* (2008) 46 EHRR 45.

[3] *Grape Bay Ltd v Attorney-General of Bermuda* [2000] 1 WLR 574, 583 (PC).

[4] See *Pennycook* (n 32) above.

[5] Limitation Act 1980, s 17.

[6] (2004) 38 EHRR 12 [37].

Of relevance to the "fair balance" inquiry is the provision of compensation: A1P1 has been read to implicitly require the payment of compensation to render lawful a "deprivation of possessions" under the second rule.[1] The presence of procedural safeguards are also relevant: the ECtHR has stated that A1P1 requires that the individual must be given reasonable opportunity to put their case forward, "for the purpose of *effectively challenging* the measures interfering with the rights guaranteed …".[2]

The mandatory nature of Ground 8, which means that the tenant cannot challenge possession except on procedural grounds, is important in this context. Similarly, as the termination of a shared ownership lease may invoke the second rule of A1P1 (a deprivation of possessions), the absence of any compensation means that to grant possession, and thereby terminate the lease, is likely to be found disproportionate. Even if termination of the lease were to be categorised as falling under the third rule, this conclusion is supported by the obiter remarks at the High Court stage[3] of the *Di Palma* case:[4]

> The landlord has received all the rent and service charge due to it. It can be compensated for any additional expense to which it has been put by her behaviour. What factor in the history of the case can justify a result by which, in addition, the landlord recovers, and she loses an asset worth, on her view, £30,000 and on any view many thousands of pounds?
>
> I regard such a loss as a wholly disproportionate penalty for her to suffer for her delayed payment of the judgment debt and, in effect, for her inability to take reasonable steps to protect and preserve her asset.[5]

Where the heart of the proportionality argument is that the shared owner should not lose the investment value of the property, it may be appropriate to delay possession in order to give the shared owner time to sell the property. Lord Neuberger in *Pinnock* said:

> … if domestic law justifies an outright order for possession, the effect of article 8 may, albeit in exceptional cases, justify (in ascending order of effect) granting an extended period for possession, suspending the order for possession on the happening of an event, or even refusing an order altogether.[6]

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[1] See *James v United Kingdom* (1986) 8 EHRR 123 [54].
[2] *Jokela v Finland* (2003) 37 EHRR 26 [45] (emphasis added).
[3] *Di Palma v Victoria Square Property Co Ltd* [1984] Ch 346 (Ch). See also *Di Palma v United Kingdom* (1988) 10 EHRR 149. The European Commission of Human Rights found there to be no violation of A1P1, placing considerable weight upon the fact that what had happened was not the result of the state interference but resulted from the private law relationship between landlord and tenant. In this case, there was a particular problem because the tenant had been unable to claim relief from forfeiture due to the limited jurisdiction of the county court (which has since been increased). Although this might appear to flow against the argument being made in this paper it is easily distinguishable from the shared ownership lease under discussion; first, the act of termination was, in *Di Palma*, based on the common law right to forfeit and not a statutory ground for termination; secondly, the landlord was a private individual, not a public authority; and thirdly, human rights law has developed considerably in the intervening years.
[4] In *Di Palma* a long lease was forfeit because the leaseholder had failed (because she was in a dispute with the landlord) to pay the service charge, amounting to £299.36, together with a bailiff's fee of £15. The flat, at the time of forfeiture, was worth around £30,000. The leaseholder later paid the sum into court and applied for relief against forfeiture.
[5] [1984] Ch 346 (Ch) 361-362.
[6] *Pinnock* (n 5) [62].

His Lordship also noted[1] that this may require certain statutory provisions to be revisited, referring to section 89 of the Housing Act 1980. Section 89 limits the period for which a possession order can be postponed to 14 days, but in cases of "exceptional hardship" can be extended to six weeks. In *Powell* Lord Hope said it is not possible to read down section 89 to extend this period but that as no evidence had been given to show that six weeks was insufficient to meet cases of exceptional hardship, he declined to make a declaration of incompatibility.[2] When discussing section 89, Lord Phillips noted that the effect of the strict section 89 time limit may "in rare cases" cause a judge to refuse possession when it would otherwise have been granted with a longer postponement.[3]

Given that more than a six week delay will be needed in order to give the tenant of a shared ownership property time to sell, the effect of section 89 is that the court will need to refuse possession (or issue a declaration of incompatibility under section 4 of the HRA 1998, although this route was rejected by Lord Phillips in *Powell*).

Of course, if the effect of the argument is to prevent possession at all this will mean that the housing association is stuck with an occupier who is not paying her dues. It may be that a time will come in which a court would say that the tenant has had their chance and it is now proportionate to order possession, or that legislative change was needed to deal with this problem.

2.3 Judicial Review

In *Kay v Lambeth London Borough Council*,[4] Lord Hope explained the grounds on which a tenant could challenge a possession order. These were formally known as Gateways (a) and (b); the former a challenge to the law under human rights law; the latter a challenge using judicial review. The availability of these Grounds was confirmed in subsequent cases, such as *Doherty v Birmingham City Council*.[5]

The recent case of *Pinnock*, whilst focusing upon the availability of a direct proportionality challenge under Article 8 (formerly Gateway (a)), also reaffirmed the availability of public law defences. Lord Neuberger said:

> … where a tenant contends that the decision of a local authority landlord to issue, or indeed to continue, possession proceedings can in some way be impugned, the tenant should be entitled to raise that contention in the possession proceedings themselves, even if they are in the County Court.[6]

This allows tenants to raise in the county court challenges to possession on grounds of judicial review that would otherwise be brought in the Administrative Court (provided, of course, that the body seeking possession is amenable to judicial review). These points were affirmed in *Powell*, where it was stated that a public law defence in the county court could challenge any prior decision on which the possession claim was founded

[1] *Pinnock* (n 5) [63].
[2] *Powell* (n 13) [64].
[3] *Powell* (n 13) [103].
[4] [2006] UKHL 10, [2006] 2 AC 465.
[5] [2008] UKHL 57, [2009] 1 AC 367.
[6] *Pinnock* (n 5) [81].

(for example, the decision to serve a notice to quit) as well as the decision to bring possession proceedings.[1]

Judicial review in this context will generally only involve a rationality inquiry under the test of *Wednesbury unreasonableness*[2] but in *Kay and Doherty*, this ground of review was expanded to what was dubbed *Wednesbury plus*.

Wednesbury plus is wider than traditional *Wednesbury* grounds; whereas the traditional approach asks whether the decision at issue was "one which no reasonable person would have made", Lord Hope in *Doherty* stated that the considerations that can now be taken into account are wider and include, for example, longevity of occupation.[3] It seems unlikely that, following *Pinnock* (where compliance with Article 8 was reached via the Gateway (a) approach), the intensity of review would drop back down from *Wednesbury plus* to conventional *Wednesbury* rationality; as Toulson LJ noted in *Doran*, that development in intensity of review was based on general public law principles rather than on the Convention rights.[4]

However, *Pinnock* and *Powell* also emphasise the focus of the judicial review; open for challenge is the *decision-making* process, rather than the specific factual circumstances of the claim which are dealt with by a proportionality inquiry (if an Article 8 or similar defence is also put forward). This makes the potential for challenge under judicial review limited in scope, and as a result any public law defence to a possession proceeding will almost inevitably play second fiddle to challenges based on Convention rights of the type discussed above.

3 Recouping the investment value

The above arguments proceeded on the assumption that the tenant is able to defend the possession claim and thus protect the "use value" of the property, at least long enough to enable her to attempt a sale of the property.[5] Once the lease has been terminated, and the shared owner has lost the home, is there any way in which the "wrong can be righted" by enabling her to recover the "investment value"?

Intuitively it would seem that the tenant should be able to recover his or her "share" of the property under private law principles. But in *Richardson* the tenant was not able to. The fact that Miss Richardson had bargained for and received a lease presents a significant obstacle to arguments for the creation of additional and informal rights through a trust or estoppel. In the case, the arguments advanced focused on attempts to establish a trust arising in favour of Miss Richardson simultaneously to the grant of the lease. A suggestion that the lease may have been held on trust was withdrawn "under judicial pressure"[6] while a claim to a trust of the freehold failed. HH Judge Gaunt QC explained, "the relationship of the housing association and Miss Richardson was that of landlord and tenant, not that of trustee and beneficiary".[7] Bright and Hopkins have shown that an alternative argument, that new rights in the freehold may arise in favour

[1] *Powell* (n 13) [42]. See J Luba and others, 'Defending Possession Proceedings' (2011) Legal Action Group (Online Update), 3, <http://www.lag.org.uk/files/93674/FileName/DPP7onlineupdateforweb.pdf> accessed 4 August 2011.
[2] *Associated Provincial Picture Houses v Wednesbury Corporation* [1948] 1 KB 223 (CA).
[3] *Doherty v Birmingham City Council* [2008] UKHL 57, [2009] 1 AC 367 [55].
[4] See *Liverpool City Council v Doran* [2009] EWCA Civ 146, [2009] 1 WLR 2365 [50].
[5] See (n 4) above.
[6] *Richardson v Midland Heart* [2008] L & TR 31 [11].
[7] Ibid.

of the shared owner at the time the lease is repossessed, is also unlikely to succeed.[1] The shared owner has made no contribution to the acquisition of the freehold to form the basis of a resulting trust, while the express grant of a lease appears to rule out arguments for a constructive trust based either on a "common intention" or on the failure of an informal "joint venture" to provide a home for the purchaser. A claim to proprietary estoppel meets the evidential difficulty of establishing an assurance of property rights other than the lease.

Therefore, this paper turns once more to arguments of human rights and public law.

3.1 A1P1

For reasons canvassed above, it is arguable that termination of the lease constitutes a breach of A1P1. Therefore, the former tenant should be entitled to a remedy.

Section 8(1) of the HRA 1998 gives broad powers to the courts to (in relation to any act which would be unlawful) award "such relief or remedy, or make such order, within its powers as it considers just and appropriate". Whilst Section 8(1) does not refer to the ECtHR jurisprudence directly, domestic courts have nevertheless taken it into account, reflecting the approach taken to damages under the HRA 1998.

3.1.1 Damages under the HRA 1998

The current leading case is *R (Greenfield) v Secretary of State for the Home Department*,[2] where a unanimous appellate committee of the House of Lords held that domestic courts were *not* free to depart from the scale of damages applied by the ECtHR (the argument was run that the courts could use domestic comparators in awarding damages). Section 8(4) of the HRA 1998, which obliges domestic courts to take into account the principles applied by the ECtHR in relation to the award of compensation under Article 41 of the Convention, was drawn upon to support this conclusion.

Therefore, domestic courts now operate a "mirror" approach to assessing damages under the HRA 1998; English courts have sought to ensure that the domestic jurisprudence reflects the approach taken by the ECtHR in terms of how the discretion to award damages is to be exercised, and the scales of damages applied.

This decision is unpopular. The Law Commissions of England and Wales and Scotland have recommended that principles of tort law should be drawn upon when awarding damages.[3] Many agree; mainly on the basis that the ECtHR jurisprudence in this area suffers from severe deficiencies.[4] Aside from some basic principles, the approach of the court lacks consistency, coherence, and principle. The court often gives little or no guidance as to the basis on which compensation has been awarded, other than typically saying it has proceeded on an "equitable basis". Nevertheless, it continues to reflect the present approach of domestic courts.

[1] S Bright and N Hopkins, 'Richardson v Midland Heart Ltd: low cost home ownership – legal issue of the shared ownership lease' [2009] Conv 337.
[2] [2005] UKHL 14, [2005] 1 WLR 673.
[3] Law Commission and Scottish Law Commission, *Damages Under the Human Rights Act 1998* (Law Com No 266/Scot Law Com No 180, 2000)
[4] See J Varuhas, 'A Tort-Based Approach to Damages under the Human Rights Act 1998' (2009) 72 MLR 750.

3.1.2 The approach to remedies of the ECtHR

Article 41 of the ECHR (introduced by the Eleventh Protocol to replace Article 50) reads:

> If the Court finds that there has been a violation of the Convention or the protocols thereto, and if the internal law of the High Contracting Parties allows only partial reparation to be made, the Court shall, if necessary, afford just satisfaction to the injured party.

The standard remedy for a violation of Convention rights is a declaration or a finding to that effect. However, in recent years the court has taken a more interventionist approach.

For example, compensation is a discretionary remedy available to the ECtHR, which the court has in recent years began to exercise with (relatively) increased frequency. The Law Commissions' report[1] distilled from the court's jurisprudence the following factors which are taken into consideration when deciding whether to award compensation:

- The other measures taken by the public authority in remedying in the breach
- Whether a finding of a breach can constitute "just satisfaction" without the need for compensation
- Whether the loss suffered is sufficient to render an award necessary
- The seriousness of the violation
- The conduct of the respondent
- The conduct of the applicant

The principle of compensation is *restitutio in integrum* – Article 41 strives to ensure that the claimant is (so far as possible) put back into the situation in which he or she would have been had the violation not occurred.

However, in *Brumarescu v Romania*[2] the Grand Chamber ordered a restitutionary remedy instead of compensation. That case was similar in nature to *Papamichalopoulos v Greece;*[3] the court had previously found that the state's nationalisation of the applicant's house constituted a violation of A1P1 and Article 6; the state had failed to remedy the situation, so the court ordered the house in issue (and the land on which it was situated) to be returned to the applicant (and, failing that, compensation representing the current market value of the house):

> The Contracting States that are parties to a case are in principle free to choose the means whereby they will comply with a judgment in which the Court has found a breach. This discretion as to the manner of the execution of a judgment reflects the freedom of choice attaching to the primary obligation of the Contracting State under the Convention to secure the rights and freedoms guaranteed (Article 1). *If the nature of the breach allows restitutio in integrum, it is for the respondent state to effect it.* If, on the other hand, national law does not allow – or allows only partial – reparation to be made for the consequences of the breach, Article 41

[1] See (n 59) above.
[2] (2001) 33 EHRR 36.
[3] (1996) 21 EHRR 439. The court ordered the respondent to return property taken from the applicant in violation of A1P1, where the respondent state had failed to abide by the courts earlier order to pay compensation.

> empowers the court to afford the injured party such satisfaction as appears to it to be appropriate.[1]

3.1.3 Application to the shared ownership scenario

In the scenario where a tenant has failed to defend the possession proceedings and therefore lost their home, in breach of A1P1, the remedy sought would mostly likely be damages to compensate for the loss of the investment value of the home.

Section 8(3) HRA 1998 provides that damages can only be awarded if, after consideration of:

> (a) any other relief or remedy granted, or order made, in relation to the act in question (by that or any other court), and
> (b) the consequences of any decision (of that or any other court) in respect of that act,

the court is satisfied that the award is *necessary* to afford *just satisfaction* to the person in whose favour it is made.

However following Section 8(4) HRA 1998 and *Greenfield*, domestic courts draw heavily upon ECtHR principles when assessing whether to make an award for damages (and if so, to what amount). Unfortunately the ECtHR jurisprudence is not at all helpful in this area. Looking at the factors cited by the Law Commissions in their joint Report, the most relevant in the shared ownership context would appear to be the nature of the loss suffered (whether sufficient to render an award necessary) and the seriousness of the violation (which, again, could draw upon the disproportion between the amount of the rent arrears and the value of the property). Furthermore, the principle of *restitutio in integrum* requires to be ascertained what the position of the tenant would be had the violation not occurred. This would seem to allow an award for the tenant's share of the market value of the property, less arrears owed to the housing association.[2]

3.2 Public law: legitimate expectations

In English public law a legitimate expectation is a device used to prevent public authorities from defeating, without good reason, expectations they have created in citizens of procedural or substantive rights. So-stated, the doctrine has clear parallels with private law estoppel, but the courts are keen to cut the Gordian knot between the doctrines. In *R (Reprotech) v East Sussex County Council*, Lord Hoffmann said:

> It seems to me that in this area, public law has already absorbed whatever is useful from the moral values which underlie the private law concept of estoppel and the time has come for [legitimate expectation] to stand upon its own two feet.[3]

Public law legitimate expectations and private law estoppel differ in their rationale, focus, and the relief available. Estoppel prevents the defendant acting "unconscionably" by reneging on a promise of rights judged against the individual circumstances of the case. Once estoppel is found the court has remedial discretion guided by the "minimum equity to do justice" or by what is necessary to counter the unconscionable conduct.

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[1] (1996) 21 EHRR 439 [20] (emphasis added).
[2] This also seems to follow the award in *Brumarescu* (n 62) above.
[3] [2002] UKHL 8, [2003] 1 WLR 348 [35].

In contrast, the doctrine of legitimate expectations aims to prevent an abuse of public power by the defendant and balances the individual's expectations against the wider public interest. A legitimate expectation that has been generated can be defeated, but only where it is proportionate for the public authority to do so having regard to a legitimate aim pursued in the public interest. The remedies available are those of public law (for example, quashing the decision). It is not generally a route to financial compensation. Damages are generally only available in judicial proceedings where they could have been claimed in private law at the time the judicial was sought;[1] or a private law claim may arise following a successful judicial review (for example, where the effect of finding a public authority's conduct unlawful is that a tort has been committed).

A potential claim under legitimate expectations would require a tenant to demonstrate that a public authority generated a legitimate expectation which is then defeated. One possible avenue to establish the expectation is through the shared ownership literature, which advertises the "*normal rights and responsibilities of a full owner-occupier*". The argument could then run that this was expectation was then defeated by the loss of the home and the consequent loss of the investment value, which clearly illustrate that the tenant did not have the "normal rights and responsibilities" of a true owner. Potentially, this could be used to quash the decision to use Ground 8 as opposed to seeking forfeiture of the lease for non-payment of rent. However, as noted above, Bright and Hopkins have doubted that Miss Richardson would be able to mount a private law claim to estoppel to establish any rights beyond the lease that would protect her investment interest.[2] In the light of this, it is improbable that a legitimate expectation claim would succeed, as the threshold for generating an expectation is higher than that for an assurance of rights for estoppel. In *Weaver* the court noted that there must be a "clear, unambiguous and unqualified promise";[3] compared to the requirement in estoppel of a "clear and unequivocal" assurance.[4]

If a legitimate expectation was established, the issue would then become one of proportionality, akin to the ECHR arguments discussed above. The question would be whether the housing association acted to pursue a legitimate aim in a manner that is proportionate, balancing the defeat of the tenant's expectations against the wider public interest.

Assuming judicial review is brought before possession has been obtained, a successful claim under legitimate expectations could result in the decision to use Ground 8 being quashed, leaving the housing association to make the decision as to how to proceed against the tenant again. As noted above, it would not provide a route to damages. If proceedings were bought after Ground 8 had been exercised, and the decision to use Ground 8 was the quashed, this would mean that the housing association's possession of the property would constitute a trespass for which damages may be available.

3.3 Public law: Ombudsmen

Public sector ombudsmen have been described by the Law Commission as "a vital 'pillar' of administrative justice"[5] playing a distinct role from that of courts and

[1] Senior Courts Act 1981, s 31(4).
[2] *Bright and Hopkins* (n 57) above.
[3] *R (Weaver) v London and Quadrant Housing Trust* [2008] EWHC 1377 (Admin), [2009] 1 All ER 17 [87].
[4] *Thorner v Major* [2009] UKHL 18, [2009] 1 WLR 776.
[5] Law Commission, *Administrative Redress: Public Bodies and the Citizen* (Law Com No 322, 2010) para 5.2.

tribunals. In addition to investigating individual complaints, public service ombudsmen "are in a privileged position to address systematic failures that occur across the administrative landscape".[1] If *Richardson* represents the "right" outcome as a matter of law, then does there remain an "injustice" of the sort an ombudsman could investigate? The role of two ombudsmen falls for consideration.

3.3.1 Independent Housing Ombudsman Service

The Independent Housing Ombudsman Service (IHOS) was created by section 51 and schedule 2 to the Housing Act 1996. Membership is compulsory for social landlords (including housing associations that are registered providers of social housing) with voluntary membership for private landlords. The IHOS has a broad jurisdiction to settle disputes, even where no maladministration is found. The role of the IHOS is thus explained in broad terms, as being to determine complaints "by reference to what is, in his opinion, fair in all the circumstances of the case".[2] The IHOS has no jurisdiction where the complaint "[concerns] matters where proceedings have been issued or they have already been taken to a court or tribunal, *where a complainant will have or has had an opportunity to raise them in the proceedings* …" or where a complaint concerns matters "where the Ombudsman considers it quicker, fairer, more reasonable, and more effective to seek a remedy through the courts, other tribunal or procedure".[3] But the IHOS could investigate, for example, the decision to seek possession under Ground 8 and the accuracy of information provided by the housing association in respect of a shared ownership scheme, as neither of these matters would be raised in Ground 8 proceedings themselves.

3.3.2 The Parliamentary Ombudsman

The parliamentary ombudsman provides redress where maladministration has led to injustice. Neither of these terms is defined by the legislation. The government funding for LCHO schemes, set in its broader policy context as a means by which the government promotes home ownership, raises the question of public accountability for the failure of schemes to deliver the policy promise. But it is questionable whether this can be said to constitute "maladministration". "Injustice" may be found not only on the part of buyers who, like Miss Richardson, have suffered quantifiable financial loss, but more generally by those who discover that they have not got the "normal rights and responsibilities" of home ownership that they were promised.

But there may be doubts as to whether the ombudsman is the appropriate forum in which to seek redress in these cases.[4] In particular, as we have shown in this paper, it may be questioned whether the legal issues have yet to be sufficiently resolved.

[1] Law Commission, *Public Service Ombudsmen* (Law Com CP No 196, 2010) para 2.50. The Commission's final report on public service ombudsmen was published on 14 July 2011; see Law Com No 329, 2011.
[2] Housing Act 1996, sch 2 para 7(1).
[3] Independent Housing Ombudsman Approved scheme, paras 16(e) and (f) – see: <http://www.housing-ombudsman.org.uk/downloads/HOS_Scheme.pdf> accessed 4 August 2011)
[4] To date (4 August 2011) the Ombudsman Case Digest reports only 5 decisions in which the tenure is described as "shared owner". These complaints deal with defects and repairs to property, management of a parking scheme and the valuation used to determine the rent payable, rather than any broader questions arising from the position of the shared owner – see: <http://www.housemark.co.uk/hmkb2.nsf/cdhp?openform> accessed 4 August 2011).

4 Conclusions

This paper has sought to sketch out the arguments available to a tenant facing possession proceedings against his or her shared ownership lease brought under Ground 8. As should now be clear, this is an area of law where there are almost as many questions as there are answers; each of the arguments under Article 8 and A1P1 offer intriguing hurdles to be surmounted – the meaning of "home" under Article 8; the nature of "deprivation of possessions" and "control of use" of property; the provision of damages under the HRA 1998 and Convention case law. This paper has not attempted to offer a definitive solution to these problems. Indeed, it may be years before these emerge from the jurisprudence of the national and European courts. Nevertheless, there is something intuitively wrong with the draconian consequences of the exercise of Ground 8 on shared owners: people (whose housing prospects are weak by definition) losing not just their home, but also their investment as the "ownership dream" turns into a nightmare. It is hoped that human right law provides the means to right this wrong.

Legal Education in Property & Construction

Construction law on built environment higher education programmes: what should be taught? How should it be taught?

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Abstract:
References to the increasingly litigious nature of UK society are prevalent in the journals and magazines directed at the industries and professions associated with the built environment disciplines. Employers of graduates of those disciplines expect those graduates to have the necessary underpinning knowledge to ensure that their practices avoid formal dispute resolution with its inherent cost and expense. The purposes of this paper are to report on an element of a longitudinal study of methods utilised for teaching Construction Law on higher education programmes in the built environment discipline and to highlight and discuss issues arising from the study with a view to educational enhancement. The content of the paper will draw on current prescriptions from the literature relating to perspectives on pedagogy and practice and will critically compare the rationales for curriculum content and teaching practices across different built environment programmes from two UK universities using data from academic tutors and complementary data from small samples of students. The findings of the study will confirm different but sound rationales for curriculum content and will illustrate a variety of teaching methods used for construction law education. The conclusions of the study generated for this paper are indicative and intended for further discussion at the conference to inform curriculum design.

Keywords:
construction, law, curriculum, design, pedagogy

1 Introduction

Our attention is drawn regularly by the press and the media to the litigious nature of UK society. The construction industry has long suffered from a reputation for being susceptible to disputes in the management of the construction project. Journals, magazines and newsletters associated with the built environment and construction regularly report on matters relating to construction management disputes. A search of the internet using one of the search engines produces a wide-range of sources addressing the issue. Historically, economic recession tends to increase the amount of disputes in the construction industry. A future historical study of the association of disputes in the construction industry and impact of the current recession would be informative. Construction contracts and contractual arrangements have been at the hub of contractual disputes. Construction contracts have, in recent years, been utilised as management tools to aid the smooth management of the construction contract. Recent

developments in standard form contracts such as those in the NEC3 and JCT suites of contract have focussed on dictating practices, procedures and, indeed, attitudes and behaviours that aim for smooth running of the contract with an emphasis on the avoidance of formal disputes. Higher education courses in the built environment disciplines have a duty to ensure that graduates are sufficiently equipped with the necessary knowledge, understanding, skills and attributes to add value in the workplace. Employers of graduates of those disciplines expect those graduates to have the necessary underpinning knowledge and attributes to ensure that their practices avoid formal dispute resolution with its inherent cost and expense. Accelerating Change (2002), a report by the Strategic Forum for Construction, stated that (p 10): "*Our vision is for the UK construction industry to maximise value for all clients, end users and stakeholders and exceed their expectations through the consistent delivery of world class products and services*". The report went on to say (p 11) "*This vision needs to be supported by an education and training process that incorporates best practice and a systematic approach to continuing professional and personal development*". This vision, with its emphasis on support through continuing and personal development endures as an appropriate context for the construction law curriculum that ultimately contributes to successful construction and project management. The purposes of this paper are to report on an element of a longitudinal study of methods utilised for teaching Construction Law on higher education programmes in the built environment discipline and to highlight and discuss issues arising from the study with a view to educational enhancement.

2 The Built Environment Discipline?

Discipline is defined by the *Oxford English Dictionary* as "a branch of learning or scholarly instruction." It is contended that the modules that make up a course in the built environment discipline are disciplines in their own right. It was hypothesised for the research design for this paper that the learning of Construction Law may be hindered by the mindset and expectations of students because, in the context of discipline, it differs from the rest of the curriculum of the course in which it resides. The courses associated with the built environment have an express or implied practical association. Construction law is founded in the regulation of human behaviour. Law is a discipline that is different. It is textual in format, necessitating the establishment and communication to students of context to focus their thinking by teaching methods that are different, particularly from those more practically oriented subjects such as construction technology, land surveying and laboratory experimentation. The conundrum is to conceive the optimal teaching, learning and assessment regime that best suits the learning styles of the various students that study built environment courses.

2.1 Disciplinary Differences

Kolb (1981) used his original Learning Style Inventory to collect data (the Learning Style Inventory has undergone significant revisions). The Learning Style Inventory consists of a psychometric test used to determine students' learning styles. From this data, Kolb came to an important conclusion that different subjects were related to different styles of learning. Biglan (1973a) devised a conceptual framework to guide the systematic investigation of diversity in the activities and attitudes of academics. He devised a three-dimensional model which contains eight mutually exclusive clusters of subject matter areas, i.e. academic disciplines. The three dimensions of the model are:

1. The degree to which a clearly delineated paradigm exists; referred to as 'hard' versus 'soft' areas,
2. The extent of concern with the practical application of the subject matter; referred to as 'pure' versus 'applied', and
3. The level of involvement with living or organic objects of study; referred to as 'life system' versus 'nonlife system'.

The model is shown in Table 3:

Table 3: Clustering of Academic Task Areas in Three Dimensions
(From Biglan 1973 – Law added by this author)

Task Area	Hard		Soft	
	Nonlife System	Life System	Nonlife System	Life System
Pure	Astronomy Chemistry Geology Math Physics	Botany Entomology Microbiology Physiology Zoology	English History Philosophy Communications	Anthropology Political Science Psychology Sociology
Applied	Ceramic Engineering Civil Engineering Computer Science Mechanical Engineering	Agronomy Dairy Science Horticulture Agricultural Economics	Accounting Finance Economics LAW	Educational Administration and Supervision Secondary and Continuing Education Special Education Vocational and Technical Education.

The dimensions of hard/soft and pure/applied are to be represented as continuums as opposed to bounded categories; i.e. as Becher (1989, p155) describes:

> "*Along the hard/soft dimension, physics chemistry, pharmacy and mathematics are predominantly hard; biology and mechanical engineering less evidently so. Economics and geography may be classed as borderline disciplines on the other side of the divide; history, modern languages, sociology and law lie firmly at the soft end of the scale…*"

The model has been used as a basis for subsequent important studies on disciplinary differences as applied to a variety of research projects by different researchers. The validity of the model and of its three dimensions has, over the years, been substantiated and extended by subsequent studies; e.g. Smart and Elton, (1975; 1982); Smart and

McLoughlin, (1978), Stoeker, J.L. (1993) and Hativa and Marincovitch (1995). Smart and Elton (1982) set out to validate Biglan's model and their study supported the empirical validity of the model and also provided examples 'to illustrate how the systematic use of the model could enhance the quality of research on university faculty (*sic*) members and the academic administration of institutions of higher learning'.

3 Research Design and Methodology

The research design took into consideration this underlying hypothesis that construction law may be different as a discipline. Data was collected from two UK universities. The rationale for the use of two universities is set out below. A questionnaire was prepared to find out from students what they thought about construction law, its relevance, the students' approaches to learning construction law and their thoughts on assessment. The questionnaire was distributed to students, willing to participate, in the classroom setting with provision to discuss and explain any matters arising from the questionnaire. The questionnaire, that predominantly requested short, quantitative and qualitative responses, was completed by students as set out in Table1 and Table 2 below.

Table 1: Students Completing Questionnaire; Institution A

Course	Year	Level	No of Students
Quantity Surveying	1	u/g	15
Building Surveying	1	u/g	15
Construction Engineering and Management	2	u/g	15
Architectural Technology	2	u/g	35
Construction and Project Management		MSc	11

Table 2: Students Completing Questionnaire; Institution B

Course	Year	No of Students
Building Surveying	1	18
Construction Management	1	10
Env Building Construction	1	20
Building Surveying	2	9
Construction Management	2	6
Architectural Technology	2	4

Focus group interviews with groups of three students were held with year 2 students in each university to probe further into their opinions, attitudes and behaviour in relation to the teaching, learning and assessment regime for construction law. In addition, an unstructured interview was conducted with one final year student who was just completing a final year dissertation on construction law. Semi-structured interviews were conducted with the tutors of construction law from each institution.

3.1 Rationale for the Use of Two Universities; Organisational Differences

> "*Every organized human activity ... gives rise to two fundamental and opposing requirements: the division of labor into various tasks to be performed and the coordination of those tasks to accomplish the activity*". (Mintzberg, 1989).

Porter (2006) highlighted the role that institutional structures and cultures play in how students engage with their studies. Organisations differ by the structures and methods used to accommodate these requirements. Organisational differences can influence student behaviour and learning patterns. Although universities superficially have identical objectives, as organisations, they can differ significantly. The context of the university, the formal and informal structures, the lines of authority and the relative emphasis on key activities, impact on the degree to which objectives are attained. Universities, although subject to government policy and control and, to a large extent, with similar stakeholder interests, are, nevertheless, independent organisations with their own individual management structures and cultures. This study used an institutional comparison in the research to determine if there were any obvious, discernible differences in academics' practices student approaches, behaviour and attitudes in relation to teaching learning and assessment of the construction law curriculum that were due to institutional differences. In order to assess the influence of institutional differences on academics' views of their assessment practices, the sample was selected from two different institutions: University A and University B. Both universities were former polytechnics and were each formed by the amalgamation of the polytechnic with other institutions. The ideology and ethos of an organisation diffuses throughout the organization and guides processes, procedures and behaviour. For example, Twale and Place (2005) asserted that:

> *"(I)deology includes mission, philosophy, and core values including vision statements, goals and objectives, and prevailing philosophy… (T)he more clearly defined the ethos, the easier it is to translate it into meaningful purposes for constituents to follow (e.g., Twale & Schaller, 2002)…".*

The vision of university A is "to be a university with a national and international reputation for excellence, innovation and regional engagement". One of its five core strategic aims is to "provide excellent learning opportunities that are student centred and client focused". The core values, set out the Corporate Plan, include:

- See all students and members of staff as individuals with their own needs;
- Provide quality learning and development for students and staff;
- Be creative and adapt to the challenges of change.

The vision of University B is: "to be the enterprise university" It states: "Our vision sets out the type of University we aspire to be. We are already an ambitious, world-class University. By placing enterprise at the heart of everything we do, we will develop an innovative and creative culture that empowers people". University B also asserts that: "Our core values define our University culture. They guide how we make our decisions, and how our staff, students and stakeholders work with each other. These core values include:

- Transforming lives through knowledge, collaboration and partnership.
- Providing access to research-informed teaching and learning to all who can benefit.

- Championing innovation, entrepreneurship and creativity.
- Pursuing excellence in all that we do.

The structure of the two universities in this study, like other UK universities, are organised around disciplines. Such organisational structure creates fragmentation and compartmentalisation because the disciplines form divisions. The discipline-based approach narrows the focus of the educational régime. The introduction modularisation and semesterisation in UK universities brought with it many educational challenges. The university course is now sub-divided into independent units of study taken over, mainly, one semester of twelve teaching weeks. The credit framework and the individual institutional regulations on the structure of modules and their assessment impact directly on teaching and learning practices. The point being argued in this section is that institutional ethos, emphasis, policies and strategies can directly influence the teaching, learning and assessment régime, the attitudes, emphasis and behaviours of tutors and, ultimately, student behaviour and attitudes. The regulatory framework of the institution should not stifle innovative teaching practices.

4 Engaging Learning

David Boud (2011), giving an address at a teaching and learning event, asserted that time spent on a task by students had a proportionate positive impact on their learning and understanding of the subject matter associated with the task. The timetabling for incorporating the curriculum design, delivering the content and using appropriate teaching practices are governed, to a degree, by such regulations. Umbach & Wawrzynski, (2005) stated that students report higher levels of engagement and learning at institutions where faculty members use active and collaborative learning techniques and engage students. They further stated (p173) that "faculty staff do matter. The educational context created by faculty behaviours and attitudes has a dramatic effect on student learning and student engagement." Graham *et al* (2007) stated that "a diverse body of educational research has shown that academic achievement is positively influenced by the amount of active participation in the learning process." Taking account of this research, McKeever and McNamee (2011) conducted a pilot study with first-year law students in which they adopted an educational approach in one module that was designed to encourage student engagement and active participation in the learning process. The teaching method employed the use of films, guest speakers and reports and documentaries. Films were chosen to both demonstrate the various workings of the legal system and to encourage debate in the wider context. Guest speakers were used to give different perspectives on current issues and to introduce a level of controversy. Reports and documentaries were introduced to act as a focus for debate and small group discussion. The evaluation by students and tutors was positive on the whole. For the purposes of this paper, two key points stand out:

1. the active, interested participation of students as a result of the creation and maintenance of a stimulating intellectual environment, and
2. the connection with practice.

5 Data Analysis, Findings and Discussion

The analysis of the data used three preset categories: practice; discipline and institution/organisation. Hypotheses and theories emerged from the qualitative data set while the data collection was in progress and after data analysis started. These

hypotheses and theories were pursued. Despite differing visions and core values, the impact of the institution as an organisation on the teaching practices and the curriculum content was not a significantly, discernible different factor. The organisation did impact on the teaching, learning and assessment regime in both institutions, but in similar ways. It is further suggested that the issues, values, beliefs, processes and procedures are not confined to construction law or, indeed, the built environment disciplines. It may not be confined to UK universities. Evidence from Williams, Sher and Simmons (2010) indicates that construction education in Australia faces issues and challenges very similar to those encountered in this research. They further identified (p108) marked changes in the attitudes and behaviours of cohorts, current at the time of their research, largely designated as 'Generation Y' students, i.e. born between 1978 – 1994, characterised by factors such as: absenteeism; being easily distracted by technology; not listening to or learning from lectures; expecting to be 'spoon-fed'; seeing education as a commodity; not valuing knowledge; being motivated to learn to earn money rather than to gain knowledge; wanting to be entertained; being computer orientated; wanting to do the 'bare minimum'; and, wanting to complete their degree quickly so they could start work. These same characteristics were apparent in the formal and informal discussions with tutors from both institutions in this study.

5.1 Matters attributable to the organisation and to discipline.

The semi-structured interviews with construction law tutors revealed some common matters attributable to the organisation or 'the system' as was the more often used term. Three particular issues are notable. The first related to the relative importance of the subject as compared to other subjects as perceived by 'the system'. References were made to 'mainstream' subjects. Tutor 'S' in institution B experienced a pronounced difference when construction moved from an Engineering Faculty to a faculty of Arts. In the Faculty of Engineering, 'S' found that construction law was considered as 'not mainstream' and not thought important enough to attract or deserve extra resources for trying out new approaches such as additional tutorials. Now in the Faculty of Arts, 'S' finds that this Faculty is *"more willing to facilitate new ideas and to give resources (to a degree)"*. The second issue relates to timetabling. Both institutions found timetabling to be an issue and outwith the necessary control of the tutors directly involved. This was indicative through comments such as: *"Timetabling is an issue…"*; *"…tutor has little say…"*; *"The System calls for 'efficiency', but…"*. Timetabling and associated rooming was a matter of key concern for students. If students found that they had a lot of downtime between classes and/or only one or two classes in a day, they had a tendency to decide not to attend. The focus group discussions, the individual interview and observant participation revealed that the learning environment is a key component in student learning. Many students commented that the schools and colleges from which they transited have better learning environments than those that they subsequently encounter in university. Cramped rooms, hot/cold conditions, noise, unable to see/ hear and operating to scheduled times at which rooms had to be vacated because another class needed the room, were issues raised by the construction law students. A suggestion from the final year student in institution B pulled together expressed or implied comments from many of the students and from the tutors when he said: *"A* base room *would be great because we could share ideas, books and have posters; especially if it was properly equipped … the public spaces are too noisy and cramped…"*. The third issue related to constraints on changes by the organisation. Both institutions profess to be at the cutting edge of educational enhancements. There was a desire amongst the construction law tutors to try out different and novel techniques with students but found that the 'system' was not quickly responsive or sufficiently flexible

to accommodate changes. Tutors in both institutions found the bureaucracy associated with curriculum delivery changes to be so "*cumbersome*", "*time-consuming*" *and* "*frustrating*", with "*uncertainty*" associated with being able to introduce new techniques and /or methods that it was "*not worth the bother*".

5.2 Student Views

The first question on the questionnaire asked students: "*Do you like Construction Law?*" This question was posed to get an overall general impression of the students' affective considerations. Despite later responses to other questions that would tend to indicate a dislike for the subject, there was an almost unanimous response of 94% of students responding "yes" to the question. When asked in question 4 to rank how much they liked the subject in relation to the other subjects studied on their course, 26% ranked construction law above the mid-point and 74% ranked it below the mid-point, with 17% ranking it as the least liked and 6% as the most liked subject. The second question asked students to briefly articulate their likes and dislikes about construction law. The purpose of this question was to get an understanding of what the students thought about construction law to inform curriculum design and teaching practices. The analysis of this question suggested key common factors. There was a dominating view that they liked the relationship between what was taught to what they envisaged as being ultimately useful in practice. These views were articulated in a variety of ways; e.g.:

- "the relevance of issues brought up will help throughout work life".
- "vital to being a professional"
- "without construction law people could be taken advantage of and ripped off, + buildings would not be constructed to any certain standard".
- "having deeper understanding of Construction Law (e.g. contracts). Useful when we get practical examples in the construction industry. Also, the knowledge is useful for future opportunities".
- "…and how it relates to the construction profession".
- "example case studies."

There were several responses that incorporated the words "boring" and "dull" and phrases that suggested the same, e.g.: "… aren't of great interest…". Almost as a counterbalance, there were responses that incorporated the words "enjoy" and "like" and phrases that suggested the same. Difficulties in learning emerged with comments such as "confusing language"; "law cases difficult to interpret"; "confusing"; "heavy workload" and "hard topic to grasp".

5.3 Teaching Practices & Curriculum Content

The tutors of construction law in both institutions were enthusiastic about the subject and had a good rapport with the students. Their practices were informed by educational research and there was a clear concern for the student experience. There was a feeling that there was not the opportunity to experiment with different methods of teaching and learning and that teaching and assessment practices were constrained because of a lack of flexibility in the system and a degree of risk aversion by the institutions. Teaching practices in both institutions were influenced to a large degree by factors outwith the direct control of the tutors and imposed by the internal procedures and processes of the respective institutions. These factors included:

- Timetabling
- Learning Environment (rooms in which class contact took place)
- Numbers in the class
- The format of the class because timetabling demands require early booking of rooms, up to six months in advance in one institution, with a stipulated use; e.g. lecture or tutorial.
- Teaching methods that are dictated either expressly or inferentially because of student demands or interventions by the institution; e.g.:
    - placing lecture slides in advance of a lecture on the virtual learning environment
    - a timetable that stipulates the format of each class activity for the duration of the module.

Students demonstrated a preference for sustained, continuous periods for study. The modular timetabling was not conducive to helping them manage their learning. They found that there was a tendency for "*bunching of assignments*" with periods of little activity and periods of "*excessive activity*". Curriculum content in construction education in which construction law is embedded is guided and controlled to a significant degree by accrediting bodies such as the Royal Institution of Chartered Surveyors, and the Chartered Institute of Building. Accreditation visits include consideration of employability. Curricula have to align with their respective educational frameworks. The clear preference for students was that the context should be clear and that the curriculum content should prepare them for ultimate practice in employment. Employers of construction graduates encountered at a variety of professional for a voiced the expectation that those graduates have the necessary underpinning knowledge to ensure that their practices avoid formal dispute resolution with its inherent cost and expense. Teaching practices have to be structured to embed in students the necessary preparatory skills and attributes for employment. In both institutions, the construction law curricula were founded on the UK legal system. Whilst this aspect of the curriculum takes a generic approach in both institutions with little reference to the construction industry at this stage, tutors from both institutions observed and commented that most students found this initial aspect of the curriculum to be enlightening because it explained how one's actions and behaviours are regulated. Students seemed to be interested because they could immediately understand the relevance to real life and the context was clear. The law of contract and the law of tort were universally accepted by students in both institutions as being useful. However, in order to make these subjects clearly relevant, the connection with construction practices had to be emphasised. For example, the law established by key cases such as *Donoghue v Stevenson* in the law of tort, or *Carlill v Carbolic Smokeball Company* in the law of contract have to have explained its significance as it relates to construction. Both institutions included contractual procedures as laid down by popular standard form contracts. Both institutions adopted the approach of using practical examples based on the provisions of the NEC3 (New Engineering Contract, third edition) and the JCT (Joint Contracts Tribunal) suites of contracts. The emphasis at undergraduate level was on the JCT Standard Building Contract. The postgraduate students proposed a greater emphasis to be placed on the NEC3 suite of contracts. These postgraduate students were mainly mature, part-time students currently employed at middle to senior management positions in the industry and, essentially, wanted training in this growing field. The preferred method of teaching this aspect of the curriculum in both institutions incorporated a significant proportion of case studies that required students to offer advice on contractual situations using their interpretations of the designated construction

contract. This connection with practice seemed to motivate students, prompted questions, discussions and argument that assisted in understanding.

6 Discussion

Perhaps the universities and the departments should place more emphasis on, and devote more resources to that element of curriculum design that considers the teaching, learning and assessment regime. Whilst these elements are evidently considered in the design of courses, there appears to be more time and effort ensuring that the content of the course meets the perceived and/or actual requirements of the various stakeholders, that the documentation accords with governance and procedural matters, that a physical 'template' is followed and that there is consistency amongst the course components. Whilst these matters are certainly important ones, I would argue that the starting point of course design should be a foundation constructed on the considered impact on the student experience. Construction law is not necessarily alone in being different in the built environment course curriculum. Other subjects may occupy different areas of the Biglan model. Notwithstanding this observation, construction law should have a teaching, learning and assessment régime that is appropriate to this discipline, and one that connects seamlessly and appositely with the teaching, learning and assessment régime of the course. In addition, it may be appropriate for the institution and/or the department, and or the course, and/or the construction law module, to have an ethos, ideology or philosophy that identifies the characteristics of the associated teaching, learning and assessment régime. For example, it may be that because the understanding of construction law demands a substantial amount of reading of, and reflection on, a wide range of textual material and because information sources are readily and instantaneously available today, the associated teaching, learning and assessment régime for construction law should adopt the heuristic method of teaching by which a learner is trained to find things out for himself or herself. The outcome of such considerations should form the basis of the teaching, learning and assessment régime for construction law.

7 Conclusion

This paper reports on part of an overall study. It has not dealt with a key element of the study and that is the assessment element. It does not give definitive answers but, rather, poses questions, formulates hypotheses and suggests proposals for this conference. The evidence suggests that the built environment disciplines imply a practical orientation to students and their expectations are that the university experience will be significantly practice oriented. The evidence further suggests that students are better motivated when they are set tasks that have a clear purpose, are interesting and are linked to practice and, preferably, require activity. Curriculum design should recognise that we are dealing with students who each have their particular degree of liking for the subject; that some find it dull, boring and heavy. Relating to practice and using actual cases motivates and engages: linking the teaching, learning and assessment regime to practice will help contextualise the learning, will help students understand and will also motivate students to learn because they will be better able to see the point of the subject as it relates to practice. Case studies formulated in conjunction with practitioners, and/or based on actual scenarios work best. Tasks must be relevant and interesting. Appropriate time to be spent on a task by students should be planned, structured and accommodated so that there can be a proportionate positive impact on their learning and understanding of the subject matter associated with the task. Construction law cases offer a ready database of

easily accessible practical issues from which a variety of practice-based tasks can be formulated and structured. Such tasks can have outcomes that emphasise those transferable skills sought after by employers; for example: communication skills, presentation skills, the ability to formulate evidence–based arguments, negotiation skills and self-assessment. Each student is an individual with an individual learning style and with a bent towards a discipline. Disciplinary differences for learning should be recognised and accommodated in curriculum design for construction law. Small group tutorials of approximately 12 students help to consolidate different learning styles, provide the opportunity for students to learn from each other, allow students to recognise their own individual learning preferences *vis-à-vis* their peers and act as a forum for discussion and argument that will ultimately add to the portfolio of skills for employment. It has to be recognised that institutional ethos, emphasis, policies and strategies can directly influence the teaching, learning and assessment régime, the attitudes, emphasis and behaviours of tutors and, ultimately, student behaviour and attitudes. This can be a very positive factor. Careful articulation and communication of the mission, vision and core values of the institution can act as a pedagogic tool to be considered in curriculum design for engagement.

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Graduate Perceptions of Building Surveying Education

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Abstract:
The high referral rate of the professional body prequalification assessment process for building surveyors and other criticisms of graduates have led many to question whether building surveying education is fit for purpose. Previous research on this subject has concentrated on obtaining the views of course providers and employers. The approach adopted for this study has been an on-line survey of recent UK building surveying graduates. A 30% response rate resulted in 806 graduates undertaking the survey. Most graduates had studied a full-time undergraduate course, three quarters had gained some form of placement or work-experience during their studies, the mode of the year of graduation was 2004 and 65% of the sample work in private practice. The survey reveals concerns over non-coverage of some of the professional body's pre-qualification competencies. The most useful subjects studied by graduates were construction technology and building pathology and the least useful was economics. The top two omitted subjects from courses were contract administration and dilapidations – both core areas of work. Skills' development was weaker on postgraduate than undergraduate courses. Those designing HE building surveying courses can refer to the results of this study to ensure that their curricular remain relevant and current to the needs of industry. This study into building surveying education has been undertaken at a time when many UK universities are reviewing their course provision to ensure that they are well placed to survive the massive upheaval imposed by government funding cuts and changes in student finance. This study with its large sample size will be of assistance to those reviewing building surveying courses.

Keywords:
building surveying, curricular, education, graduates, quality

1 Introduction

Within a generation the profession of building surveying has grown from an offshoot of general practice surveying to a professional group of 28,000 members worldwide – growth that has been described as 'rapid and spectacular [and one] that pays tribute to the increasing importance of the building surveyor role' (Sayce, 2010). There are currently about 8,000 Chartered Building Surveyors working in the UK and another 700 working overseas – although nearly half of these are based in Hong Kong (RICS, 2011). There are 27 RICS-accredited BS degree courses in the UK and approximately one-third of graduates applying for BS posts are from postgraduate courses (Gough, 2010). In addition to an RICS accredited degree, Chartered Surveyors are required to pass the Assessment of Professional Competence (APC) which involves a minimum of two years approved professional training and a final professional interview with two or three

assessors who are BS practitioners (RICS, 2006). The first time referral rate for the BS pathway is typically 50% which is higher than for other professional groups. Sayce (2010) suggests that the technical nature of building surveying is the likely reason that APC candidates lack the depth of experience required after two years in the work-place.

The high APC referral rate and general disquiet about the content of academic courses has led many in the profession to question whether BS education is fit for purpose. In a study of large BS employers five years ago Hoxley & Wilkinson (2006) found that there was a concern about the level of construction technology knowledge of BS graduates, and that in teaching contract administration to building surveyors, relevant contracts should be used (principally minor works and intermediate forms). The RICS HE Policy Manager for Education and Qualifications Standards, Nick Evans has recently commented that there has been criticism of HE's role in supporting professional practice – principally over the quality of graduates (Evans, 2010).

As the UK comes out of economic recession there are fears that there will be a shortage in the supply of construction professionals including building surveyors. There were skills shortages following the last two recessions and fewer graduate places are being offered by BS firms because of the decline in activity. Sayce reports that the first generation of building surveyors is nearing retirement and there are concerns about the supply of graduates and recently qualified surveyors to replace them. Between 2007 and 2009 BS APC enrolments fell by over 50% (Sayce, 2010). In the previous two recessions enrolments onto HE courses in building surveying fell drastically as the number of graduate opportunities diminished although there was a lag of several years between what happened in the jobs market and enrolment onto HE courses. This time around there is the added complication of HE applicants rushing to beat the 2012 increase in tuition fees (Browne, 2010) so that numbers on BS courses are likely to remain buoyant for the time being. After 2011, however there may well be a significant decline in applications for HE courses in building surveying. This is a worrying scenario given forecasts from Construction Skills and Asset Skills that there is a long term need for surveyors and other built environment professionals (Hough, 2010).

As the financial implications of the Browne Report (2010) become clearer, many universities are undertaking reviews across departments, programmes and within courses to ensure that their future offerings will enable them to survive. Given the huge upheaval predicted for the HE sector and industry concerns about the quality of BS education, now would seem an opportune moment to consider the content and delivery of building surveying courses.

2 What does RICS-accreditation mean?

The oversight of surveying academic programmes of study by the professional body has undergone change in the last decade. An accreditation visit every 5 years or so has been replaced by an annual partnership meeting. Whereas the visit would typically last a couple of days the meeting is usually over within a few hours. Employers sit on the partnership committees and any new programmes or changes to programmes are considered by these committees. However time pressures usually ensure minimal consideration and discussion of any changes of curricular. Of course universities have their own rigorous validation and review procedures and employers participate in these processes but the reality is that the oversight of curricular of surveying programmes of study has become 'lighter touch' with the move to partnership meetings. It is therefore

incumbent upon individual course providers to ensure that their curricular are current and relevant.

RICS do publish guidance on what should be included in courses. For many years a document written by Professor Trevor Mole was the point of reference for building surveying courses (Mole, 1997). This document known throughout the profession as 'Mind the Gap' suggested that any profession is concerned, ultimately, with the way its members operate in practice and the skills, knowledge and competencies they have. The work was heavily influenced by the work of Eraut (1994) who suggested that the abilities of each professional depend on the particular knowledge and skills of each, as derived from their educational and practice background. Eraut considers this to be a mix of the following:

- propositional knowledge
- personal knowledge, impressions and experiences
- professional knowledge referred to as 'process knowledge', which is based upon professional experience and action
- moral or ethical principles.

Mole's contribution has been replaced by Keep learning: a framework for building surveyors (RICS, 2009). This document includes much of the philosophical discussion of the earlier 'Mind the Gap' paper (Mole, 1997) and when considering BS courses suggests that typical modules are:

- Construction Technology
- Law and Responsibility
- Economics and Finance
- Building Pathology
- Planning and Design
- Environmental Science
- Management.

Murray (2010) writing in a special edition of the RICS Building Surveying Journal devoted to education and training suggests that the core subjects to be covered should be:

1. Building pathology (in both traditional and modern methods of construction)
2. Environmental and material sciences
3. Construction technology
4. The law of contract, tort, property, and landlord and tenant.

He goes on to say that Universities could offer separate 'electives' in curtain walling, cladding systems, building contracts options, contract administration, etc.

The general advice that RICS gives all universities offering programmes of study in surveying is that the APC competencies and particularly the 'core' competencies (see Table 1) should be covered by the course. Obviously in some cases this may involve teaching the knowledge that these competencies require even if the skills elements will be delivered as part of the later professional training.

It is well known throughout industry that different building surveying courses have different flavours and indeed some employers make a point of only appointing graduates from one or two particular universities each year. Thus each BS programme of study will be different but what is important, of course, is that each one delivers the core subject knowledge and understanding to prepare graduates for the workplace.

3 Assessing the quality of education

In the UK, the Higher Education Council for England uses an independent national student and graduate survey (HEFCE, 2010) as one of the proxies of quality. As far as surveying is concerned, Lee & Hogg (2009) took a similar approach when considering the education and training of the quantity surveying (QS) profession. They report the outcomes of a survey of 425 early career QSs to rate their own degree of confidence with performing a number of standard QS tasks. Poon et al (2010) followed this example in their study of UK real estate graduate competences. In their study of previous RICS education reform on the BS profession, Wilkinson & Hoxley (2005) surveyed course providers and large employers (Hoxley & Wilkinson, 2006) but the individuals who are likely to have the most clearly focused views about education are those who have recently experienced it and who are now working in the industry. A decision was taken, therefore to carry out a survey of BS graduates.

4 The survey

RICS Education provided the names and email addresses of current and recent APC candidates for the building surveying route (the 'sampling frame'). In conjunction with the RICS BS Professional Group Board an online questionnaire on BS education was developed. Initially the objective was to see how graduates perceived that the course they had studied prepared them for the BS APC competencies. For each APC pathway the competencies are divided into mandatory (that are common across all of the surveying disciplines) core and optional. One would expect all of the mandatory and core competencies to be covered to some degree by BS courses and some but probably not all of the optional competencies. Table 1 lists all of the BS APC competencies.

On 3rd August 2010, 2,910 emails were sent to the sampling frame with an invitation to complete the survey via Survey Monkey. 226 of the emails were undelivered for one reason or another and by mid-October 2010, 806 responses had been received, which represents an overall response rate of exactly 30%.This is a very good response for this type of survey (Hoxley, 2008, p126). In their on-line survey of quantity surveyors, Lee & Hogg (2009) received a response rate of less than 10%. Attention to detail in the design of research instruments is critical in ensuring an adequate sample size. For example in this study, several hours effort was expended to ensure that each of the nearly 3,000 emails was personally addressed to the first name of the recipient.

Table 1: Building Surveying Assessment of Professional Competence Competencies (Source: RICS, 2006)

Mandatory Competencies	Optional Competencies
Data management	Analysis of client requirements
Conflict avoidance, management and dispute resolution procedure	Commercial management of construction
Client care	Conservation and restoration
Sustainability	Contract practice
Health and safety	Design economics and cost planning
Business planning	Development/project briefs
Accounting principles and procedures	Fire safety
Teamworking	Housing maintenance or maintenance management
Communication and negotiation	Insurance
Conduct rules, ethics and professional practice	Measurement of land and property
	Project financial control and reporting
Core Competencies	Quantification and costing of construction works
Building pathology	Risk management
Construction technology and environmental services	Works progress and quality management
Contract administration	
Legal/regulatory compliance	

5 Findings

The sample of graduates included 650 who had studied an undergraduate qualification (and 97% of these had a degree) while 129 had studied either a Masters or a Graduate Diploma. Just under two-thirds had studied full-time, 20% part-time and just under 8% by distance learning. Six-hundred and fourteen (76%) had undertaken some form of placement or work-experience during their studies. The mode of the year of graduation was 2004 and the mode of the year of qualification as a chartered surveyor was 2007. The mean time since graduation was 7 years for UGs and 5 years for PGs. One-hundred and thirty of the graduates work in the public sector while the majority (65%) work in private-practice. The graduates were asked to indicate their main industrial activity and as will be seen from Figure 1, the vast majority (nearly 86%) were almost equally divided into those undertaking professional work, including condition assessment and those undertaking project work.

In interpreting the results, the ‘acceptable’ threshold of the aggregate view of all the attitude scale questions was taken as ‘3’, that is the neutral response. Above that level the aggregate view was positive and below that level, negative. In determining differences of emphasis between undergraduate and postgraduate responses the non-

parametric Mann-Whitney U test was used and the test was conducted at a one-percent probability level (Dancey & Reidy, 2007).

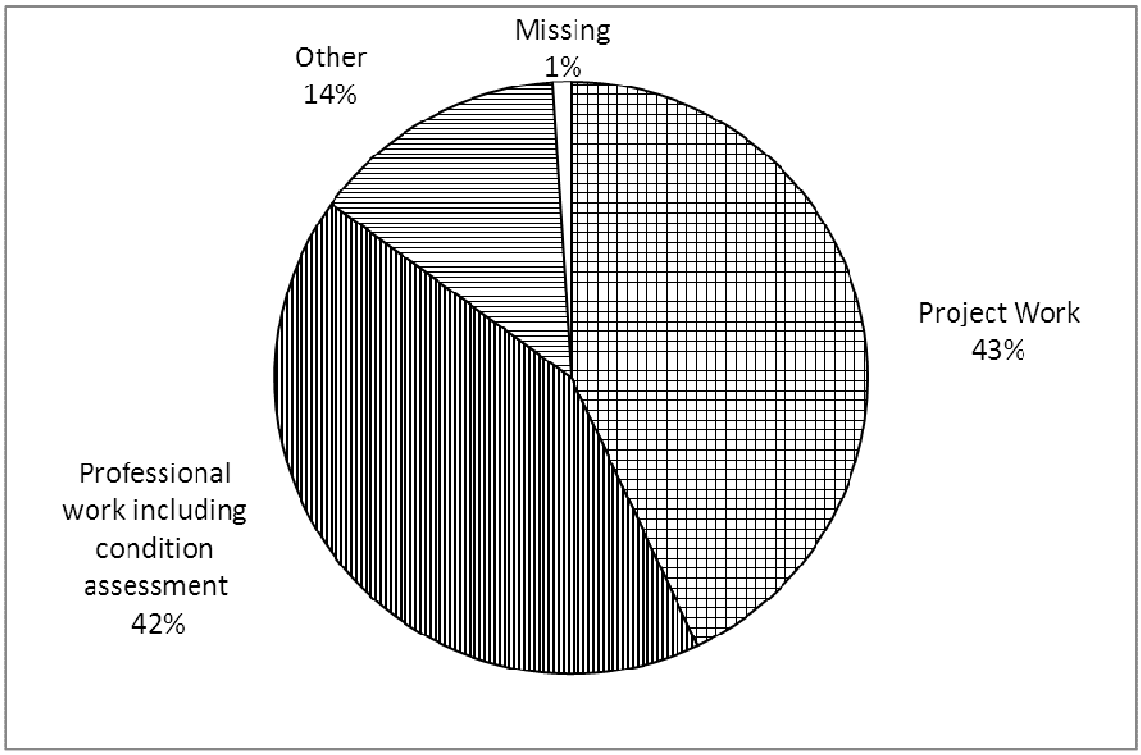

Figure 1. How would you describe the main type of work you currently undertake?

5.1 APC Competencies

Figure 2 indicates the aggregate response (i.e. means of each variable) for the mandatory competencies of the APC. The variables are ordered (from left to right) by value of their means and as will be seen 'teamworking' was the area most covered by courses – a clear indication of the success of group project work. Only half of these competencies were above the neutral response level and the areas where there is cause for concern are with the coverage of ethics, conflict avoidance, business planning, accounting and client care.

On a more positive note all of the core competencies are adequately covered by courses but of the optional APC competencies, insurance, risk management, work progress monitoring, financial control and commercial management of projects had means below the neutral response.

5.2 Preparation for undertaking common tasks

The highest ranked variables in this question were understanding building structures, building defect diagnosis, condition surveys and maintenance scheduling. However graduates felt less than prepared to carry out work involving insurance, dilapidations, submitting statutory control applications and design and tendering for small building projects. This result has similar themes to the responses to the question about what graduates should have studied but did not. The top two responses were contract administration (132) and dilapidations (112). These two activities are core BS work and should be adequately taught on all BS courses.

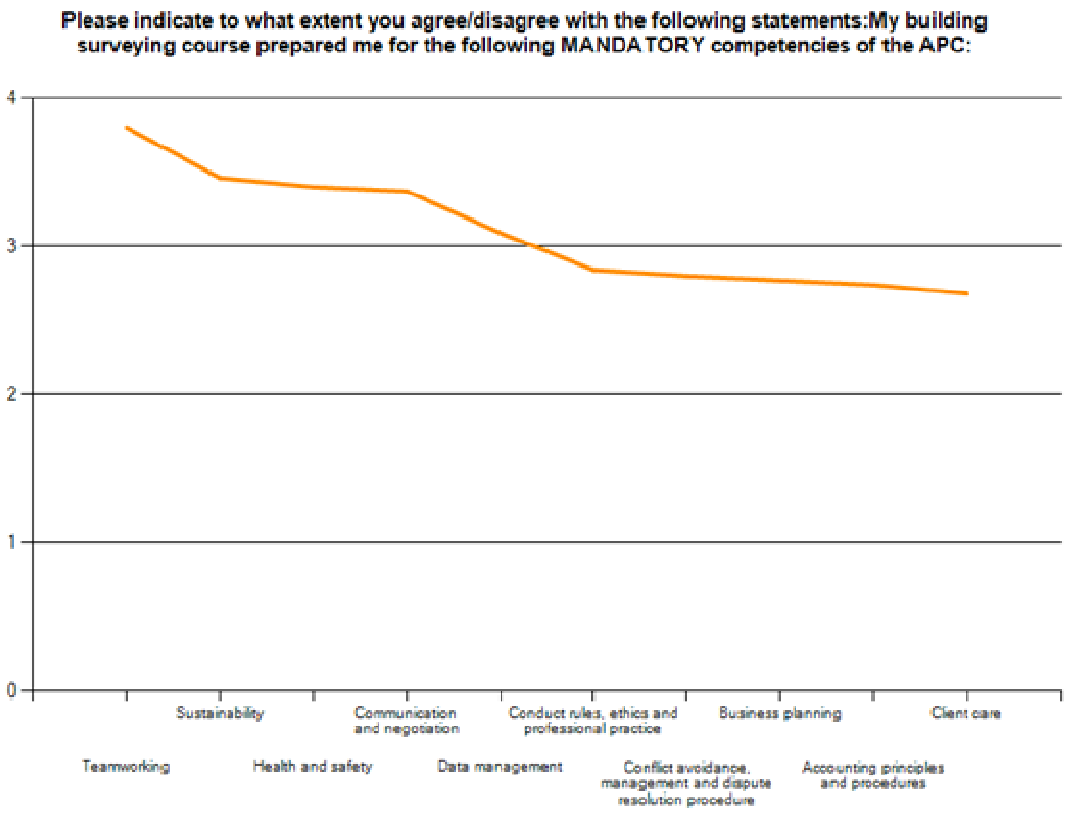

Figure 2: Course preparation for mandatory competencies of RICS BS APC

5.3 The curricular

Table 2 lists the top 6 responses to the questions about the most useful and least useful subjects on their courses. Those designing programmes of study are advised to take these responses into account when deciding upon the curricular of their courses. Clearly there are mixed messages (for example the fact that law appears in both lists) but the over-riding importance of building pathology and construction technology and the apparent irrelevance of economics cannot be ignored.

Table 2: Most useful and least useful subjects studied

Most useful subject studied		Least useful subject studied	
	n		n
Building pathology	281	Economics	170
Construction technology	231	Law	44
Law	83	Management	36
Design	30	Facilities management	33
Contract administration	29	Structures	26
Professional practice module	21	Statistics	25

5.4 Skills' development

In the questions about skills' development and learning, teaching and assessment the aggregate responses were all above the neutral benchmark level. However when the responses were separated by level of course studied there were interesting differences revealed in the skills' question. Figure 3 indicates the differences between the aggregate undergraduate response and that of those who studied a postgraduate programme of study for this question. As will be seen, UGs are much more confident than PGs in this area of their studies and indeed all of the drawing skills on the PG response fall below the '3' acceptable response. The likely reason for this result is related to the length of the respective courses. Whereas there is time to develop these skills during a 3 or 4 year undergraduate course there is far less time available to do this during a 12-month fast-track conversion course. This is an issue that should be addressed by postgraduate course providers particularly as the proportion of PG to UG students shows signs of increasing (Gough, 2010).

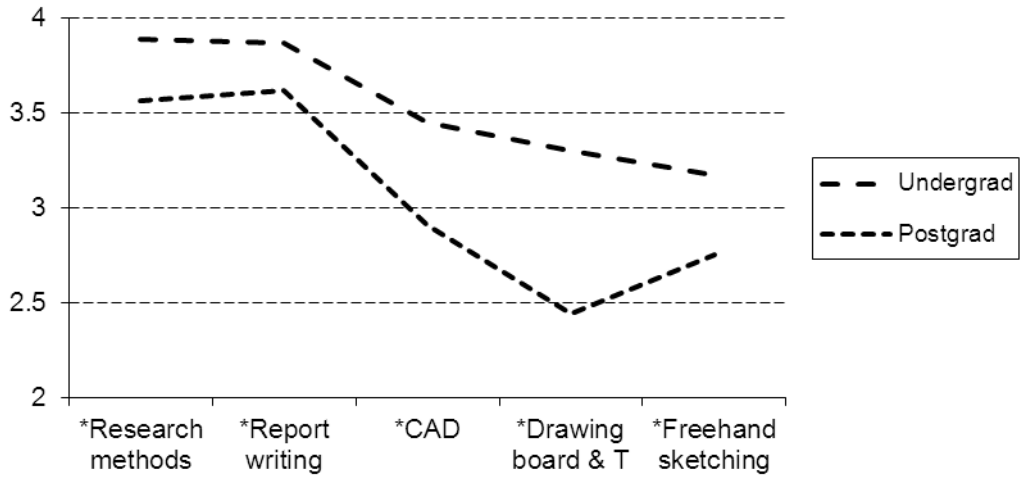

Figure 3: A comparison of UG and PG graduates' perception of skills acquisition from their course

(* indicates a significant difference at a 1% probability level)

6 Conclusions and recommendations

At the time of writing this paper there are rumours circulating throughout the surveying education community that the RICS is planning to remove the requirement for trainees to have studied an accredited degree. They would instead be able to complete any undergraduate degree and then train with a surveyor for five years. Clearly this proposal, should it be made, will be in response to fears about the number of students opting to study surveying at university once there has been a significant rise in tuition fees. This additional competition for surveying course providers is even more reason for them to ensure that their curricular are current and relevant The results of the survey reported in this paper suggest that of the mandatory competencies of the APC, ethics, conflict avoidance, business planning, accounting and client care could be better covered on building surveying courses. Core competencies are adequately covered but a high proportion of respondents believed that they should have studied (and didn't) contract administration and dilapidations. Both of these subjects are central to the work of building surveyors and it is essential that they are adequately taught on BS courses. The optional APC competencies of insurance, risk management, work progress monitoring, financial control and commercial management of projects could be better covered on courses.

Graduates feel less than prepared to undertake the following types of work: insurance, dilapidations, submitting statutory control applications and design and tendering for small building projects. Clearly, this finding does not throw a positive light on the education that these graduates have received. Construction technology and building pathology are the most useful subjects studied while economics appears to be the least useful. Although only 16% of the respondents studied a PG programme there are some interesting differences of confidence revealed, particularly in the area of skills development.

The shortcomings revealed by this survey should be addressed in future building surveying course designs/reviews. This mainly involves strengthening courses by ensuring adequate technical content and including core subjects such as contract administration and dilapidations. Each of these subjects is core to the work undertaken as part of the two facets of building surveying– project work and condition assessment. As evidenced by Figure 1, building surveying is a very broad subject and in the author's view the only way to adequately address the issue of the high referral rate in the APC is to give consideration to allowing BSs to specialise (in professional work including condition assessment OR project work) prior to the APC final assessment. Naturally the profession has reservations about such a development but unless the issue of the high referral rate is addressed, potential BSs will be dissuaded from entering the profession in the first place.

At the end of the questionnaire the graduates were asked if they had any additional comments about building surveying education. Two typical comments about the education they received were 'very out of touch with the industry itself' and 'I left university feeling disheartened and unprepared for my day to day job'. Overall there were more negative than positive comments and if the concerns revealed by this study are to be addressed then course designers and reviewers should concentrate on delivering the core technical subjects that are so clearly valued by graduates.

7 Acknowledgements

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Minerals and waste

Demolition Protocol & Best Local Practice for the Western Australian Construction and Demolition Industry

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Abstract:
There is currently no best practice demolition guidance for the West Australia (WA) construction and demolition industry. The work presented here sought to address this need. Development (and subsequent validation) of an optimum, local best demolition practice tool was determined through consideration of: industrial need; environmental impact; and, economic viability, resulting in a resource efficient demolition protocol for WA. The developed protocol was then applied to specific case studies to guide local practice. Primary data generation produced results indicating that both potential environmental and economic benefits are achievable through the application of resource efficient demolition practices. It is concluded that the application of a resource efficient demolition protocol applied to current activities in WA can result in both environmental and economic benefits; translated as significant measureable CO_2 emission reductions (emission benefit of 65,734.2 kgCO2 per site) as well as an Aus$14/tonne saving in the processing of arising demolition materials.

Keywords:
demolition-protocol, best-practice, construction, Western-Australia.

1 Introduction

Waste production in Western Australia (WA) is generally designated into three different waste streams (a classification used to describe waste materials that are produced from a particular source): Municipal Solid Waste; Commercial & Industrial Waste; and, Construction & Demolition Waste. Construction and Demolition Waste (C&D Waste) represents the largest waste stream generated locally.

The Construction & Demolition Industry in WA currently produce over 50% of the total waste being sent to landfill locally; the C&D waste stream contributed 2,096,960 tonnes to landfill in 2006/07, accounting for 57% of total landfill in WA (Cardno, 2008a).

Records of C&D material being sent to landfill in WA began in 1995; Figure 1 charts the trend over a twelve year period. C&D material being sent to landfill in the Perth Metropolitan Region has increased periodically despite the two main outliers: 2000/01 and 2001/02 might be attributed to the introduction of the Goods and Service Tax (Cardno 2008b); whilst the decrease in 2008/09 may perhaps be attributed to knock-on competition effects related to the Global Financial Crisis. It is argued that the deviations and outliers indicate strongly that financial concerns impact noticeably upon on C&D

waste landfill disposal; measures that 'hit-the-pocket' result in landfill volume decreases.

Whilst recycling of C&D material is increasing in Western Australia, quantities have only been recorded in recent years. The highest amount of C&D material recycled in the Perth Metropolitan Region, recorded to date, was 723,541 tonnes in 2008/09. The quantities of C&D material being both landfilled and recycled in the Perth Metropolitan Region, from 1997 to 2009, are shown in Figure 1.

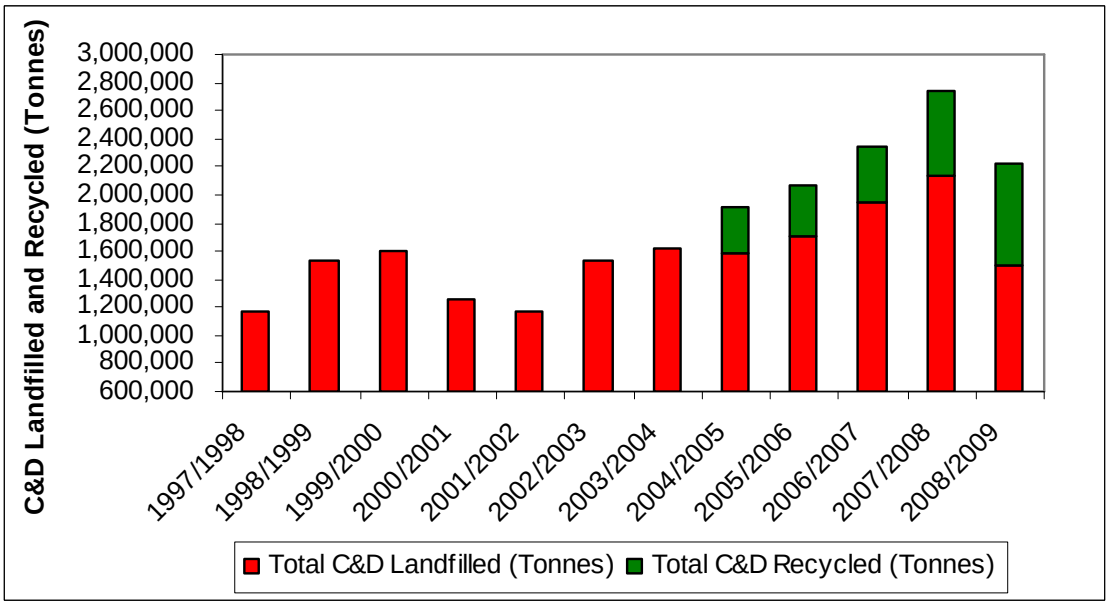

Figure 1: Total Landfilled and Recycled C&D Material in the Perth Metropolitan Region (1997/98 to 2008/09) (source: Hyder, 2009)

As the Figure above shows there have been gradual increases in the amount of C&D material being recycled over the last five years. Despite trends, the actual extent to which recycling is increasing is minimal when compared to: the amounts being landfilled; as well as, targets being achieved both in the Commonwealth of Australia and overseas (ICE, 2008). A need exists to review and revise the current disposal practices and demolition practices currently undertaken in WA.

1.1 International Lessons Learnt

The potential to utilise demolition waste as recycled products for supply to the construction industry is well recorded; the ICE (Institute of Civil Engineers), in combination with London Remade and EnviroCentre Ltd, produced a Demolition Protocol promoting resource efficiency in 2003 and has since produced a second Demolition Protocol in 2008 to be used in conjunction with the 2003 Demolition Protocol. The application of these protocols has seen significant improvements in resource efficiency in demolition activity in the UK and Europe. WRAP (the Waste & Resources Action Programme), backed by government funding from the United Kingdom, publish a number of case studies highlighting the economic and environmental benefits achieved by applying these protocols. Despite such international advancements, the Australian Industry and in particular the Western Australian Industry has yet to introduce resource efficient processes to guide local demolition practice.

1.2 Western Australian Current Best Practice

There are currently three major inert material recycling facilities located in the Perth (WA) Metropolitan Region: All Earth Group (Maddington); C&D Recycling (Hazelmere); and Capital Recycling (Bayswater). Given demolition material is segregated at source, these recycling facilities provide a relatively inexpensive and resource efficient alternative to landfill disposal in WA. These recycling facilities achieve recovery rates of between 96.6-99.5% for material entering respective facilities.

The best demolition recovery rates experienced in WA, resulting from efficient on-site segregation, range from 80-85%. These rates are achieved by Capital Recycling, StateWide Demolition and, the City of Canning District of Perth, in specific test-case projects; it is argued that these initiatives guide the way forward for local practitioners.

1.3 Western Australian Waste Authority

WA does recognise the need for action and a 2nd Draft Waste Strategy for Western Australia was produced by the Western Australian Waste Authority in consultation with the Western Australian community and was published in March 2010. The document highlights areas of importance relating to the generation of waste in Western Australia. In addition, it provides direction towards dealing with this waste including; government strategies, future regulations and areas of public opinion. The Waste Authority also provide two priority actions directly relating to the demolition industry: they recommend to the government that it require its agencies to take 50% of the current C&D waste stream for use as raw material; and, propose regulations to empower local government to require and implement waste disposal plans before authorising demolition. Although, these strategies suggest the need for a greater diversion of demolition material away from landfill, a means to achieve this end is unspecified; it is argued here that the production and enforcement of a demolition protocol that promotes resource efficiency is needed.

1.4 Existing Specification of Demolition Recyclate in WA

The protocol proposed by this study is somewhat implicitly supported by local initiatives such as the specification of crushed recycled concrete currently within the WA Local Authority's infrastructure body, *Main Roads*' Specification 501 for Pavements. *MainRoads* WA outlines the use of crushed recycled concrete in both sub-base and base-course applications. This specification has been successfully applied to a test pavement section on the new Perth to Bunbury Highway in 2009. Similarly The City of Canning District in Perth has specification suggestions for recycled materials applicable to road-base and has applied these to yet another test section during upgrade activities on the Welshpool Road in late 2007. These new-build and refurbishment applications for recycled material show that a market does indeed exist for the protocol developed here.

2 Methodology

Data collection included secondary and primary research. This study employed a qualitative research method that involved the collection, organisation and interpretation of documented material derived from semi-structured interviews, observations, as well as case study applications to validate the results. Secondary research, providing contextual information and background, laid the foundations for primary research related to confirmation of key variables via semi-structured interviews, alongside case

study applications to measure specific environmental and monetary values (Creswell, 2007).

Semi-structured interviews were conducted in two sessions; one prior to the case study, a pilot study, and one after case study analyses. The initial pilot study session was conducted in order to support, refute or extend the main variables identified via a review of literature. The session after the case study, however, was used to both re-evaluate the industry demand for recyclates and to further validate case study findings (which indicated the viability of applying a demolition protocol to demolition practice within WA).

The selection of participants and subsequent case-studies sought to provide an accurate overall representation of the demolition/recycling industry within WA. Furthermore, the participants involved were all designated in senior positions. The participants/companies interviewed included: the three major local inert recyclers identified above; two demolition contractors; an engineer with extensive experience in recyclate specification; and, the President of the Waste Management Association of WA.

3 C&D Waste in WA

The semi-structured interviews, and the resulting analysis, identified explicit local industry requirements.

3.1 C&D Waste Local Variables

The key findings included:

Significant recovery rates can be achieved by the demolition industry in Western Australia.

High recovery rates by recycling facilities can only be achieved through the supply of clean, segregated demolition material.

The existing specifications and proven performance of recycled products within Western Australia should result in increased procurement of recycled products.

The current landfill tax levy within Western Australia should be increased from its current level of $8/tonne towards a figure of $28/tonne, to align with other Australian states.

The landfill tax levy cannot be viewed as being the only factor that will influence the disposal practices within Western Australia.

Legislation to make the recycling of demolition materials a requirement will work strongly towards creating a greater diversion of demolition material away from landfill.

Tender specification of recycled products and legislative requirements to use recycled products are needed in order to achieve increased recycled product procurement.

Significant economic savings can be made through the application of on-site segregation.

Pre-Demolition Audits could potentially result in a significant increase in the amount of demolition material being sent to recycling facilities.

3.2 Industry Outlook

In recent times there has been a push towards sustainable practice across the civil ebgineering/construction industry; despite this push towards sustainable practice, efficient resource recovery has not been applied to the common demolition practice currently undertaken in WA.

The general opinion from the interview responses was that for greater resource recovery from demolition to occur, perceived barriers restricting the recycling industry must be addressed, and that, any increase in resource recovery will continue to remain minimal in WA without market forces that 'hit-the-pocket'. The senior respondent (from Capital Recycling) expressed the view that the industry will see a greater amount of demolition material being recycled in about five years time, but added that a demolition protocol could potentially see an increase in the amount of demolition material being recycled much sooner.

Respondents confirm that the civil engineering/construction industry outlook suggests that demolition activity will seek to employ greater resource efficiencies in the future. An increase in resource efficiency could occur sooner with the introduction of a resource efficient demolition protocol. The continued application of such a demolition protocol across the civil engineering/construction industry would aid significantly the maintenance of desirable demolition recovery rates.

4 Demolition Protocol for WA

A demolition protocol of best practice for the Western Australian civil engineering/construction industry was adapted and modified from secondary research sources such as the ICE Demolition Protocol. The protocol presented here aims to provide a structured procedure that can be implemented by developers and demolition contractors in order to achieve greater resource recovery. The demolition protocol includes key processes, such as: on-site segregation; Pre-Demolition Audits; cost benefit analysis; and environmental benefit analysis.

4.1 On-site Segregation

On-site segregation involves the separation of different structural components into similar waste streams. On-site segregation requires; assessing a proposed demolition on a site-by-site basis, defining different waste streams, and the production of a site design guide to allow for different waste streams. The potential benefit from waste material will be maximised if a structure or built-asset is taken apart systematically, and divided into waste streams such as: concrete; masonry; steel; non-ferrous metals; timber; plastic; glass; and mixed waste.

4.2 Pre-Demolition Audit

A Pre-Demolition Audit is implemented in order to accurately assess the resource recovery potential of a structure. In order to do this effectively, the materials/components of the structure must be outlined individually. These components must then be recorded with their corresponding tonnages, volumes, percentage of recycling/reuse opportunities and potential applications. These components are then

used to create a Bill of Quantities (BQ) as a specific resource production guide for the proposed demolition.

There are three main steps that should be undertaken to improve the efficiency of the Pre-Demolition Audit. These steps include: desk study examining structural drawings; on-site measurement and visual assessment; and quality assessment.

4.3 Cost Benefit Analysis

The most applicable demolition cost analysis to WA industry is the comparison between demolition resulting in landfill disposal and demolition resulting in recycling facility disposal. All factors influencing the total cost benefit of demolition options should be assessed and represented clearly for the client. For demolition resulting in landfill the costs should include: labour/plant, transport and disposal fee inclusive of the landfill tax levy. Similarly, demolitions resulting in reuse/recycling the costs should include: labour/plant and disposal fee.

4.4 Environmental Benefit Analysis

Resource efficiency is an important step towards waste minimisation and greenhouse gas reduction. The application of a demolition protocol will significantly reduce both waste to landfill and CO2 emissions associated with demolition projects. A recent study undertaken by Life Cycle Strategies Pty Ltd (2010) can be used in determining the environmental costs of disposing recyclable waste from demolition activities in Perth, WA. The study found that recycling activities produced net environmental benefits. The results identify the amount of CO2 per tonne prevented by recycling as opposed to landfill disposal. These individual material component indicators were applied specifically by this research project to the case study described below.

5 Case Study

The case study undertaken by this research project applied (an international adapted and locally developed) demolition protocol to the demolition component involved in the *Forrest Place Redevelopment* in Perth, Western Australia. The selection of the Forrest Place Demolition for case study analysis was based upon: the site's high recycling potential; site constraint variables; extensive labour/plant requirements; and a central location to provide reasonably indicative urban transportation distances.

5.1 Pre-Demolition Audit

A full Pre-Demolition Audit was undertaken, involving a desktop study examining the structural plans of the existing structure proposed for demolition. The Pre-Demolition Audit carried out by this research project resulted in the creation of a full BQ for the arising volumes of demolition material. These volumes were then converted into the potential recovered tonnages and total tonnages in order to calculate the Demolition Recovery Index achieved, seen in Table 5.1

Table 5.1: Demolition Recovery Index (Case-Study: Forrest Place Demolition Site)

Material	Total Tonnage	Recovered Tonnage
Large/Heavy Concrete	0	0
Small/Rubble Concrete	0	210
Masonry	92.52	92.52
Metals	52.81	52.81
Timber	1.32	0.65
Glass	4.504	4.234
Miscellaneous	54.0	33.75
Total	205.154	393.964
Demolition Recovery Index	97.4%	

5.2 Cost Benefit Analysis

The cost benefit analysis of demolition resulting in landfill disposal as opposed to demolition resulting in recycling facility disposal was undertaken for the Forrest Place Demolition case-study. The labour/plant costs were higher for recycling facility disposal due to the need for on-site segregation. However, this increased labour/plant cost was heavily outweighed by the economic saving made on lower disposal and transport costs associated with recycling facility disposal. The potential financial saving to be made on the Forrest Place Demolition case-study, through the application of on-site segregation and recycling facility disposal is shown below in Table 5.2.

Table 5.2: Potential Economic Benefit achieved by recycling demolition materials arising from the Forrest Place Demolition Site Case-Study

Potential Economic Benefit	
Saving per m^3 of Demolition Material	\$17.70 / m^3
Saving per Tonne of Demolition Material	\$13.91 / tonne
Saving per Semi-Truck Load	\$280.10 / Load
Total Cost Saving	\$14,539.20

5.3 Environmental Benefit Analysis

The total reduction in CO2 emissions, as well as the landfill capacity saving, achieved by sending the majority of the demolition materials from the Forrest Place Demolition case-study to recycling facility disposal can be seen in Table 5.3. The reductions in CO2 emissions are calculated from the study outlined previously.

Table 5.3: Potential Environmental Benefit achieved by recycling demolition materials

Potential Environmental Benefit	
CO2 Emission Benefit	65,734.2 kgCO2
Landfill Capacity Saving	801.6 m3

The CO2 emission benefit of 65,734.2 kgCO2 per site is equivalent to taking 10 standard vehicles off the road for 1 year (based on a “standard vehicle” producing 6,600 kgCO2/year).

5.4 Conclusion: Benefit Validation

The Forrest Place Demolition case-study presents an accurate representation of both the economic and environmental benefits that can potentially be achieved by applying a resource efficient demolition protocol, which addresses the relocation of demolition materials to recycling facilities as an alternative to landfill disposal, related to demolition activity in WA. The accuracy of the case study results were subsequently confirmed as representative and accurate by interview participants in the follow-up validation procedure; potential economic benefits calculated were confirmed as having a high degree of accuracy while the potential environmental benefits were confirmed and if anything deemed somewhat conservative by the sample study group.

6 Conclusion

This study into Demolition Protocol and Best Local Practice for WA has highlighted the need for reform to the common demolition practice undertaken in Western Australia (WA), in order to improve resource efficiency. To encourage further resource recovery from demolition activities in WA, a structured process in the form of a demolition protocol should be applied to all demolition projects. The lessons learnt from demolition protocols created and applied to projects internationally, is that demolition protocols result in significant economic and environmental benefits; local study indicates a similar potential for benefit.

This study has identified that the application of a demolition protocol to demolition activities in WA has the potential to increase resource efficiency. The case study analysis provides strong evidence that the application of the demolition protocol in WA can provide an economic benefit of $14/tonne saving on the processing of arising demolition materials as well as significant reductions in CO2 emissions.

7 Recommendations for Industry

Recommendations for the civil engineering/construction industry in WA with regard to current demolition activities include:

Introduction of legislation making recycling demolition material a requirement, prior to allowing landfill disposal.

Introduction of a demolition protocol as a form of regulation, aimed at greater resource efficiency.

Increase in the Landfill Tax Levy in Western Australia to align with the other Australian states.

Introduction of an annual Landfill Levy Escalator.

Class 1 (Inert) Landfill levy to be charged per tonne.

Greater policing on Inert Landfill sites to monitor and enforce correct disposal.

The inclusion of adequately tested demolition recyclates in Australian Structural Design Standards.

An introduction of legislation requiring the use of demolition recyclates, where feasible, in all new build projects.

Consideration of the introduction of a primary aggregates tax in the future.

Industry/stakeholder (re)education outlining the potential economic and environmental benefits to be achieved by resource efficient demolition practice.

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Planning and development

Handling Soundness and Quality to Improve Relaibility in LPS – A Case Study of an Offshore Construction Site in Denmark.

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Abstract:
The Last Planner System of Production Control (LPS) is, in today's construction projects, a common used tool to secure a reliable planning. Even though LPS is an efficient system to keep track of the production, and a remarkable increase in productivity has been achieved; the system is not perfect. In order to gain further productivity improvement, elements in LPS have, therefore, been analyzed. This includes both the elimination of preconditions, defects, and quality issues which among others are affecting the time schedule. To determine if defects and low quality is substantial in construction, empirical data was collected and compared with previous studies. This showed that cost and time consumption related to rework, caused by defects and low quality, is significant. Rework is impossible to forecast, and it affects the time schedule, and decreases reliability and predictability. Quality has in LPS only minor direct attention, but in an attempt to increase reliability defects and quality has to be taking into account. In general the construction site is complex, dynamic and uncertain why one wonders why the "health check" when eliminating preconditions only is performed once. Because the soundness of each precondition easily can change, it brings uncertainty into the backlog of sound assignments. An approach to increase reliability is to expand the PPC measurement to include quality and by introducing a "health check" of the buffer as an addition to the conduction of the Weekly Plans.

Keywords:
defects, last planner, precondition, quality, waste

1 Introduction

Through this research there will be a focus on the defects and errors which surfaces during the construction process. The defects and errors consist of problems, inconvenience, mistakes, breakdowns etc. All the mentioned factors are affecting the time schedule, and are decreasing the reliability and predictability of the construction process. By determining the magnitude of defects and errors it can be concluded whether or not these problems are general in construction and if the related extra cost and time consumption are significant. The study reviled that cost and time consumption are significant, therefore, preventive actions have to be carried out, to help the construction industry in handling the mentioned problems.

To prove that defects and errors are a general tendency in construction and not just an isolated incident, previous studies are included. By including other studies the quantity of data is much greater.

The Last Planner System of Production Control (LPS) is a scheduling tool developed to increase the reliability of the schedule and thereby handling errors and defects which occur during construction. Ballard (1994) who introduced LPS also introduced a tool to measure the reliability of the schedule called PPC.

Before Ballard introduced the LPS, he measured the PPC level to be about 50 %, after implementation he recorded the PPC to be at the 70 % level. Furthermore he measured a decrease in non-productive time on 15 % from 50 % to 35 % (Ballard 1999). Here non-productive time only included the loss of productivity which can be assigned to delays and rework

Indeed there is still, both reliability in planning and more essential productivity to be achieved. Still 30 % of all planed activities do not finish as planned and still only 65% of all time is productive. The question is what can be done to improve the LPS, in the handling of defects and errors. Two issues are treated; the making ready process, and the purpose of the PPC.

The making ready process is extremely important; through this preconditions are removed. This is done from every individual assignment and if the making ready process fails, the assignments cannot be executed. But changes in preconditions take place (Love 2002). In this research, a weekly “health check” is therefore proposed to ensure nothing goes wrong.

The reason to introduce the PPC measurement was to measure the reliability of the schedule, to be able to react on variations, and to find and eliminate root causes. By only measuring the observance of the schedule, the quality aspect of the completed work is neglected. Therefore this research proposes that a quality aspect is added to the PPC measurement. The reason why, is that a completed assignment is very depended on quality. Increased quality also means reduced time spend on rework.

1.1 Elucidation of the extends of defects in construction

The costs of defects and errors during the construction process have been a popular objective for research in decades e.g. (Hammerlund *et al.* 1990b). A brief historical view to these studies points out that it is a general problem which usually amount to a considerable part of the total project costs (Burati *et al.* 1992). The costs of defects or errors can be divided into direct and indirect costs. The direct costs are the direct measurable costs attached to a given defect. The indirect costs are not directly connected to correcting the defects or errors and are, therefore, not directly measurable. The indirect cost or consequence of an error is multiple. Peter Love categorizes the consequences of errors into three groups which all attribute to cost at different levels in the company (Love 2002).

- *At the individual level*, stress, fatigue, absenteeism, de-motivation, and poor morale are found to be the primary indirect consequences of rework.
- *At the organization level*, reduced profit, diminished professional image, interorganizational conflict, loss of future work and poor morale are identified as indirect consequences of rework.

- *At the project level*, work inactivity (e.g. waiting time, idle time, travelling time etc) and end-user dissatisfaction are identified as indirect consequences of rework.

Cited from (Love 2002)

The results of the selected studies are presented in the text below.

Back in 1990 Hammalund *et al.* (1990a; 1990b) conducted a study of quality failure costs. The study included one main site which was monitored spanning over a 20 month period. To test the validity, 21 small building sites were monitored in a 3 week period. The study reviled that the costs of correcting the quality failures amounts to 6 % of the total production costs.

Burati *et al.* (1992) monitored the cost of quality deviation from nine construction projects. The collected data did include the direct costs related to rework, and cost of rework associated with design changes. Burati *et al.* found that the costs of rework on the nine projects varied between 0.4 and 26.0 % of the total project costs resulting in an average cost at 12.4 %.

Through studies performed from 1994-1996 Josephson and Hammerlund (1999; 1994) monitored seven different construction projects to ascertain the causes of defects and the related costs. The studies showed that the costs of defects varied between 2.3 and 9.4 % of the total production costs, this only including the direct costs of the defects.

In a research conducted by Abdul-Rahman *et al.* (1996) the costs of non-conformances on constructions sites were measured to be 6 % of the total project costs. Here a single construction site was monitored during a 22 week period. Non-conforming costs include costs of rework, material waste, warranty repairs etc. while conformance costs include costs of training, indoctrination, verification, validation, testing, inspection, maintenance, audits etc. (Love and Li 2000).

Love and Li (2000) studied the courses and costs of rework at two Australian construction projects. This revealed a cost of rework at respectively 3.2 and 2.4 % of project contract value. Even though the study only included the direct costs, Love and Li (2000) stated that the results were not to be considered indicative. This mainly because the costs were significantly lower than indicated by previous studies.

In 2000 Barber *et al.* (2000) measured the costs of quality failures in two major road projects. Only the direct costs of failure were observed. The findings showed that the costs of failure were respectively 3.6 and 6.6 % of the total project costs. To this Barber *et al.* (2000) afterwards added the calculated costs of both delay and work acceleration resulting in a significantly higher los at respectively 16 and 23 % of the total project costs.

In Denmark Apelgren *et al.* (2005) during a three months period studied the amount of stumbling stones in a housing construction. Where the term, stumbling stones, is defined as: All conditions in the product or process which prevents the entrants in conducting his work as effective and correct as possible – the first time (Apelgren *et al.* 2005). The findings showed that the amount of stumbling stones amount to 7 % of the total contract sum. The result includes both the direct and indirect cost; it is though a conservative estimate to the costs of stumbling stones. This is primarily due to limited

resources to the registration of stumbling stones and to difficulties in determining the extent of the indirect costs. Design changes are not included in the study.

All the mentioned studies include only the direct costs related to rework or errors, this except Apelgren *et al.* (2005) who also have included a conservative estimate to the indirect costs. The direct costs are according to Burati *et al.* (1992) only the "tip of the iceberg". An study by Love (2002) states that the indirect costs are a significant expense, and have a multiplier effect of the direct cost at between 3 to 6 times. This agrees with Love and Li (2000) which state that indirect costs are a considerable part of the costs. The reason why only the direct costs are included is because it is very difficult to determine the indirect costs (Love 2002).

Wantakorn *et al.* (1999) studied management errors in construction. They concluded that no matter levels of skill, experience or training of the management, they can make errors at any time. Wantakorn *et al.* (1999) identified the following factors as affecting the frequency and severity of the errors: Task complexity, pressures of time and cost of project, and the uncertainty of the management task. They furthermore simulated the probability of management error in consideration of the mentioned factors.

Of course there is conducted more studies than those included in this short review. The included studies confirm that errors do occur, and they provide a basic knowledge to which extent errors occur. Since only the direct costs are included in the above mentioned studies, with the exception of Apelgren *et al.* (2005), the figures gives a very conservative bid to the costs of error in construction. However the studies do show that the costs of error represent a significantly part of the estimated total construction costs.

2 Research Methodology

This case study is in a four months period conducted at an offshore wind farm project in Denmark. The study is conducted in collaboration with the main contractor of the civil works. Because the construction site was placed at sea, the logistics and storage of equipment and materials took place with limited resources. Transportation was done by boat, and depending on the speed and the placement of the foundation, the transport time varied between 20 – 60 minutes.

The purpose of the case study was to A) prove that errors do occur and B) to find root causes to these problems in an attempt to increase productivity. The main research question throughout the study has been: How is it possible to improve reliability in order to increase productivity.

The data collection consists of primary daily observations and experienced problems. Here the observations are focused on problems related to soil surveys and excavations, where there on a regular basis has been contact with the main personnel. Additionally data was collected through unstructured interviews.

Only major problems which had a significant impact on the production were collected. In total 24 problems were registered. The observer was focusing on soil surveys and excavations. It is expected that not all major problems were discovered. Therefore, the survey does not give a complete picture of all experienced problems, but it leaves a good impression of the impact and the significance of problems in construction. Besides observations of problems, the everyday contact to the contractor gave a good insight in difficulties and complications which occur during offshore construction.

The data collection consists of a short description of observed problems. There is made no calculation of expected cost.

3 Empirical evidence

During a four month period, major problems in an offshore construction project were monitored. In total 24 problems were collected, all having influence on among others the time schedule. The problems are described in detail in (Thomsen 2010). There is made no calculation to neither the direct nor the indirect costs of the problems, but an offhand estimate clarify that the costs are significant.

Besides the monitored problems, other factors were having an influence on cost and on reliability. The weather in general had a great impact to the work performed, because it was changing the soundness of the scheduled assignments. This is why bad weather often was the cause to non-productive time, in a normal workweek this composed to, not only hours, but days. The number of bad weather days varied with the season, at summer it was one or two days a week, and at winter it was three or four days a week. The weather was very unpredictable which is why it was an obstruction to the planning and time scheduling. Even local weather forecasts had difficulties in predicting the weather and the time span of bad weather so accurate that scheduling by the hour made sense.

The weather made it with the tools available impossible to conduct a robust and reliable time scheduling. It affected both the working scheme and the duration of the assignments. Bad weather days completely stopped production at the construction site, where only maintaining activities could be conducted. Because of the weather the soundness of the assignments varies, which makes it impossible cf. LPS to maintain a backlog of ready work. Thus the assignments are not following the critical characteristics for a sound assignment cf. LPS (Ballard 2000).

Another factor which complicated the planning was the great distance to the construction site. Material, equipment, machinery, and labour; everything has to be transported by boat. With limited resources the logistics have to be planned carefully, changes in orders made it very difficult and often there was a lack of capacity. Moreover the transport took a lot of time, which besides non-productive time, made the production sensitive. If for instance there is a breakdown on some of the heavy equipment and a repairman or a specific spare part is needed, the transport time gives an increased delay in the production. Furthermore, the great distance made it difficult to follow up on the production, to verify the quality and to follow up on the planning.

Finally the study has revealed that construction managers work with high pressure and stress. The time pressure presses the construction managers to make fast and not thought through decisions. This gives an enhanced probability for the managers to make errors (Wantanakorn *et al.* 1999).

The conclusion after monitoring the project is that the construction process at offshore construction is very complex and chaotic and impossible to predict and plan completely. There is constantly a change in the daily plans which indicate the lack of a more flexible and robust planning.

4 Evaluation of the studies

The great variation in results from previous studies, can among others, be ascribed to the building process, which is complex and chaotic (Bertelsen and Koskela 2003; Bertelsen 2003). This is making it very difficult to register and measure the costs. There are a lot of factors that contributes to the great variation in the findings. Primarily there is a lack of uniformity in the way data is collected; this includes the used sources such as observations, interviews and other documented sources from the site. This non-uniformity is reflected in the huge difference in the factors which are included in the studies. Furthermore, the objective of the studies is often different, some are focusing on measuring the cost of errors some quality failures, some non-conformance and some the amount of rework. Generally there is a lack of guidelines on how to perform the study and there is no given interpretation of which factors there should be included in the studies.

Despite differences in data collection all studies shows that the related cost of errors are significant. Furthermore, there is accordance between the presented theory and the empirical data collected from the case study. Therefore it can be concluded that errors are a general problem in construction.

Errors or rework are directly effecting the conducted planning. The errors cause non-productivity which include waiting, motion, cleaning, rectifying etc. and are thus a main source of time- and cost overruns and chaos (Love 2002). Love and Li (2000) found that rework have a major effect in the time performance. He measured two construction projects and found that rework had an unfavourable effect on the critical path at respectively three and four weeks. Furthermore errors do provoke defects which induce increased costs and decreased quality and productivity.

To avoid delay and daily penalties, time overruns are often handled through accelerated work. Barber *et al.* (2000) pointed out that accelerated work usually is significantly more expensive than work completed at normal tempo. Randolph and Todd (1996) surveyed 129 different electrical contractors to measure the magnitude of inefficiencies due to overmanning. They found an average loss of total efficiency on 29 % which could be attributed to overmanning introduced to speed up production. They also found that the general trend is that the net loss of efficiency increases if the percentage of overmanning increases. The relation between schedule acceleration and losses in efficiency is supported by (Thomas 2000). Thomas surveyed three different construction projects and found that the estimated loss in productivity caused by accelerated work to be 25 %. He furthermore measured the loss in labor efficiency to range between 20 % and 45 %.

Errors are increasing the variation in execution of activities, and cause defects which subsequently lead to low quality. This result in rework which again makes the construction process unpredictable and chaotic. This unpredictability is making it very difficult to especially perform long term scheduling.

5 Improvement of LPS ability to handle soundness and quality

Rework, defects, errors and non-conformances all refers to problems or difficulties which occur at the construction site. And yet difficulties occur; Bertelsen and Koskela (2004) express it severe: *"The plans and schedules present an idealized linear picture*

of what should take place, but not of what actually dos take place. Planning does not reflect reality, but dreams!"

The LPS works with a parameter PPC, which is a measurement showing in percent how many of the scheduled activities which are actually completed. In a typical construction site only half of the activities in the weakly plans, get conducted as planned (Howell and Ballard 1995). According to Ballard (1999) the implementing of LPS has raised the work flow reliability from 30 - 60 % to the 70 %. Though high PPC has been gained after implementing LPS, there is still a need for a more reliable and robust plan (Ballard 2000). To reach PPC at 90 % or higher additional actions are required (Ballard 1999).

According to the LPS theory the soundness of a certain assignment depends on seven preconditions which have to be present for an assignment can be conducted, first presented in Koskela (1999), but widely cited, among others (Bertelsen *et al.* 2006; Koskela 1999). The preconditions are as following:

- Construction design; correct plans, drafts and specifications are present
- Components and materials are present
- Workers are present
- Equipment and machinery are present
- Sufficient space so the task can be executed.
- Connecting works, previous activities must be completed
- External conditions must be in order.

If just one of the seven preconditions is not fulfilled the assignment cannot be conducted. Therefore it is extremely important that assignments do not starve any of the seven inputs. Koskela (1999) continues by stating that *"the realization of tasks heavily depends on flows, and the progress of flows in turn is dependent on the realization of tasks"*. The varying nature of Planning and scheduling can be difficult because these flows often are plagued by missing inputs and varying nature (Koskela 1999).

To secure a more robust scheduling a Lookahead process is introduced in the LPS. The Lookahead process is a plan spanning 3-8 weeks and which purpose is to remove constraints to secure the soundness of the assignments. Only sound activities are later moved to the Weekly work plan or to a buffer to maintain a backlog of assignments which can be performed (Hamzeh *et al.* 2008; Steyn 2001; Ballard 2000).

By securing that only sound activities are selected to the Weekly Work plans the success rate of completed tasks (PPC) is increasing. This entails that the uncertainty of the schedule is significantly reduced (Jang and Kim 2008; Ballard 1997; Ballard and Howell 1994). This increases certainty and honesty in the construction process, where "*we do what we say we are going to do*" (Ballard 1994). Furthermore a reduced uncertainty in the schedule leads to reduced project duration and costs (Ballard 1997).

Based on the case study two aspects of LPS are treated in an attempt to develop and improve LPS and thereby increase the reliability and robustness of the scheduling. The two aspects are first the making ready process with focus on changes in soundness, and secondly the purpose of the PPC measurement with focus on quality.

5.1 Changes in soundness

This process of removing constraints and making assignments sound is very idealistic. The "health check" is only performed once; it does not take in consideration that the

soundness very well can change. A change in just one of the seven preconditions is enough. For instance would design changes, rotten and dwindling materials, illness, breakdowns, unauthorized storage of materials, delay of previous activities, or troublesome weather conditions all give rise to a change in soundness of an assignment. Conclusively every precondition are hereby a variable and compose a possible obstruction for a given assignment to be fulfilled. Still the likelihood of change in a precondition varies. For instance changes in construction design are expected, according to Love. This is because the clients haves difficulties with the visualization of the end product that they procure (Love 2002). New 3D tools can help the costumer in defining criteria and thereby decrease the number of changes.

According to the PPC problems, with not sound assignments, shall be registered, investigated and the roots afterwards eliminated, this is done to achieve a higher PPC. Firstly the roots can be very difficult to eliminate and control, especially concerning the external conditions such as weather conditions. Secondly, there is no assurance that every non-completed assignment is registered. If for instance a craftsman has to use a buffer assignment, but finds that it at present time not can be conducted. Then the craftsman has a choice; A) report it to management or B) say nothing and find another assignment. If the change in preconditions is more permanent he could without telling choose to put the assignment back in the Lookahead plan.

At extreme construction projects a single or more preconditions can be very uncertain and uncontrollable. This will result in Weekly Work plans which at times contain not sound activities. In such constructions this precondition could be ignored. This could for instance be offshore works which are very dependable of the weather conditions. By ignoring the weather conditions cf. the example; the planning could be conducted as normal, but maybe with an extra focus on having a backlog with sound and weather undependable activities if possible.

The risk of changes in preconditions increases with time. Often many preconditions are fulfilled weeks before the assignment is planned to be conducted, leaving plenty of time for changes. To detect changes in preconditions it is proposed to implement a weekly “health check”. Changes in preconditions will now be detected beforehand, which will keep the production running unaffected and thereby increase the reliability and robustness of the schedule. The weekly “health check” can be implemented as essential part of the weekly PPC evaluation.

5.2 Handling quality

One of the central elements in Lean is the focus on product flow and in the elimination of non-transformations or non-value adding activities; in other terms the removal of waste. Ohno (1988) stated that the total capacity of a production system equals the sum of work and waste, he furthermore identified seven different types of wastes, these are showed at the list below; see also (Suzaki 1987). In the list the first five elements refer to the material flow while the two last refer to the human work flow (Koskela 2000).

- Waste of overproduction
- Waste of stock on hand (Inventory)
- Waste of transportation
- Waste of making defective products
- Waste of processing itself (Over-processing)
- Waste of movement

- Waste of time on hand (Waiting)

There are a lot of different reasons to why waste arises. Defects are resulting in waste. When work assignments cannot be conducted as a result of defects, it results in crew waiting time, crew motion and unnecessary transportation of material and equipment. This is reducing productivity and could subsequent lead to delay, and thereby affect the time scheduling. But most importantly defects result in low quality which force rework to take place.

Rework, which is very difficult to forecast, is by Love and Li defined as the unnecessary effort of correcting construction errors (Love and Li 1999). This often induces demolition or removal of the defect or damaged structure. Koskela (1999) states that rework is carried out with minimum preparation and planning. This is often making a ravage to the sequencing of the work, and furthermore there is a risk that it would cause congestions and thereby slowing down or at worst completely stopping the production.

The fact that defects occur and that defects lead to waste implies that a reduction of defects would reduce waste and thereby increase productivity. Nevertheless, LPS is only focusing on the conduction of the schedule and trying to make the schedule itself more reliable. It is not focusing on the end product and not trying to enhance the quality in construction. Therefore, the only measure is the PPC. In worst case the production can be speeded up in order to archive high PPC, but then later witness lots of defects and poor quality, which again lead to waste consisting of waiting, motion, transportation and rework.

PPC is often used as a measure of the performance of the construction site. If quality is not taking into account it gives a disfigured picture of the performance. To restore the picture poor quality and related defects should be deducted from the performance. To secure a consistent judgment of quality the control could either be undertaken by the construction manager or by the crews which undertake the subsequent assignments. Here the minimum criteria for acceptance must be that current standards are followed and that the outcome is correct. If only acceptance is the criteria for quality, the amount of rework can be used as an indicator of quality.

6 Conclusion

This research is based on a case study of an offshore construction site in Denmark. In order to prove that defects and errors are common in construction, a short literature survey was conducted. This was done to compare existing theory with the new empirical knowledge. Through comparison it was found that the conducted research supports existing theory and state that errors and defects are common in construction and that the related cost and time consumption is significant.

Defects and errors in construction lead to an unpredictable and chaotic construction process. The case study revealed two possible ways to increase reliability, both related to LPS. The two aspects are related to LPS ability to respectively handle soundness and quality.

A central element in LPS is the making ready process, which secures that all preconditions are removed. When all preconditions are removed the assignment is moved to a workable backlog, from here the sound assignments are later moved to the

Weekly Work plan. This case study shows that changes in preconditions take place. To detect changes and secure that only sound activities end up in the Weekly Work plans a weekly "health check" is proposed.

To secure a reliable and continuous improving scheduling the PPC measurement was introduced. In order to reduce the number of defects and errors, this research suggests that there should be a focus on the end product. Therefore, this research recommends that quality is implemented as a supplement to the PPC measurement.

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Construction programming efforts of indigenous and expatriate contractors and their influence on project outcome in Nigeria

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Abstract:
Programming and scheduling which are the functions of contractors have significant role to play in the outcome of construction projects. This study evaluates the efforts of indigenous and expatriate contractors in Nigeria on programming and scheduling and their contribution to the outcome of the projects they execute. The objectives are to determine the performance of selected construction programming processes by indigenous and expatriate contractors in Nigeria, its relationship with project outcome, compare the efforts of indigenous and expatriate contractors on construction programming and their influence on project outcome. In order to achieve the objectives, a survey of 86 contractors was conducted. 12 programming activities were selected to represent the efforts of contractors on construction programming. Data were collected using structured questionnaires and analysed using percentage, chi-square and t-tests. The results reveal that overall efforts of the contractors have no influence on project outcome but the performance of the programming processes contribute to project outcome. It is therefore suggested that the two categories of contractors should ensure that the processes are not only done but performed properly using Microsoft project software.

Keywords:
construction projects, contractors, Nigeria, project outcome and project programming.

1 Introduction

The construction stage and indeed contractors are very crucial in project delivery. The activities carried out at the construction stage are known to have major impact on the outcome of projects. Any decision or action taking and any delay at the construction stage are known to have greater implications than when they are taking at the pre-construction stage. This is so because the bulk of the resources of a project are utilised and the works that constitute the project are carried out at the construction stage. The contractor is the major player at the construction stage because he is the party responsible for the execution of the project. In Nigeria, construction contractors are categorised into indigenous and expatriates (Edmonds, 1979; Ogunpola, 1984; Olateju, 1991; Samuel, 1999). Studies (Olateju, 1991; Oni, 2001; Eze, 2004; Idoro, 2004; Okafor, 2005) discovered that Nigerian clients give preference to expatriate contractors in the award of contracts. Several reasons have been adduced for this preference such as clients' lack of confidence in the capability of indigenous contractors (Oni, 2001); clients' negative mentality about indigenous contractors (Eze, 2004); impact of colonial

rule (Idoro, 2004) and low managerial and technical capacities of indigenous contractors (Idoro, 2009). Idoro (2009) discovered that clients' mentality about indigenous contractors and preference for expatriate could change if indigenous contractors improve upon their managerial and technical capacities.

One important aspect of management as far as project delivery is concerned is planning. Planning plays a significant role in the success of construction projects. This is so because construction projects involve the use of numerous and complex resources (materials, plant and equipment, men, labour, time, information, stakeholders, etc) and series of interrelated activities or operations that demand effective planning. Mawdesley (2001) observed that the numerous activities, parties, constraints such as time and cost involved in the construction of a project necessitate careful and proper planning before the commencement of construction work. Faniran *et al.* (1998) classified project planning into two categories namely: pre-construction and construction planning. The former describes the planning that is done prior to construction while the latter describes the planning done during construction. Another important difference between the two is that while pre-construction planning is the duty of consultants, construction planning is majorly the duty of contractors. Although, the two types of planning are important for a project to be successful, pre-construction planning has been the focus of previous studies. Studies conducted by Faniran *et al.* (1998 & 2000), Idoro (2009) were concerned with pre-construction planning. Whereas indigenous contractors in Nigeria can change the negative impression that clients have about them and the preference for expatriate contractors by adopting improved planning strategies, little attention has been given to construction planning in previous studies.

The attempt to ascertain how indigenous contractors in Nigeria fared when compared with their expatriate counterparts prompted this study. This study evaluates the efforts of these two categories of contractors on programming and scheduling and their contribution to the outcome of the projects they execute. The objectives are to compare the extents of performance of selected construction programming processes by indigenous and expatriate contractors in Nigeria, their relationship with the outcome of projects executed by the two types of contractors, compare the efforts of the two types of contractors on construction programming and their influence on project outcome. The achievement of these objectives is expected to assist the two categories of contractors to improve their efforts on construction planning with a view to improving the performance of the projects they execute.

2 Literature Review

2.1 Construction Contractors in Nigeria

Contractors play a very important role in project delivery as the parties responsible for executing the works in any construction contract. The classification of construction contractors in Nigeria into indigenous and expatriates in previous studies has been mentioned. Indigenous contractors refer to construction firms that are fully owned and managed by Nigerians while expatriate contractors refer to construction firms that are jointly owned by Nigerians and foreigners but their management is fully controlled by expatriates. Ogunpola (1984), Olateju (1991), Samuel (1999) and Idoro (2004) discovered that expatriate contractors are few in number, operate on a large scale and execute majority of the contracts in Nigeria while indigenous contractors considerably outnumber their expatriate counterparts; operate on small and medium scales but are responsible for a very small proportion of the value of contracts executed in Nigeria.

These two parties collaborate with consultants to ensure that construction projects are delivered to time, cost and to required quality standards.

2.2 Construction Programming

Planning constitute a considerable part of the process of project delivery such that the first three phases namely: inception, design and construction are sometimes described as planning stage. However, it has been realised that planning is a continuous process in project delivery that has to be done from the opening to the close of a project. Hore *et al.* (1997) and Faniran *et al.* (2000) in separate studies described project planning as the systematic arrangement of project resources in the best way so as to achieve project objectives. Faniran *et al.* (1998) described project planning as the process of determining appropriate strategies for the achievement of predefined project objectives. The process of project planning requires that client's requirements and available resources be defined first, matched to set project objectives, available options identified and evaluated and the most appropriate frameworks, strategies and tactics to achieve the objectives selected. It also involves communicating the objectives and the frameworks, methods, strategies, targets/deadlines to achieve them to persons, parties and organisations concerned with their implementation, monitoring and control. Project planning therefore refers to the process of defining project objectives, determining the frameworks, methods, strategies, tactics, targets and deadlines to achieve the objectives and communicating them to project stakeholders.

Planning is a continuous process and it starts as soon as the decision to invest is taken and does not end until the project is successfully delivered. For this reason, Dvir *et al.* (2003) identified three levels of project planning namely: 1) the end-user level where planning focuses mainly on the functional characteristics of the project end-product; 2) the technical level which focuses on the technical specifications of project deliverables that are needed to support the functional requirements and 3) the project management level which focuses on planning the activities and processes that are needed to be carried out to ensure that the technical work proceed effectively. These three levels of planning refer to project conception planning, project design planning and construction planning.

2.3 Relationship between Construction Planning and Project Outcome

Research studies agree that planning contributes considerably to the final outcome of projects. Since planning is all about how to achieve project objectives, it follows also that the objectives of planning are the same with those of a project. Faniran *et al.* (1998) assertion that the objectives of project planning are to complete a project within a fixed time, at a previously estimated cost and to a specified quality standard implies that project and planning objectives are invariably the same. This assertion also implies that the bases of project performance and planning performance are the same. Naoum (1991), Ling and Chan (2002) and Thomas *et al,* (2002) agreed with the assertion by regarding project performance as the basis of evaluating the effectiveness of project planning. Naoum *et al.* (2004) described planning as one of the key tools that stakeholders use to ensure that construction projects are delivered successfully. Idoro (2009) opined that the measures of the effectiveness of project planning and the measures of project performance are the same. These assertions show that there is agreement among researchers that planning whether pre-construction or construction contributes to project outcome.

3 Variables of the study

The variables used for the study are classified into four categories namely: construction contractors, construction programming processes, contractors' effort on construction programming and project outcome. Construction contractors in Nigeria are classified into two categories namely: indigenous and expatriate contractors. Twelve processes of construction programming namely: lists, quantities, durations, start and finish dates, production rates, sequences, cash-flow chart, plant, labour and material schedules of project activities and summary of major project phases were identified from the features of the programme of work in Microsoft project software and the preliminary interview conducted during a pilot study and used for the study. Two parameters namely: contractor's level of performance of construction programming process and level of construction programming were derived from construction programming processes and used as contractors' effort on construction programming. On project performance, two parameters namely: time-overrun and cost-overrun were selected. Time-overrun was calculated as the percentage of time-overrun to initial contract period while cost-overrun was calculated as the percentage of cost-overrun to initial contract sum of a project. The understanding of the four categories of variables shows that there is a relationship between them. The two categories of contractors are responsible for the programming of the projects they execute and construction programming involves a number of processes which are described as construction programming processes in this study. Contractors' effort on construction programming is a measure of the number of the processes performed and this is expected to contribute to the performance of projects executed by the contractors. This relationship is expressed in the conceptual framework of the study presented in Fig. 1.

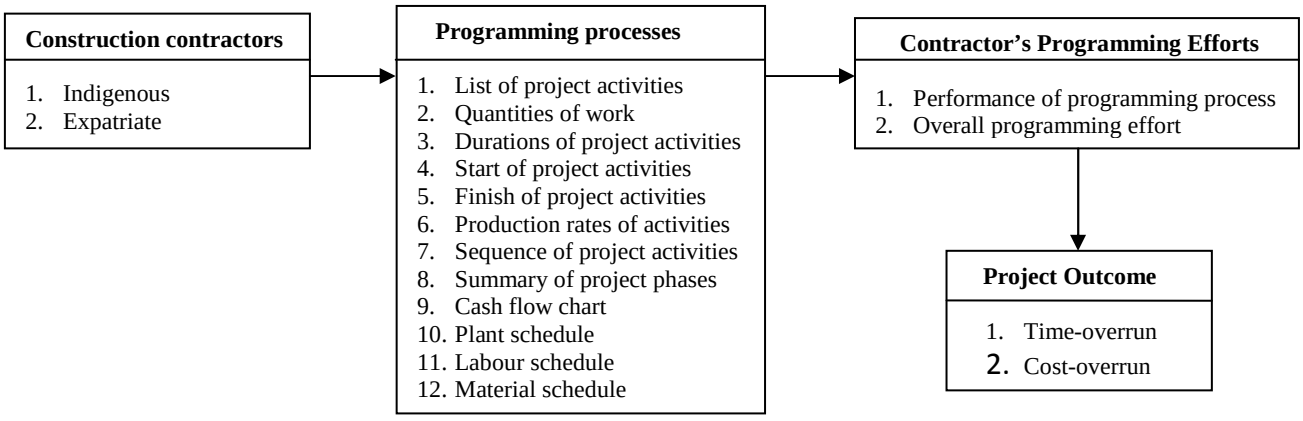

Fig. 1 Conceptual framework showing relationship between contractors' construction planning and expatriate contractors and project outcome

4 Research Methods

A questionnaire survey approach which involved a field survey of 86 construction projects was adopted. A list of 136 recently completed projects made up of 96 projects executed by indigenous contractors and 40 projects executed by expatriate contractors was prepared through a preliminary survey conducted in early 2009 because a reliable list of both on-going and recently completed projects in Nigeria could not be obtained. These projects were used as the population frame for the study. The study sample was selected from this population by stratified random sampling. The population was

classified into indigenous and expatriate contractors' projects thereafter; 86 projects made up 64 projects executed by indigenous contractors and 22 projects executed by expatriate contractors were selected randomly.

Four hypotheses were postulated to achieve the objectives of the study. The first hypothesis states that the differences in the extents of performance of construction programming processes between indigenous and expatriate contractors are not significant. The second hypothesis states that the extents of performance of selected construction programming processes by indigenous and expatriate contractors have no relationship with the outcome of projects they executed. The third hypothesis states that the efforts of indigenous and expatriate contractors on construction programming are not significantly different while the fourth hypothesis states that the efforts of indigenous and expatriate contractors on construction programming have no significant relationship with the outcome of the projects they executed. The results of the first and fourth hypotheses will enable indigenous contractors to compare their efforts on construction programming with those of their expatriate counterparts. The results of the second and third hypotheses will inform both indigenous and expatriate contractors concerning the contribution of their efforts on construction programming to the performance of the projects they execute.

Data were collected using structured questionnaires on the characteristics of the projects sampled. The respondents were also requested to tick whether or not each of the twelve programming processes were performed in the projects and to state the initial and actual contract periods and sums of the projects. The level of performance of each programming process was derived as the percentage of the number of projects in which a process was performed to the number of projects sampled. Contractor's level of construction programming was derived as the percentage of the number of processes performed to the expected number of processes to be performed which is twelve. Time-overrun that is the difference between initial and actual contract period and cost-overrun that is the difference between the initial and final contract sum of a project were derived. The parameters of project performance that is time and cost overruns were derived as the percentages of time-overrun to initial contract period and cost-overrun to initial contract sum. The instrument was administered in mid 2009 on either engineers or builders who were involved in the projects sampled as the heads of contractors' team. The data were analysed using percentage, Chi-square test, t-test and Spearman correlation test.

5 Results of Data Analysis

The results of the analysis of the data collected for the study are presented as follows.

5.1 Characteristics of the Projects Sampled

The characteristics of the projects sampled were investigated. Table 1 contains the results.

Table 1 Descriptive result of the characteristics of projects sampled

Characteristic	N	%	Characteristic	N	%
Project type			**Project client type**		
Building	72	83.7	Public	16	18.6
Road	14	16.3	Private	70	81.4
Total	86	100	Total	86	100
Project planner			**Project contractor type**		
Project manager	24	28.6	Indigenous	64	74.4
Architect	14	16.7	Expatriate	22	25.6
Builder	20	23.8	Total	86	100
Quantity surveyor	12	14.3			
Structural engineer	14	16.7			
Total	84	100			

N=Number of respondents

Table 1 shows that both building and road projects were sampled but building projects formed the majority. The two known types of project clients namely: public and private were covered in the study although the majority of the projects sampled were procured by private clients. The two types of contractors in Nigeria namely: indigenous and expatriates were equally covered in the study however; indigenous contractors constituted the majority. The professionals responsible for preparing the programme of work of the projects sampled were discovered to be project managers, architects, builders, quantity surveyors and structural engineers.

5.2 Level of Performance of Construction Programming Processes by Indigenous and Expatriate Contractors

The levels of performance of the selected programming processes by indigenous and expatriate contractors were analysed in order to determine their efforts in construction programming. In the analysis, the 12 processes involved in programming construction projects stated in the variables of the study were used. The performance of each process represents a programming effort therefore; the extents of performance of the processes by the two categories of contractors were analysed. The respondents were requested to indicate whether or not each process was performed in the programming of the projects sampled. The extents of performance of the twelve programming processes were analysed as explained in the research methods. The results are presented in Table 2.

Table 2: Percentages of performance of selected programming processes by indigenous and expatriate contractors in Nigeria

Construction programming process	Total N	%	Not prepared N	%	Prepared N	%	Construction programming process	Total N	%	Not prepared N	%	Prepared N	%
List of acties							**Summary of phases**						
Indigenous	64	100	10	15.6	54	84.4	Indigenous	64	100	18	28.1	46	71.9
Expatriate	22	100	4	18.2	18	81.8	Expatriate	22	100	6	27.3	16	72.7
Total	86	100	14	16.3	72	83.7	Total	86	100	24	27.9	62	72.1
Quantities of acties							**Sequences of acties**						
Indigenous	64	100	14	21.9	50	78.1	Indigenous	64	100	20	31.3	44	68.7
Expatriate	22	100	0	0	22	100	Expatriate	22	100	10	45.5	12	54.5
Total	86	100	14	16.3	72	83.7	Total	86	100	30	34.9	56	65.1
Period of acties							**Cash-flow chart**						
Indigenous	64	100	28	43.8	36	56.2	Indigenous	64	100	30	46.9	34	53.1
Expatriate	22	100	10	45.5	12	54.5	Expatriate	22	100	12	54.6	10	45.4
Total	86	100	38	44.2	48	55.8	Total	86	100	42	48.8	44	51.2
Start date of acties							**Plant schedule**						
Indigenous	64	100	12	18.8	52	81.2	Indigenous	64	100	28	43.8	36	56.2
Expatriate	22	100	6	27.3	16	72.7	Expatriate	22	100	10	45.5	12	54.5
Total	86	100	18	20.9	68	79.1	Total	86	100	38	44.2	48	55.8
Finish date of acties							**Labour schedule**						
Indigenous	64	100	20	31.3	44	68.7	Indigenous	64	100	44	68.8	20	31.2
Expatriate	22	100	4	18.2	18	81.8	Expatriate	22	100	10	45.5	12	54.5
Total	86	100	24	27.9	62	72.1	Total	86	100	54	62.8	32	37.2
Prodn rates of acties							**Material schedule**						
Indigenous	64	100	22	34.4	42	62.4	Indigenous	64	100	26	40.6	38	59.4
Expatriate	22	100	10	45.5	12	54.5	Expatriate	22	100	10	45.5	12	54.5
Total	86	100	32	37.2	54	62.8	Total	86	100	36	41.9	50	58.1

N=Number of respondents, Acties=activities, Prodn=production

Table 2 shows that the levels of preparation of lists (84.4%), durations (56.2%), start dates (81.2%), production rates (62.4%), sequences (68.7%), cash-flow charts (53.1%), plant schedules (56.2%) and material schedules (59.4%) of project activities by indigenous contractors are higher than the levels of preparation of lists (81.8%),

durations (54.5%), start dates (72.7%), production rates (54.5%), sequences (54.5%), cash-flow charts (45.4%), plant schedules (54.5%) and material schedules (54.5%) of project activities by expatriate contractors. However, the levels of preparation of quantities (100%), finish dates (81.8%), summary of major project phases (72.7%) and labour schedules (54.5%) of project activities by expatriate contractors are higher than the levels of preparation of quantities (78.1%), finish dates (68.7%), summary of major project phases (71.9%) and labour schedules (31.2%) of project activities by indigenous contractors.

5.3 Differences in Performance of Selected Programming processes by Indigenous and Expatriate Contractors

Further analysis was done to test for significant differences in the levels of preparation of the selected programming processes between indigenous and expatriate contractors. The analysis involved the test of the first hypothesis that the extents of performance of construction programming processes by indigenous and expatriate contractors are not significantly different. The hypothesis was tested using the Chi-square test with $p \leq 0.05$. The rule for the rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. The result is presented in Table 3.

Table 3 Results of Chi-square test for difference in the levels of performance of selected programming processes between indigenous and expatriate contractors

Process	N	χ^2	Df	p-value	Decision
Lists of project activities	86	0.079	1	0.779	Accept
Quantities of project activities	86	5.748	1	0.017	Reject
Durations of project activities	86	0.019	1	0.890	Accept
Start dates of project activities	86	0.719	1	0.307	Accept
Finish dates of project activities	86	1.390	1	0.238	Accept
Production rates of project activities	86	0.860	1	0.354	Accept
Summary of major project phases	86	0.006	1	0.939	Accept
Sequences of project activities	86	1.454	1	0.228	Accept
Cash-flow chart of project activities	86	0.385	1	0.535	Accept
Plant schedule of project activities	86	0.019	1	0.890	Accept
Labour schedule of project activities	86	3.803	1	0.051	Accept
Material schedule of project activities	86	0.157	1	0.692	Accept

N=Number of respondents, Df=Degree of freedom

Table 3 reveals that the p-value for the test of difference in the preparation of quantities of works involved in project activities between indigenous and expatriate contractors is less than the critical p-value (0.05), therefore the test rejects the hypothesis. This result indicates that the difference in the levels of preparation of quantities of work in project activities between the two categories of contractors is significant. However, the p-values for differences in the levels of preparation of other processes are greater than the critical p-value (0.05) therefore; the test fails to reject the hypothesis. The results indicate that the differences in the levels of preparation of lists, durations, start and finish dates, production rates, sequences, cash-flow chart, plant, labour and material schedules of project activities and the summary of major project phases between the two categories of contractors are insignificant.

5.4 Relationship between the Extents of Performance of Programming Processes by Indigenous and Expatriate Contractors and Project Outcome

To determine whether or not the performance of each programming process contributes to project outcome, the second research hypothesis that the extents of performance of selected construction programming processes by indigenous and expatriate contractors have no significant relationship with the outcome of projects they executed was tested. The extents of performance of each of the 12 selected programming processes and project time-overrun and cost-overrun were used to test the relationship. The hypothesis was tested using the Chi-square test with $p \leq 0.05$. The rule for the rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. The results are presented in Tables 4 and 5.

Table 4 Results of chi-square test of relationship between the levels of performance of selected programming process by indigenous contractors and project outcome

Parameters correlated	N	x^2	Df	P	Decision
Time-overrun					
Lists of project activities	56	53.548	21	0.025	Reject
Quantities of project activities	56	40.000	21	0.007	Reject
Durations of project activities	56	35.037	21	0.028	Reject
Start dates of project activities	56	37.820	21	0.014	Reject
Finish dates of project activities	56	47.289	21	0.001	Reject
Production rates of project activities	56	42.933	21	0.003	Reject
Summary of major project phases	56	41.778	21	0.004	Reject
Sequences of project activities	56	34.222	21	0.034	Reject
Cash-flow chart of project activities	56	41.258	21	0.005	Reject
Plant schedule of project activities	56	49.333	21	0.001	Reject
Labour schedule of project activities	56	31.111	21	0.072	Accept
Material schedule of project activities	56	43.938	21	0.002	Reject
Cost-overrun					
Lists of project activities	54	45.164	24	0.006	Reject
Quantities of project activities	54	46.286	24	0.004	Reject
Durations of project activities	54	41.574	24	0.014	Reject
Start dates of project activities	54	42.955	24	0.010	Reject
Finish dates of project activities	54	54.000	24	0.001	Reject
Production rates of project activities	54	48.000	24	0.003	Reject
Summary of major project phases	54	43.586	24	0.009	Reject
Sequences of project activities	54	45.424	24	0.005	Reject
Cash-flow chart of project activities	54	48.600	24	0.002	Reject
Plant schedule of project activities	54	45.989	24	0.004	Reject
Labour schedule of project activities	54	54.000	24	0.001	Reject
Material schedule of project activities	54	44.654	24	0.006	Reject

N=number of respondents, x^2 =Chi-square value, Df=Degree of freedom, p=p-value

Table 4 reveals that the p-value of the test of relationship between time-overrun and the level of preparation of the labour schedule of project activities is higher than the critical p-value (0.05) therefore; the test fails to reject the hypothesis. The result implies that the extent to which the labour schedule of project activities was prepared by indigenous contractors did not contribute to the time-overrun of the projects they executed.

However, the p-values of the test of relationship between time-overrun and the level of preparation of lists, quantities, durations, start and finish dates, production rates, sequences, cash-flow chart, plant and material schedules of project activities and the summary of major project phases are less than the critical p-value therefore; the test rejects the hypothesis. These results imply that the extents to which the lists, quantities, durations, start and finish dates, production rates, sequences, cash-flow chart, plant and material schedules of project activities and the summary of major project phases were prepared by indigenous contractors contributed to the time-overrun of the projects they executed.

Table 4 also reveals that the p-values of the test of relationship between cost-overrun and the levels of preparation of the lists, quantities, durations, start and finish dates, production rates, sequences, cash-flow chart, plant, labour and material schedules of project activities and the summary of major project phases by indigenous contractors are less than the critical p-value therefore; the test rejects the hypothesis. These results indicate that the extent to which all the twelve programming processes were prepared by indigenous contractors contributed significantly to the cost-overrun of the projects they executed.

Table 5 Results of chi-square test of relationship between the levels of performance of selected programming process by expatriate contractors and project outcome

Parameters correlated	N	x^2	Df	P	Decision
Time-overrun					
Lists of project activities	18	7.875	7	0.344	Accept
Quantities of project activities	18	**			
Durations of project activities	18	13.950	7	0.052	Accept
Start dates of project activities	18	13.500	7	0.061	Accept
Finish dates of project activities	18	18.000	7	0.012	Reject
Production rates of project activities	18	13.950	7	0.052	Accept
Summary of major project phases	18	13.500	7	0.061	Accept
Sequences of project activities	18	13.950	7	0.052	Accept
Cash-flow chart of project activities	18	13.950	7	0.052	Accept
Plant schedule of project activities	18	18.000	7	0.012	Reject
Labour schedule of project activities	18	18.050	7	0.012	Reject
Material schedule of project activities	18	18.000	7	0.012	Reject
Cost-overrun					
Lists of project activities	20	20.000	10	0.029	Reject
Quantities of project activities	20	**			
Durations of project activities	20	20.000	10	0.029	Reject
Start dates of project activities	20	20.000	10	0.029	Reject
Finish dates of project activities	20	20.000	10	0.029	Reject
Production rates of project activities	20	20.000	10	0.029	Reject
Summary of major project phases	20	20.000	10	0.029	Reject
Sequences of project activities	20	20.000	10	0.029	Reject
Cash-flow chart of project activities	20	20.000	10	0.029	Reject
Plant schedule of project activities	20	20.000	10	0.029	Reject
Labour schedule of project activities	20	20.000	10	0.029	Reject
Material schedule of project activities	20	20.000	10	0.029	Reject

N=Number of respondents, x^2 =Chi-square value, Df=Degree of freedom, p=p-value,**= value is a constant.

Table 5 reveals that the p-values of the test of relationship between time-overrun and the levels of preparation of lists, durations, start dates, production rates, sequences, cash-flow chart of project activities and the summary of major project phases are higher than the critical p-value (0.05) therefore; the test fails to reject the hypothesis. These results indicate that the extents to which the lists, durations, start dates, production rates, sequences and cash-flow chart of project activities and the summary of major project phases were prepared by expatriate contractors did not contribute to the time-overrun in of the projects they executed. However, the p-values of the test of relationship between time-overrun and the levels of preparation of the finish dates, plant, labour and material schedules of project activities are less than the critical p-value therefore; the test rejects the hypothesis. These results show that the extents to which the finish dates, plant, labour and material schedules of project activities were prepared by expatriate contractors contributed significantly to the time-overrun of the projects they executed.

Table 5 also reveals that the p-values of the test of relationship between cost-overrun and the levels of preparation of lists, durations, start and finish dates, production rates, sequences, cash-flow chart, plant, labour and material schedules of project activities and the summary of major project phases are less than the critical p-value (0.05) therefore;

the test rejects the hypothesis. These results indicate that the extents to which all the programming processes except durations of project activities were prepared by expatriate contractors contributed significantly to the cost-overrun of the projects they executed.

6.5 Difference between Programming Efforts of Indigenous and Expatriate Contractors

To compare the efforts of the two categories of contractors in Nigeria on the programming of the projects they execute, the efforts of the contractors on programming were measured as described in the research methods. For the purpose of the comparison, the third hypothesis was tested. The hypothesis states that the efforts of indigenous and expatriate contractors on the programming of projects are not significantly different. The hypothesis was tested using the t-test with $p \leq 0.05$. The rule for the rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. Table 6 contains the results.

Table 6 Results of t-test for difference between programming efforts of indigenous and expatriate contractors

Variables differentiated	N	Mean	SD	t-value	Df	p-value	Decision
Levels of programming efforts							
Indigenous contractors	64	0.61	0.151	-0-210	84	0.834	Accept
Expatriate contractors	22	0.62	0.158				

N=Number of respondents, SD=Standard deviation, Df=Degree of freedom

Table 6 reveals that the p-value for the test of difference in the efforts of indigenous and expatriate contractors on programming of projects is higher than the critical p-value (0.05); therefore the test fails to reject the hypothesis. This result indicates that the efforts of indigenous and expatriate contractors on programming of projects are not significantly different.

5.5 Relationship between Effort of Indigenous and Expatriate Contractors on Programming and Project Outcome

The study also evaluated the contribution of the efforts of the two categories of contractors on construction programming to project outcome. To achieve this, the fourth research hypothesis was tested. The hypothesis states that the efforts of indigenous and expatriate contractors on construction programming have no significant relationship with the outcome of the projects they executed. The hypothesis was tested using the Spearman correlation test with $p \leq 0.05$. The rule for the rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. The result is presented in Table 7.

Table 7 Results of Spearman correlation test for relationship between the efforts of indigenous and expatriate contractors on programming and project outcome

Parameters correlated	N	Mean	SD	R	p	Decision
Indigenous contractors effort on programming	56	0.27	0.249	0.215	0.112	Accept
Time-overrun	54	0.07	0.115	0.134	0.332	Accept
Cost-overrun						
Expatriate contractors effort on programming	18	0.23	0.140	-0.309	0.212	Accept
Time-overrun	20	0.08	0.074	0.245	0.297	Accept
Cost-overrun						

N=Number of respondents, SD=Standard deviation, R=Spearman correlation value, p=p-value

Table 6 reveals that the p-values for the test of relationship between the efforts of the two categories of contractors on programming and the time-overrun and cost-overrun of the projects they executed are higher than the critical p-value (0.05) therefore the test fails to reject the hypothesis. The result indicates that the efforts of the contractors on programming had no significant relationship with the outcome of the projects they executed. In other words, the overall effort of the contractors on programming did not contribute to project outcome.

6 Discussion of Findings

The test of the first hypothesis in Table 3 has revealed that the two categories of contractors differ only in the extents to which the quantities of work in project activities are prepared. The analysis of the performance of selected programming processes in Table 2 implies that expatriate contractors prepare the quantities of work involved in project activities more than their indigenous counterparts. The result implies that the only difference in the programming efforts of the two contractors is that expatriate contractors are more concerned with preparing the quantities of work involved in the activities of the projects they execute than indigenous contractors. However, the test of the third research hypothesis in Table 6 shows that the overall efforts of the two categories of contractors on programming of projects are the same. This finding tends to indicate that if construction programming contributes to project performance as claimed by Faniran *et al.* (1999), the contribution is expected to be the same for projects executed by the two categories of contractors. In other words, the advantage of better performance on the part of expatriate contractors discovered in research studies (Idoro, 2004 and 2009) cannot be attributed to better programming of projects.

The results of the second and fourth hypotheses tend to indicate that the overall efforts of the two types of contractors on construction programming do not really contribute to project outcome but the extent to which each process is performed does contribute to project outcome. The test of the second hypothesis tends to indicate that the preparation of all the programming processes except labour schedule will reduce the time and cost overruns of projects executed by indigenous contractors. This result is an indication that the preparation of the programming processes will improve the performance of projects executed by indigenous contractors. The reason for this is not unconnected with the fact that each process often produces information that is useful for the monitoring and control of a project. The effectiveness and efficiency of project monitoring and control processes and the eventual success of a project are based on the available information generated during construction planning. This finding agrees with the findings in the

study conducted by Faniran *et al.* (1999) that construction planning has effect on project performance.

The result of the second hypothesis also indicate that the preparation of the finish dates and plant, labour and material schedules of project activities contribute to the time-overrun and all the programming processes except the quantities of work involved in project activities contribute to the cost-overrun of projects executed by expatriate contractors. This result implies that the preparation of some of the programming processes will improve the performance of projects executed by expatriate contractors.

7 Conclusion

The purpose of the study is to evaluate the contribution of the efforts of indigenous and expatriate contractors in Nigeria on construction programming to the performance of the projects they execute. This was achieved through a survey of eighty-six construction projects. From the findings of the study, it is concluded that first, indigenous contractors in Nigeria compare with their expatriate counterparts on construction planning. The only significant difference in their efforts is that expatriate contractors are more concerned with the preparation of the quantities of work involved in the activities of the projects they execute than their indigenous counterparts. Second, many of the processes involved in construction planning contribute significantly to project outcome whereas the overall efforts of the two types of contractors on construction planning do not. This finding tends to show that the influence of construction planning on project outcome is based on the processes involved in programming.

From the conclusion of the study, indigenous and expatriate contractors need to concentrate their efforts on the processes of construction planning and be concerned with how well the processes are done. They should ensure that the processes investigated in the study are properly carried out in order to monitor and control projects effectively. Since the processes are derived from the features of Microsoft project software, it is suggested that both indigenous and expatriate contractors should adopt the software for the programming of the contracts awarded to them.

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Planning Law

Expert Evidence and Expertise in Dispute Resolution

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Abstract:
Courts and tribunals determining environmental, planning, and land use disputes routinely rely on expert evidence from a range of disciplines. The decision maker may themselves have expertise which frames the perspective through which expert evidence is viewed. The approach adopted by a particular court or tribunal to the admissibility of expert evidence, and the form in which it is provided, may depend less on whether the dispute resolution process takes an adversarial form than on other factors, including the nature of the issues in dispute and the constitution of the decision-making body. The challenges posed by environmental and land use disputes, including the diversity and complexity of the issues raised, make it imperative that expert evidence is focussed on assisting the decision-maker to reach a sound and justifiable outcome. Specialist environmental courts and tribunals are not unique in seeking more effective ways to elicit and manage expert evidence than have traditionally been adopted in adversarial dispute resolution. Australian environmental courts and tribunals have been active in implementing procedural reforms relating to expert evidence, including court-appointed experts, joint conferencing, and concurrent evidence.

Keywords:
dispute resolution, environmental law, expert evidence, planning law

1 Introduction

The purpose of this paper is to identify the challenges for the provision of expert evidence in environmental and planning disputes, and to consider how reforms to civil procedure have impacted on provision of expert evidence across a broad range of adversarial dispute resolution processes. Australian specialist environmental courts and tribunals, in particular the Land and Environment Court of New South Wales (LEC), and the generalist Administrative Appeals Tribunal (AAT), have adopted many civil procedure reforms relating to expert evidence, including single experts, joint conferencing, and concurrent evidence. There is limited research on whether these reforms have achieved the desired efficiencies in cost and time, and whether they have contributed to an increase in impartiality and value of expert evidence to the dispute resolution process.

2 Expert evidence in environmental and land use disputes

Australia has a well developed system for the hearing of appeals in relation to environmental and land use decisions made at all levels of government, from Commonwealth or State Ministers through to local authorities. In most instances, such

appeals are appeals de novo, where the reviewing court or tribunal is not limited to the evidence before the decision maker, and has the power to substitute a new decision for that of the original decision maker, based on evidence presented to it which may include expert evidence. Such appeals are generally determined at the Commonwealth level by the AAT, established in 1975 and deriving its jurisdiction from a range of legislation.[1] Appeals in respect of decision making at the local, State and Territory levels are heard by a variety of separately established courts or tribunals.[2] In addition to the review of administrative decisions by courts or tribunals, Australian courts hear and determine environmental civil enforcement and judicial review proceedings, and criminal proceedings, which may also require the presentation of expert evidence.

There is a developing body of literature on specialist environmental courts and tribunals (Pring & Pring, 2009), and a detailed consideration is beyond the scope of this paper. This paper focuses on one such court, the LEC, and a generalist tribunal that hears environmental disputes. The LEC is a specialist environmental court, established in 1980 as a superior court of record.[3] Classes 1, 2 and 3 of its jurisdiction include appeals heard de novo and a number of other civil disputes; Class 4 is the civil enforcement and judicial review jurisdiction; criminal prosecutions are heard in Class 5; Classes 6 and 7 are appeals from the local court; and Class 8 is a relatively recently conferred jurisdiction relating to mining matters. The LEC exercises both administrative power and judicial power, depending on the nature of the proceedings and the class of jurisdiction. In contrast, the AAT is a general merits review tribunal which exercises only executive power in reviewing decisions of Commonwealth government officials and agencies. In common with many other specialist environmental courts and tribunals, both the AAT and the LEC include among their members persons with specialist qualifications and expertise in areas other than law; and those members appointed without such specialist qualifications soon acquire through the course of decision making experience and expertise in areas other than law.

In most instances Australian courts and tribunals determining merits appeals are not bound by the rules of evidence. However, the rules of evidence, now codified to some extent in legislation,[4] provide the framework within which decisions are made as to which evidence to admit and how much weight to give it. Courts hearing civil enforcement, criminal, and judicial review proceedings are bound by the rules of evidence. Those rules prohibit the provision of opinion evidence, subject to some exceptions, including the provision of evidence by a person with "specialised knowledge based on the person's training, study or experience".[5]

The need for expert evidence arises as a consequence of the nature of disputes presented to the courts and tribunals hearing environmental and land use disputes. A major part of the LEC caseload comprises appeals from decisions of local authorities refusing consent to proposed development, or imposing conditions, or making orders directing landholders to do or refrain from carrying out certain activities (such as using premises

[1] The central Commonwealth environmental legislation is the *Environment Protection and Biodiversity Conservation Act* 1999; other legislation conferring jurisdiction on the AAT includes the *Great Barrier Reef Marine Park Act* 1975.
[2] The Australian Capital Territory Administrative Appeals Tribunal, the Land and Environment Court of NSW, the Planning and Environment Court of Queensland, the Environment, Resources and Development Court of South Australia, the Tasmanian Resource Management and Planning Appeals Tribunal, the Victorian Civil and Administrative Tribunal, and the Western Australian State Administrative Tribunal.
[3] *Land and Environment Court Act* 1979 (NSW).
[4] The *Evidence Act* 1995 (Cth) is the model which has been adopted elsewhere, including in NSW: *Evidence Act* 1995 (NSW).
[5] *Evidence Act* 1995 (NSW) s79.

for a purpose without development consent). Such appeals may require the court (usually constituted by a Commissioner) to decide both threshold legal issues, such as permissibility of proposed development, and issues going to the merits of the application such as whether the proposed development should be approved and on what conditions. Merits issues routinely require consideration of planning issues such as consistency with the objectives of applicable planning instruments, and often include assessment of noise impacts, social impacts (eg in relation to operation of licensed premises), ecological issues (eg impacts on threatened species), bushfire protection, and engineering questions (eg adequacy of drainage). All of these issues are matters on which the Court will usually be assisted by expert evidence. Criminal prosecutions can require expert evidence to assist the Court to determine issues such as whether vegetation cleared allegedly in breach of the applicable legislative prohibition is in fact "native vegetation".[1] Judicial review proceedings can require the Court to determine, as a jurisdictional fact, whether or not a proposed development is likely to significantly affect threatened species, as part of its determination whether a development consent was validly granted.[2]

The challenges of environmental and land use dispute resolution include the broad diversity of issues that may require provision of expert evidence; the complexity of some of the issues (such as urban ecology: Taylor & Ives, 2009); a relatively small pool of individuals who might be qualified to give expert evidence in some areas; and simply a lack of reliable data and research.

One example which illustrates the complexity of environmental dispute resolution was a decision of Preston J, the Chief Judge of the LEC, Newcastle & Hunter Valley Speleological Society Inc v Upper Hunter Shire Council & Stoneco Pty Ltd [20101] NSWLEC 48, which was a challenge to the granting by the council of consent for a limestone quarry. The issues in the appeal included whether the proposal was likely to significantly affect the White Box Yellow Box Blakely's Red Gum Woodland (White Box EEC), which was an endangered ecological community, and the habitat of the Squirrel Glider (a threatened species); and whether the limestone on the site was likely to contain caves and other karst features and cave-dwelling fauna, such that the proposal was likely to cause serious or irreversible damage to those karst features and fauna. The Court (constituted by Preston J, assisted by an Acting Commissioner with qualifications in ecology) heard evidence from experts on vegetation and soils in order to determine whether or not the vegetation on the project site comprised the White Box EEC as defined, and in determining whether or not the project was likely to have a significant effect on the EEC. On the limestone issues, the Court heard evidence from experts in geology, concluding:

177 In the present matter, although there is an absence of site-specific information on biota in the limestone, the presence of biota in caves and groundwater in the near vicinity of the site and the increasing number of studies elsewhere that establish the presence of biota in limestone, make it scientifically likely that some form of biota will be found within the limestone on the site. Without being able to predict the particular species which would be present, it is beyond a mere possibility that biota will be present. This scientific likelihood is sufficient to engage the precautionary principle…

[1] *Native Vegetation Act* 2003 (NSW) Part 2.
[2] *Environmental Planning and Assessment Act* 1979 (NSW) s78A(8).

178 If there is biota present then, at least within the extraction area, the biota will be harmed by quarrying. Such harm would constitute serious and irreversible environmental damage. There is uncertainty as to the threat of environmental damage flowing from the uncertainty as to the presence of voids and fissures, with available water, to support biota. However, the threat of environmental damage is scientifically likely; there is reasonable scientific plausibility that there are voids and fissures, with available water, to support biota, which would be damaged by quarrying: Telstra Corporation Ltd v Hornsby Shire Council [2006] NSWLEC 133; (2006) 67 NSWLR 256; (2006) 146 LGERA 10 at [148].

The Court concluded that an appropriate response to the threat of environmental damage to biota within the limestone was to implement an adaptive management approach through conditions of consent requiring monitoring linked to adaptive management.

3 Requirements for expert evidence

The now common reliance by courts and tribunals on expert evidence from a range of disciplines is a relatively recent development. During the 19th and early 20th centuries the courts were mistrustful of evidence given by scientific experts, who were often perceived to be in support of the cause in which they were embarked, and in favour of the person employing them (Bergin, 2011). As recently as 1963 the NSW Supreme Court referred to expert scientists being "affected in greater or less degree by the kind of unconscious bias which is a well known characteristic of expert evidence".[1]

Both the United Kingdom and Australia have made significant reforms to expert evidence procedures in recent years. The UK reforms have their origin in the reports of Lord Woolf in 1995 and 1996 which led to Part 35 of the Civil Procedure Rules 1998 (UK) (CPR). The reforms in New South Wales built on those reforms, and the relevant legislation applicable to NSW courts and tribunals is the Civil Procedure Act 2005 and the Uniform Civil Procedure Rules 2005 (UCPR). These reforms were driven in part by a perceived need to reduce costs and complexity in civil litigation, and also by a desire to improve the quality of expert evidence and its provision.

The threshold question in any proceedings is whether expert evidence is admissible. Expert opinion evidence given by someone with “specialised knowledge based on training, study or experience” can only be given where the opinion of that person is wholly or substantially based on that knowledge.[2] If a person without experience in the area would be able to form an opinion on the matter without the assistance of a person possessing specialised knowledge, expert evidence is not admissible (Pepper, 2011). The critical issues will be that the expert have specialised knowledge based on their training study or experience; that the field be sufficiently recognised as a reliable body of knowledge; that the evidence be based on that specialised knowledge; that the facts or assumptions on which the opinion is provided are established or are made explicit; and that the reasoning engaged in to arrive at the conclusions is set out (Pepper, 2011).

Australian courts and tribunals share with the UK a reliance on what Dwyer has described as “notions of decent conduct and fair play” (Dwyer, 2008:347): that is, imposing on experts an overriding duty to assist the court, which finds its expression in

[1] *Miller Steamship Co Pty Ltd v Overseas Tankship (UK) Ltd* [1963] NSWR 737 at 753.
[2] Section 76, 79 *Evidence Act* 1995 (NSW).

express statements in the applicable rules.[1] In NSW expert witnesses are required to agree to be bound by a code of conduct, and to acknowledge that agreement in their written report, failing which their report may not be admitted, and their oral evidence not received, without leave of the court.[2]

4 Particular issues

There are two distinctive features of environmental and land use dispute resolution in the LEC and the AAT which may impact on the expert evidence provided to, and required by, those bodies.

4.1 Council staff as experts

It is not uncommon in appeals heard by the LEC from decisions of a local authority for the council to lead expert evidence from one of its employees, commonly from planning officers or other officers with engineering or building qualifications. Resource limitations mean that many councils only retain the services of external experts where their own staff have recommended approval of a proposed development and would as a consequence be unable to give expert evidence in support of the council's case in an appeal against refusal of consent. The general proposition is that an employee is not precluded from giving expert evidence; however, their evidence may be given less weight.3 The issue is whether the expert has the required degree of impartiality.4 For example, in one matter the LEC rejected evidence from a council officer who had been involved in the proposal for the development and whose report contained not only facts but partisan opinions.5 It can be difficult to determine the point at which a council officer ceases to be able to provide impartial expert evidence and demonstrates the degree of connection with the subject matter that precludes them from giving expert evidence.

4.2 Expertise of decision maker

Both the LEC and the AAT are required to consider the question of expertise in constituting the court or tribunal for particular matters. The qualifications for appointment of a Commissioner of the LEC are specified in s12 of the Land and Environment Court Act, and include qualifications and experience in planning, valuation, engineering, and architecture. For members of the AAT, the relevant provision is s7 of the AAT Act which includes a similarly broad range of disciplines and expertise. Section 30(2) of the Land and Environment Court Act requires the Chief Judge to have regard to the knowledge, experience and qualifications of the Commissioners and to the nature of the matters involved in the proceedings in determining the Commissioner or Commissioners who is or are to exercise the jurisdiction of the Court in relation to any proceedings. In Classes 1, 2 and 3 of the Court's jurisdiction a Judge may sit with the assistance of a Commissioner with particular relevant qualifications. A similar requirement to consider the type of expertise that may be relevant applies to constitution of the AAT.6 Both the AAT and LEC have

[1]CPR r35.3: Dwyer 2008.
[2] UCPR r31.23.
[3] *Fagenblat v Feingold Partners Pty Ltd* [2001] VSC 454 at [7]; *Sydney South West Area Health Service v Stamoulis* [2009] NSWCA 153 at [211].
[4] *Pittwater Council v A1 Professional Tree Recycling Pty Ltd* [2008] NSWLEC 325.
[5] *Willoughby City Council v Transport Infrastructure Development Corporation (No 2) [2008] NSWLEC 238.*
[6] *Administrative Appeals Tribunal Act* 1975 (Cth) s23B.

part time members with a diverse range of expertise: in the AAT, that includes expertise in aviation, engineering, environmental science, medicine, pharmacology, military affairs and public administration (Downes, 2011).

Consideration of how an AAT member or an LEC Commissioner who has specific expertise relevant to the issues in dispute can make use of that expertise has generally been framed in terms of procedural fairness. The parties must be alerted to information derived from that expertise where the decision-maker proposes to reach a conclusion based on their knowledge of a particular fact, or relying on a particular expertise.1 Beyond this constraint, there appears to be acceptance that a decision-maker appointed because of their expertise should be able to use it in the decision-making process;2 the unresolved issues are the extent to which such knowledge should be contestable by the parties (Cane, 2009: 241), and precisely how that expertise is used by the decision-maker. At the least a decision-maker with expertise should be better able to evaluate competing expert evidence, or at least know what questions need to be asked of the expert witnesses. The LEC makes use of the expertise of Commissioners in conciliation of many of the matters that are appealed to the Court (Preston, 2007).

5 Procedural matters

In NSW, the main purposes for the provision of expert evidence are set out in r31.17 of the UCPR:

(a) to ensure that the court has control over the giving of expert evidence;

(b) to restrict expert evidence in proceedings to that which is reasonably required to resolve the proceedings,

(c) to avoid unnecessary costs associated with parties to proceedings retaining different experts,

(d) if it is practicable to do so without compromising the interests of justice, to enable expert evidence to be given on an issue in proceedings by a single expert engaged by the parties or appointed by the court,

(e) if it is necessary to do so to ensure a fair trial of proceedings, to allow for more than one expert (but no more than are necessary) to give evidence on an issue in the proceedings,

(f) to declare the duty of an expert witness in relation to the court and the parties to proceedings.

The LEC Practice Directions set out the requirements for when, and how, expert evidence is provided in each of the classes of the Court's jurisdiction.3 Distinctive features of the LEC's approach to expert evidence include the requirement that the parties first consider whether expert evidence is required on a particular issue; appointment of single experts if appropriate; routine joint conferencing of parties' experts; and provision of oral evidence by experts as concurrent evidence. These are

[1] *Tisdall v Health Insurance Commission* [2002] FCA 97.
[2] *Gillies (AP) v Secretary of State for Work and Pensions Scotland* [2006] UKHL 2.
[3] Practice Directions are authorised by r31.20 of the UCPR. LEC Practice Directions are available at: http://www.lawlink.nsw.gov.au/lawlink/lec/ll_lec.nsf/pages/LEC_practicedirections.

discussed in more detail below, however it is worth noting here that the adoption of procedures such as these is entirely consistent with the prevailing trends in civil litigation more generally, both in Australia and elsewhere. Dwyer argues that the changes contained in the CPR are an attempt to provide more efficient use of resources, both state and party, through more active case management, and that the significant change in the use of experts under CPR Pt 35 and the nature of expert roles is a reflection of broader changes in the culture of civil procedure (Dwyer, 2008: 210). That is consistent with the NSW experience, where the Civil Procedure Act states as the overriding purpose of the Act and the rules as being "to facilitate the just, quick and cheap resolution of the real issues in the dispute or proceedings".1 This statement of overriding purpose is supplemented by a legislative statement of the objects of case management (s57); and directions that the court act in accordance with the dictates of justice (s58), eliminate delay (s59), and implement procedures with the object of resolving the issues between the parties in such a way that the cost to the parties is proportionate to the importance and complexity of the subject-matter in dispute (s60).

5.1 Single experts

The LEC Practice Directions provide that parties must first consider whether expert evidence is genuinely necessary to resolve the issues in dispute.2 Where expert evidence is necessary, the Practice Directions encourage consideration of whether a single expert is appropriate, by reference to:

(a) the importance and complexity of the subject matter in dispute in the proceedings;

(b) the likely cost of obtaining expert evidence from a parties' single expert compared to the alternative of obtaining expert evidence from individual experts engaged by each of the parties;

(c) the proportionality of the cost in (b) to the importance and complexity of the subject matter in (a);

(d) whether the use of a parties' single expert in relation to an issue is reasonably likely either to narrow the scope of the issue or resolve the issue;

(e) the nature of the issue, including:

(i) whether the issue is capable of being answered in an objectively verifiable manner;

(ii) whether the issue involves the application of accepted criteria (such as Australian Standards) to ascertainable facts;

(iii) whether the issue is likely to involve a genuine division of expert opinion on methodology, or schools of thought in the discipline; and

(iv) whether the issue relates to the adequacy or sufficiency of information provided in the development appeal application;

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[1] *Civil Procedure Act* 2005, s56(1).

[2] *Practice Note Class 1 Development Appeals* at [42]; *Practice Note Class 1 Residential Development Appeals* at [53]; *Practice Note Classes 1, 2 and 3 Miscellaneous Appeals* at [30]; *Practice Note Class 3 Valuation Objections* at [34].

(f) whether the evidence of the parties' single expert involves the provision of aids to assist in the assessment of a development appeal application (such as shadow diagrams, view lines or photo montages).

(g) whether the parties' single expert would be required independently to obtain further information or to undertake monitoring, surveys or other means of obtaining data before being able to provide expert evidence;

(h) whether the parties are prepared at the time to proceed to hearing on the basis of a parties' single expert report about the issue and no other expert evidence about that issue;

(i) whether the integrity of expert evidence on the issue is likely to be enhanced by evidence being provided by a parties' single expert instead of by individual experts engaged by the parties; and

(j) whether the Court is likely to be better assisted by expert evidence on the issue being provided by a parties' single expert instead of by individual experts engaged by the parties.

The parties may agree on an expert ("parties' single expert") or the court may decide to appoint a "court appointed expert". The Court must be satisfied that it is practical to appoint a court appointed expert, and that it is in the interests of justice to do so.1 The parties require leave of the Court to adduce evidence of another expert on an issue where a single expert has been appointed to provide evidence on that issue.

A single expert (whether engaged by the parties or court-appointed) may not be appropriate where the relevant discipline recognises that there may be more than one school of thought on an issue and where a single expert may employ only one method of analysis (Pepper, 2011). Appointment of a single expert may not assist in reducing time and associated costs for the arties if the parties engage their own experts to "shadow" a single expert (Livingstone, 2008: 47). The use of single experts in the LEC, whether parties' single experts or court-appointed experts, has declined in recent years: while between March 2004 and April 2005 there were 171 court-appointed experts in the LEC, in 2010 there were only 5 parties' single experts and no court-appointed experts (Pepper, 2011). That may be because the LEC routinely utilises Commissioners with expertise in certain areas (Pepper, 2011); or it may reflect concerns that there are more fundamental limitations with this mode of expert evidence, including concern that it is not possible to test whether the views provided in this form are correct in the absence of evidence to the contrary (Livingstone, 2008: 48; Rackemann, 2011).

5.2 Conferencing

A routine feature of litigation in the LEC is a requirement for joint conferencing of experts, with the provision to the Court of a joint report which "must specify matters agreed and matters not agreed and the reasons for any disagreement".2 The LEC's further requirements for a joint report are:3

[1] UCPR r31.17(d).
[2] UCPR r31.26(2).
[3] *Practice Note Class 1 Development Appeals* at [54]; *Practice Note Class 1 Residential Development Appeals* at [61]; *Practice Note Classes 1, 2 and 3 Miscellaneous Appeals* at [42]; *Practice Note Class 3 Valuation Objections* at [46]; *Practice Note Class 4 Proceedings* at [46].

If experts are directed by the Court to confer, experts are to ensure that their joint conference is a genuine dialogue between experts in a common effort to reach agreement with the other expert witness about the relevant facts and issues. Any joint report is to be a product of this genuine dialogue and is not to be a mere summary or compilation of the pre-existing positions of the experts.

Lawyers are not permitted to attend a joint conference, or be involved in the preparation of a joint report, without the leave of the Court.

Joint conferencing may not necessarily reduce time and costs to the parties (Livingstone, 2008: 57). Reservations have been expressed as to whether joint conferencing improves the quality and impartiality of evidence, in particular whether the process can be hindered by entrenched or inflexible views, hostility between experts, or domination of the process by more senior or experienced experts (Livingstone, 2008: 55). There is an added difficulty where an expert later withdraws or modifies agreement reached in the joint conferencing process, and in identifying when it is appropriate to grant a party leave to adduce additional evidence from another expert (Livingstone, 2008: 56). On a more practical level, joint conferencing is of limited assistance where the experts fail, or refuse, to engage with each other to identify areas where agreement can be reached.

5.3 Concurrent evidence

There is some debate as to its origins (Bergin, 2011; Livingstone, 2008), however concurrent evidence (or "hot tubbing" as it is sometimes referred to) is now an accepted aspect of the provision of oral evidence in the course of proceedings in many Australian courts, including the LEC, and in the AAT. The earliest use of concurrent evidence in the AAT was in 1994 (Administrative Appeals Tribunal, 2005). The LEC commenced routine use of concurrent evidence in March 2004 (Administrative Appeals Tribunal, 2005), and the LEC's Practice Notes assume that where expert evidence is given from more than one expert in the same discipline it will be given concurrently unless the hearing Judge or Commissioner orders to the contrary.1 There is no express reference to concurrent evidence in the UCPR, and in the LEC the procedure is as directed by the Judge or Commissioner hearing the matter. The procedure was described by McClellan J in BGP Properties Pty Ltd v Lake Macquarie City Council [2004] NSWLEC 399:

121 The issues which were ultimately defined in the proceedings required resolution of the different views of experts in relation to a number of significant matters. As will become commonplace in proceedings in this Court, the oral testimony of the experts was taken by a process of concurrent evidence. This involved the swearing in of the experts with similar expertise, who then gave evidence in relation to particular issues at the same time. Before giving evidence, the experts had completed the joint conferencing process, which enabled the court to identify the differences which remained and which required resolution through the oral evidence. Each witness was then given an opportunity to explain their position on an issue and provided with an opportunity to question the other witness or witnesses about their position. Questions were also asked by counsel for the parties. In effect, the evidence was given through a discussion in which all of the experts, the advocates and the Court participated.

An example of an appeal in the AAT involving concurrent expert evidence was The International Fund for Animal Welfare (Australia) Pty Ltd and Ors and Minister for

[1] For example, *Practice Note Class 1 Development Appeals* at [56]; *Practice Note Class 4 Proceedings* at [48].

Environment and Heritage and Ors [2005] AATA 1210, a challenge to the Minister's decision to grant permits for the import of eight Asian elephants (listed in the Convention on International Trade in Endangered Species of Wildlife, Fauna and Flora (CITES)) to two Australian zoos.1 The issues requiring determination included whether the elephants were being imported "for the purposes of conservation breeding or propagation"; whether the zoos were "suitably equipped to manage, confine and care for the animals, including meeting the behavioural and biological needs of the animals"; and whether the importation of the elephants would "be detrimental to, or contribute to trade which is detrimental to ... the survival …or …recovery in nature of" Asian elephants. There were 17 expert witnesses, with qualifications and expertise in areas ranging from veterinary science, ecology, to animal behaviour. The means by which the evidence was provided is described as follows:

43. The means by which most of the evidence was taken was the process now frequently used in the Tribunal which the Tribunal has called "concurrent evidence". All of the witnesses prepared reports or made affidavits. The reports and affidavits were admitted without objection except as to relevance. Prior to giving evidence witnesses whose evidence related to similar areas of expert knowledge conferred with one another. This process involved up to four witnesses at a time. Legal representatives were not present. Sometimes the meeting was wholly or partly by telephone including international telephone calls. Witnesses who gave evidence on more than one area of expert knowledge were involved in more than one meeting. The witnesses who took part in this process included the chief executive officers and other employees of the zoos. The chief executive officers were also cross examined conventionally on non expert issues. During their meetings the experts were asked to isolate the matters on which they reached agreement and the matters on which they continued to disagree. They were asked to reduce this to writing. So far as the Tribunal is aware this process took place without any intervention from the legal representatives except, perhaps, in the provision of typing facilities.

44. Each group of witnesses took an oath or affirmation to be truthful. They sat alongside one another. Not all witnesses were in the hearing room. Some were overseas. They joined the concurrent evidence session by video link. In one case (Mr Kumar) the evidence was received by telephone. Dr Atkinson and Dr Stevenson gave evidence concurrently from the United Kingdom by video link. At the time they were in separate parts of the country.

45. At the beginning of each session the agreed statements were received in evidence. The witnesses were then asked, in turn, to state succinctly what they wished to stress as the essential parts of their evidence. Some of the witnesses accepted this opportunity. Others did not. They were then asked, in turn, whether they wished to ask any of the other witnesses questions or to comment on what the other witnesses had said. Counsel for the parties were then invited to ask questions of any of the witnesses. During all this time members of the Tribunal asked questions when they thought it was appropriate.

The hearing ran for seven days; it is not possible to determine how many days might have been required for more traditional presentation of the expert evidence.

[1] Another case involving a large number of experts of different areas of expertise in the AAT is *No Ship Action Group Inc and Minister for Sustainability, Environment, Water, Population and Communities and State of New South Wales (Joined Party)* [2010] AATA 702, a challenge to the Minister's decision to grant a permit for the scuttling of a former navy frigate in the coastal waters off New South Wales.

The benefits of concurrent evidence are said to be that it enhances the quality of the court's decision by identifying the fundamental issues and providing the material necessary to resolve them, and that it saves time;1 and that it helps to narrow the issues in dispute (Pepper, 2011). There is disagreement as to whether concurrent evidence assists the less articulate expert in presenting their evidence. McClellan J when Chief Judge of the LEC was of the view that it does, and thereby both assists communication between the experts and assists the court in deciding which expert to accept (McClellan 2005); however Davies J was not persuaded that it would prevent the court being unwittingly convinced by the more articulate or authoritative personality (Pepper, 2011). There is dispute as to whether it reduces the likelihood of adversarial bias. Edmond, for example, doubts whether simply allowing experts to respond during the same session rather than a day or week later can produce a demonstrable change in behaviour (Edmond, 2009:172). On a more fundamental level, Edmond questions whether adversarial bias is deliberate or necessarily detrimental - after all, experts may be selected by the parties because they already adhere to particular assumptions or commitments, and experts do not enter into disputes without some professional, institutional or ideological "baggage" (Edmond, 2009:173). It may be impossible for the decision maker to determine whether an expert's reluctance to agree with others is because of legitimate professional differences, or simply because of a desire to advance the cause of the party engaging them (Edmond, 2009:174).

At its minimum, there seems to be agreement that concurrent evidence enhances communication and comprehension in court. As Edmond notes (2009: 174):

If nothing else, concurrent-evidence procedures require the experts to meet and talk, they enable expert witnesses to give longer explanations using their own words, they encourage experts to comment directly on the testimony of others, and they provide a forum where judges are less restricted in their questioning of witnesses and enable fact finders to observe the interaction between experts.

Edmond cautions, however, that there are no guarantees that concurrent evidence can narrow disagreement or encourage co-operation, or make decision-making easier, less controversial or more accurate (Edmond, 2009: 174-5). It also needs to be noted that whatever the benefits of the concurrent evidence model for adducing evidence at trial, it should not be considered a substitute for appropriate pre-trial management to obtain the benefit of expert discourse at an earlier time (Rackemann, 2011).

There has been limited empirical research into concurrent evidence. That which has been conducted suggests that concurrent evidence is supported by judges and tribunal members (Livingstone, 2008: 50-51), less so by legal practitioners and by expert witnesses (Edmond, 2009:182-185; Rackemann, 2011). The AAT reviewed its use of concurrent evidence in 2005, finding that tribunal members considered that concurrent evidence enhanced the decision-making process by identifying areas of contention, distilling issues and making technical issues easier to understand (88.1% of tribunal members), and that it had improved the objectivity of evidence presentation (73.7%). However, tribunal members considered that while in approximately 30% of cases the experts spent less time giving evidence and the hearing was shorter, in approximately 50% of cases it was about the same, and in 20% of cases it was longer (Administrative Appeals Tribunal, 2005). Edmond's study based on interviews in 2007 and 2008 (which included practitioners and experts appearing in the LEC) found that lawyers disliked

[1] *BGP Properties Pty Ltd v Lake Macquarie City Council* [2004] NSWLEC 399 at [122].

idiosyncratic implementation of concurrent evidence procedures, and that experts, while generally favourably disposed toward concurrent evidence were more ambivalent about the pretrial joint conferences (Edmond, 2009). It is worth noting that Edmond's study was conducted not long after concurrent evidence became the norm in the LEC, and it may be that attitudes have changed with more familiarity, and hopefully more consistency in practice.

6 Value of expert evidence

The suggested benefits of joint conferencing and concurrent evidence include that they enable experts to engage directly with each other. A joint report, or questioning during concurrent evidence, may lead to the expression of agreement for example as to methodology, modelling, or the relevant criteria to be applied, or it may lead in a more fundamental way to agreement as to outcome. Sometimes all that can be agreed is that adoption of a particular methodology (rather than another) will lead to an agreed outcome, while adoption of another methodology will lead to a different (agreed) outcome: the decision-maker will still be required to decide which (or whose) methodology is the appropriate one to adopt. Lack of willingness of experts to engage with each other and make appropriate concessions may relate both to personal and professional factors, and to the adversarial context within which court and tribunal processes are framed. The recent decision of the Supreme Court of the United Kingdom to abolish the immunity previously enjoyed by expert witnesses may add another factor, at least in the UK (there being no suggestion at this stage that the Australian courts are likely to follow suit).1 Professional reputation, and perhaps a desire to continue to be engaged by litigants, may have a more significant impact on an expert's willingness to make concessions in the course of conferring.

The courts and tribunals which have adopted procedural reforms such as joint conferencing and concurrent evidence have done so in the belief that this may help counter adversarial bias, improve efficiency of court and tribunal hearings, and enhance both the quality of the expert evidence and the ultimate decision. There is clearly a need for empirical research, based on the now substantial experience in the LEC and the AAT, into whether these procedural reforms have promoted better decision-making.

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Urban Planning Legislation in New Zealand: Resource Management Act Stage Two Reforms

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Abstract:
The Resource Management Act (RMA) 1991 is a major piece of legislation underpinning urban development in New Zealand and is considered as a fundamental legal framework governing the built environment. The Act is administered by the Ministry for the Environment and has the intention "to promote the sustainable management of natural and physical resources"[1] in the country.

The purpose of this paper is to examine the current RMA Stage Two Reforms, a process that began in 2010 with the appointment of two Technical Advisory Groups (TAGs), the Urban TAG and the Infrastructure TAG. Both bodies were commissioned to produce independent reports for the Minister for the Environment and advise on the viability of further reforms of the RMA. In October 2010 The Ministry for the Environment launched a Discussion Document *Building Competitive Cities: Reform of the urban and infrastructure planning system*[3] building on these two reports. New legislation will be introduced by the Government as a consequence of the two expert reports and the public, individual and group submissions. This paper analyses the recently launched Discussion Document and evaluates some of its major recommendations to address planning coordination and process efficiency in relation to the urban environment.

The paper concludes that the main focus of the new Discussion Document should be on the urban environment, which until now has been completely unrecognised in the Act. Some of the proposed initiatives offer potential to significantly improve planning and urban design outcomes.

Keywords:
planning legislation, Resource Management Act, urban planning

1 Introduction

The Resource Management Act (RMA) 1991[1] is a major piece of legislation underpinning urban development in New Zealand and is considered as a fundamental legal framework governing the built environment. The Act is administered by the Ministry for the Environment and has the intention "to promote the sustainable management of natural and physical resources"[1] in the country.

The purpose of this paper is to examine the current RMA Stage Two Reforms, a process that began in 2010 with the appointment of two Technical Advisory Groups (TAGs), the Urban TAG and the Infrastructure TAG. Both bodies were commissioned to produce

independent reports for the Minister for the Environment and advise on the viability of further reforms of the RMA. In October 2010 The Ministry for the Environment launched a Discussion Document *Building Competitive Cities: Reform of the urban and infrastructure planning system*[3] building on these two reports. New legislation will be introduced by the Government as a consequence of the two expert reports and the public, individual and group submissions. This paper analyses the recently launched Discussion Document and evaluates some of its major recommendations to address planning coordination and process efficiency in relation to the urban environment. In addition a summary of the official submissions of two key professional bodies, the New Zealand Institute of Architects (NZIA) and the New Zealand Planning Institute (NZPI) are also included in the paper to illustrate some of the feedback provided to the Ministry for the Environment.

2 An Overview of the Resource Management Act (RMA) 1991

The RMA 1991 is a major piece of legislation underpinning urban development in New Zealand and is considered as a fundamental legal framework governing the built environment. The Act is administered by the Ministry for the Environment and has the intention "to promote the sustainable management of natural and physical resources"[1] in the country. At the time of its inception the RMA "was hailed as a world first for its freedom, flexibility and focus on effects-based environmental management" (Oram, 2007, p.11), "as an innovative, brave attempt to devise a planning system capable of delivering sustainable development" (Barton, 1998, p.453) and a "pioneering example of legislating for sustainability" (Jackson & Dixon, 2007, p.107).

The scope of this national legislation is quite wide as it integrates previous pieces of legislation dealing with a diverse range of fields: land use planning and control of the built environment under the Town and Country Planning Act 1977 (TCPA); management of certain natural resources from the Water and Soil Conservation Act 1967 and Geothermal Energy Act 1953; and environmental regulation functions of the Clean Air Act 1971 and various other acts regulating hazardous materials. For example, Part 3 of the Act, "Duties and restrictions under this Act"[1] has separate sections dealing with land, coastal marine area, river and lake beds, water, discharges, and noise.

Part 2 of the Act, "Purpose and principles", section 5[1], provides a definition of "sustainable development [which] means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety"[1]. The same section identifies three key conditions that enable sustainable development defined by the Act: sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and avoiding, remedying, or mitigating any adverse effects of activities on the environment.

2.1 The RMA and its Amendments

The eighteen subsequent amendments to the Resource Management Act 1991 that were introduced over the past twenty years, from 1993, 1994, 1996, 1997, 2002, 2003, 2004, 2005, 2007, 2008 and 2009, have strived to improve existing practices and ultimately the overall quality of the urban environment in New Zealand. Some of the main amendments deal with a diverse range of issues. The 1993 amendment, No 65, introduced changes to a number of administrative and process issues regarding

subdivisions. The 1996 amendment, No 160, covered areas such as marine farming, coastal occupation and a range of technical issues. The 2003 amendment, No 29, was concerned with streamlining RMA processes at all levels including the development of National Policy Statements. Furthermore, Regional Policy Statements and Regional and District Plans were required to reflect those. The six 2004 amendments, No 2, No 5, No 46, No 77, No 94 and No 103 were limited in scope and scale to energy and climate change issues and had a large impact on Regional Policy Statements. The 2005 amendment, No 87, was considered the most significant as it intended to improve various management processes such as national leadership, decision making, local policy and plan making as well as Environment Court operations.

Whether the particular planning aims and intentions of the RMA and its eighteen amendments have been achieved over the past two decades remains highly debatable. Oram (2007) argues that while the RMA works well for "small, local consents … it is inadequate for dealing with wide area, long-term and strategic issues of urban development" (p.3). Overall "the RMA does radically shift the weight of planning legislation towards sustainable resource management" (Barton, 1998, p.454). Jay (1999) identifies some of the major problems with this piece of national legislation whose primary focus is "on the effects and impacts of development rather than on the nature or scale of development" (p.468). As sustainable management seems to take precedence over the process of sustainable development and biophysical issues play a central role, "this places the Act at a significant distance from issues of urban planning and development (Hunt, 2008, p.9).

An additional problem is presented by "the exclusion of social and economic matters" (Jay, 1999, p.468) which is believed to have been dictated by the prevailing market forces in New Zealand central government circles. "The RMA carefully stresses the physical variables, leaving social variables, including equity in resource distribution, largely to look after themselves" (Barton, 1998, .454). As a consequence "the reduced emphasis on socio-economic effects within land-use development plans has impeded the promotion of sustainable spatial development strategies" (Jackson & Dixon, 2007, p.107). The "market forces emphasis remains at odds with processes that deliver high quality urban design outcomes" (Hunt, 2008, p.2). In summary, the powers vested in the RMA become seriously compromised when it comes to "control over the nature or scale of resource use, provided that detrimental effects on the biophysical environment are avoided, remedied, or mitigated" (Jay, 1999, p.468). Barton (1998) concludes that the RMA "does integrate in one compendious Act a host of environmental legislation … and it does display, in the text at least, a naive idealism which can inspire respect" (p.453).

2.2 The RMA and Functions, Powers and Duties of Central and Local Government

The introduction of the RMA in 1991 was accompanied by changes at central and local government levels. Part 4 of the Act is dedicated to the "Functions, powers and duties of central and local government"[1]. Section 24 defines the functions of the Minister for the Environment, who is in charge of issuing National Policy Statements and making of National Environmental Standards. Section 28 defines the functions of the Minister of Conservation, who is in charge of the preparation and recommendation of New Zealand Coastal Policy Statements and the approval of Regional Coastal Plans.

On a local government level New Zealand has a two-tier system that consists of 12 regional councils and city or district councils. Section 30 (a) defines the functions of the regional councils, who are in charge of "the establishment, implementation, and review of objectives, policies, and methods to achieve integrated management of the natural and physical resources of the region"[1]. In general, the regional councils were given responsibility for managing water, soil, air, coasts, natural hazards, and hazardous-waste mitigation, the discharge of contaminants, and land-transport planning. They are also required to produce Regional Policy Statements, a Regional Coastal Plan and a Regional Plan. Section 31 (a) defines the functions of the territorial authorities, who are in charge of "the establishment, implementation, and review of objectives, policies, and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district"[1]. The territorial authorities or the district and city councils are in charge of district planning, noise control, hazard mitigation, and land subdivision and are required to produce District Plans under the RMA.

2.3 The RMA and Planning Practice in New Zealand

All proposals for the use and development of land in New Zealand fall within the jurisdiction of the RMA 1991. Every proposal not identified as permitted activities in the relevant District or Regional Plans requires the lodgement of a resource consent application at the local district or city council. The local territorial authorities (TAs) are responsible for developing District Plans based on the guidelines provided in Part 5 of the RMA "Standards, policy statements and plans"[1]. Section 72 states the purpose of the District Plans: "The purpose of the preparation, implementation, and administration of District Plans is to assist territorial authorities to carry out their functions in order to achieve the purpose of this Act"[1].

As "the 1991 New Zealand Resource Management Act established an effects-based planning system intended to safeguard the biophysical resource base" (Jackson & Dixon, 2007, p.107), one of the functions of the TAs under the Act as stated in Part 4, Section 31 (1) (a) is "to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district"[1]. The types of zones developed in the District Plans "are related to the types of effects generated by activities, rather than types of uses" (Jay, 1999, p.468). Similarly Miller (2000) agrees that "the emphasis was very clearly on the control of the effects on the environment rather than the activity itself" (p.129). Overall, an examination of District Plans reveals a consistent reliance on rules and regulatory instruments (Miller, 2000).

Planning practice in New Zealand requires the local councils to check resource consent applications to establish compliance with the District Plan rules. If the proposal is deemed to have no significant detrimental environmental effects and if the assessment of potential environmental effects is satisfactory, then resource consent is granted. One major deficiency of this generally rigorous process is the complete lack of consideration of the proposed activity with its associated aesthetic characteristics. As long as a proposal is perceived as harmless and having only a minor environmental effect, this guarantees the favourable outcome of the resource consent application. Hunt (2008) contends that traditionally, analysis of effects has focused on biophysical effects, and issues of design quality have not been considered which "highlights the limited basis on which visual effects have typically been assessed under the RMA" (p.5). The need to shift the focus and include urban design issues when evaluating resource consent

applications led to the establishment of the Urban Design Panel at Auckland City Council in 2003. Although this was a non-statutory initiative, the role of the Panel is mainly to ensure high quality urban design of large scale central city developments and make recommendations included as part of the resource consent process.

There are three major options when evaluating resource consent applications. The first and most straight forward one is when the proposed activity complies entirely with the District Plan rules. The second option can be a non-notified resource consent which requires the signatures of all affected parties in the cases when there is some degree of deviation from the District Plan rules for that particular area. The third and most time-consuming option is a notified resource consent which requires public notification and the opportunity for members of the public to make submissions.

Hunt (2008) poses the question whether the District Plans based on the requirements of the RMA 1991 are able to accommodate measures that will ultimately lead to quality urban design and development. In the absence of city by laws and the fact that the RMA is a piece of national legislation governing all urban development in the country, any urban design initiatives that sit outside this legislation remain non-mandatory. In recent years the need to introduce statutory measures has become more compelling which has led to the RMA Stage One and Two Reforms.

3 The RMA Stage Two Reforms

The latest Resource Management (Simplifying and Streamlining) Amendment Act 2009 No 31[2] was passed by the Government in 2009 to improve some of the aspects of the resource consent process. This Amendment Act constituted the Stage One Reforms undertaken by the Government. Currently the Stage Two Reforms is underway, a process that began in 2010 with the appointment of two TAGs (Technical Advisory Groups), the Urban Technical Advisory Group and the Infrastructure Technical Advisory Group. Both bodies were commissioned to produce independent reports for the Minister for the Environment and advise on the viability of further reforms of the Resource Management Act. In October 2010 The Ministry for the Environment launched a discussion document *Building Competitive Cities*[3] building on these two reports. The intention was to invite feedback from various professional bodies as well as the general public, a process, which had a deadline by 17 December 2010. New legislation will be introduced by the Government as a consequence of the two expert reports and the public, individual and group submissions.

3.1 Building Competitive Cities: An overview of the Discussion Document

The document has a clear structure and consists of five sections: 1. Introduction; 2. Problems with the planning system; 3. Options for change: Planning and urban design; 4. Options for change: Social and economic infrastructure development; and 5. Consultation process[3]. The current problems with urban planning and infrastructure are clearly identified in section 2. The suggested possible solutions are listed in two separate sections: section 3 is dedicated to options for change in planning and urban design and section 4 deals with possible options for change in social and economic infrastructure development.

The purpose of the document is clearly stated in the Introduction section: "to improve our knowledge and understanding of the issues facing planning and urban design and infrastructure development in New Zealand" (p.1)[3.] The document seeks feedback on

the options for reform and how they could improve the status quo. As 85 per cent of New Zealanders live and work in urban areas[3], it becomes even more important to build attractive and competitive cities that will contribute to the country's economic growth. Being the largest city in New Zealand, Auckland plays a special role in the country's economy with an average productivity, which is 45 per cent greater than the rest of the country (Mare, 2008). Hence the focus of the suggested changes in the planning system as well as in social and economic infrastructure is on Auckland first. One example is the spatial planning currently taking place in Auckland as a result of the amendments to the Local Government Act (LGA). Similar spatial planning principles could also be applied to other New Zealand cities and towns.

3.2 Problems with Urban Planning and Infrastructure

The New Zealand urban planning system is complex and is guided by three different pieces of legislation: the Resource Management Act (RMA) 1991, the Local Government Act (LGA) 2002 and the Land Transport Management Act (LTMA) 2003. In addition the Historic Places Act 1993 also plays a role in certain urban areas. The three major pieces of legislation governing the urban environment have "different legal purposes, processes and criteria, which were not actively designed to work together" (p.5)[3]. The Government has identified four potential problems with urban planning due to current legislation and practice that hinder the process of building competitive cities.

The first problem with urban planning is the inadequate recognition of urban environment in the RMA[3]. This major piece of national legislation deals primarily with effects-based management of the natural environment and has limited capacity to assess the value-adding capabilities of potential urban developments. The achievement of long-term urban planning goals and good urban design outcomes is hindered by the existing legislation leading to the intrusive sprawl of ad hoc developments driven by quick return motives. The second problem with urban planning comes from the complex planning system that consists of the three separate Acts mentioned above and their complete lack of alignment and connection[3]. As a consequence there is a complete lack of consistency in the decisions that have been made, which constitutes the third problem of the urban planning system[3]. The multiple participants and decision-makers aggravate further the problems already identified: local and central government, the private sector, infrastructure providers, communities and various non-government organisations. Agreements reached among the participants operating within a single Act are not simultaneously integrated with agreements reached within the other Acts. The fourth problem with urban planning is the barriers to effective implementation: inconsistent implementation of national objectives and standards in plans; cost and time associated with preparing and changing plans; and the potential problems with various tools in practice[3].

Separate from the problems with the urban planning system, the Government has identified five problems with the infrastructure development in New Zealand. The first problem is the lack of clarity and consistency of national objectives and standards, such as National Policy Statements (NPS) and National Environmental Standards (NES). Due to the specific nature of large infrastructure projects, which often cross regional and local boundaries, NPSs and NESs become increasingly important to "articulate national priorities, provide national direction and facilitate consistency and certainty in the way resource management issues will be addressed" (p.12)[3]. The second problem refers to the mixed access to designations, which are special provisions in the District Plan which allow a public work, such as schools, airports, etc to be developed without the need for

land-use resource consent from the territorial authority[3]. The complex and inflexible approval processes constitute the third problem with issues ranging from the level of detail required for new designations to the multiple approval processes and appeal routes[3].The fourth identified problem with the infrastructure development is the lack of robust and integrated decision-making and the fifth one is the inefficient and inadequate land acquisition which deals with issues when land is acquired for public works and compensation provisions are required[3].

3.3 Proposed Changes for Urban Planning and Design

The third chapter of the document *Building Competitive Cities* proposes specific changes in the urban planning system that are structured around the problems identified in the previous chapter. The recommendations are outlined in four categories corresponding to the relevant problems. The first category deals with the recognition for the urban environment in the RMA framework. Ensuring a stronger focus on the urban environment necessitates the modification of two definitions: of "environment" to specifically include the urban environment and of "amenity values" to put more emphasis on the quality of the urban environment[3]. The second category of proposed changes addresses issues of greater national direction and clarity[3]. The feedback received when the NPS on Urban Design was introduced in 2008 suggests that the NPS needs to include principles of good urban planning that result in a quality urban environment on all levels from cities and towns to individual spaces and buildings. The option that is put forward suggests extending the scope of the proposed NPS to require local authorities to provide an adequate supply of land to meet future urban growth demands and include policies considering housing affordability. The third category of suggested options is dedicated to spatial planning. The new Auckland Council that came into being on the 1st November 2010 as a result of the merge of the seven Councils in the Auckland Region has been charged with the task of developing a spatial plan for Auckland "to provide an overarching vision for Auckland" (p.21)[3]. The 2010 Amendment to the LGA defined the requirements for Auckland spatial plan. Careful consideration has been given to the possibility of applying the spatial plan tool to other areas in New Zealand and also to be given "an appropriate level of statutory influence" (p.24)[3] on RMA, LGA and LTMA plans. The fourth category of suggested options deals with the improvement of tools to develop and maintain a quality urban environment: introduce a national standardised template for local and regional plans, developed by central government; produce a single document with a combined NPS and NES as a clear expression of national direction; establish a National Urban Design Panel and a Government Architect to improve the quality of urban design; and improve land assembly to create large areas of land in specific places that require regeneration[3].

3.4 Proposed Changes for Social and Economic Infrastructure Development

The fourth chapter of the document *Building Competitive Cities* proposes specific changes addressing infrastructure issues that are structured around the problems identified in the previous chapter. The recommendations are outlined in six categories corresponding to the relevant problems. The first category deals with the recommendation for greater national direction and consistency through the systematic use of NPSs and NESs that will outline the Government's priority areas of economic, social and environmental significance under the RMA. The second category includes recommendations for changed access to the designation system by extending eligibility for designations to a broader range of infrastructure types, such as ports and electricity generation. The third category deals with improved approval processes. Some of the detailed recommendations specify the eligibility criteria for concept designations and

define the level of detail required with applications. Integrating current multiple approval processes into a single process and removing duplicated processes is seen by the Government as an efficient way to streamline approval processes. The fourth category is dedicated to the enhanced decision-making framework with the aim to make decision-making more independent, transparent and integrated. Under the current system, decisions on different infrastructure projects are made by different decision-makers in isolation from each other. The fifth category of proposed changes describes an efficient compensation process under the Public Works Act (PWA) 1981 in the cases of land acquisition from private property owners. The suggested options outline a reasonable list of compensation measures for land acquired under the PWA. The sixth category of recommendations deals with transitional provisions which may be needed to manage the change and to ensure that investment in existing infrastructure is maintained and continued.

3.5 New Zealand Institute of Architects (NZIA) Submission on Building Competitive Cities Discussion Document

NZIA's submission summarises the strong views of the architectural profession of the complete lack of recognition of the urban environment in the current version of the RMA 1991. As discussed above, this major piece of national legislation which defines the legal framework governing the built environment in New Zealand focuses predominantly on planning coordination and process efficiency and remains completely ignorant to the fundamental changes in New Zealand's urban environment and infrastructure over the past twenty years. The Stage Two Reforms and the launch of the *Building Competitive Cities* Discussion Document are seen by the Institute as an opportunity for an adjustment of the RMA to reflect the urban reality in the country. NZIA's submission suggests six initiatives to significantly improve planning and urban design outcomes (NZIA, 2010).

3.6 Explicitly Recognise the Urban Environment in the RMA (NZIA, 2010)

The NZIA provides its strong support to the adequate recognition of the urban environment in the RMA framework. The Purpose of the Act may be extended to include recognition of the built environment, and consider both the beneficial and adverse effects on it. Another area where the Institute feels strongly that improvements can be made is "amenity values"[1]. New Zealand cities and towns have undergone major transformations over the past twenty years since the RMA was first introduced in 1991 and yet the concept of "aesthetic coherence"[1] has not, still providing little guidance as to how desirable design outcomes can be achieved. The possible inclusion of other qualities relevant to amenities, such as "sense of place, contribution to vitality and social interaction" (NZIA, 2010, p.1), are seen by the Institute as having the potential to overcome past and current urban design and planning issues resulting from the inadequacies in the current version of the RMA.

One major concern expressed by the Institute is the differentiation between the natural and urban environment. While the RMA seeks to actively protect the natural environment by minimising the adverse effects on it, a major characteristic of the urban environment is its constant change and development. This characteristic needs to be considered by the revised RMA to encourage good urban development on a national scale.

Another recommendation of the Institute is the formulation of a new definition of heritage either within the RMA or as a supplementary document outside the RMA.

New Zealand is a young country and requires recognition of its modern heritage, which is different from the historic heritage connected to the history of the country, which "is thinly spread in our young country" (NZIA, 2010, p.1).

3.7 Ensure the Spatial Plan for Auckland replaces the current multiple overlapping planning processes and guides a Unitary Plan (NZIA, 2010)

The proposed Auckland Spatial Plan must integrate the Regional Policy Statement and the Regional Land Transport Strategy in order to be effective according to the NZIA. Under the current legislative system a suite of District Plans, based on the RMA, are in operation. Before the 1st November 2010 when the new Super City in Auckland came into being, there were seven Councils in the Auckland Region (Rodney, North Shore, Auckland Central, Waitakere, Manukau, Franklin and Papakura) using their own District Plans. The necessity to introduce a single Unitary Plan with a single set of definitions, policies and controls that apply across wider Auckland is strongly supported by the Institute. While the role of the Spatial Plan is seen as providing "vision for the city, lower order plans, including a Unitary Plan, should be consistent with it, rather than being required to give effect to the Spatial Plan" (NZIA, 2010, p.2).

3.8 Establish a National Policy Statement on the Urban Environment (NZIA, 2010)

The formulation of a National Policy Statement (NPS) is seen as a "simple means of setting expectations for the planning and design of the urban environment and ensuring their consistent application nation wide" (NZIA, 2010, p.3). The scope of this NPS is quite wide including diverse areas, such as: intelligent growth management that integrates transportation and land use; response to local conditions and context, distinctive sense of place, ecological responsiveness, mix of densities and network of connections to and within an area, mixed use areas and achieving high quality public realm and great places to live.

3.9 Establish a National Urban Design Panel (NZIA, 2010)

The NZIA believes that the establishment of a National Urban Design Panel (NUDP) will assist "better, higher value design outcomes" (NZIA, 2010, p.3). It should be administered by the Government Architect and work with regional and local panels. The Urban Design Panel at the former Auckland City Council had an advisory role and made recommendations that were not mandatory. Similarly, the new proposed NUDP will not be a decision-making group but the recommendation is that its findings should have standing in RMA related processes.

3.10 Establish a Government Architect (NZIA, 2010)

The NZIA believes that establishing a position of Government Architect "would assist New Zealand in achieving a level of design excellence and sustainability performance in the built environment that will enrich the lives of all New Zealanders" (NZIA, 2010, p.3). The New Zealand architectural profession has been under severe criticism over Auckland's urban environment and the almost complete lack of urban planning considerations. Although well understood, good urban design principles seem to remain an enigma for urban planners in Auckland, resulting in the ubiquitous proliferation of mediocre architecture and urban spaces. "… Auckland lacks a collective sense of creative energy and focus; … has poor urban design and planning; and … is developing with little attention to aesthetic considerations" (p.9)[4].

The argument that NZIA puts forward is that "Government plays a vital role in shaping our built environment" (NZIA, 2010, p.4) through the erection of various social and institutional buildings, such as town halls, museums, schools, hospitals, courts and the Parliament buildings, hence the necessity to lead by example.

3.11 Ensure efficiencies in the planning and resource consent process are achieved (NZIA, 2010)

The NZIA places more emphasis on the resolution of conflicts at a planning and design level thus avoiding the involvement of legal mechanisms that prove to be costly and time consuming. Ensuring efficiencies is seen through a range of measures: the establishment of the National Policy Statement on Urban Development; the introduction of a Unitary Plan in Auckland in order to simplify and coordinate the planning process; and the establishment of a National Urban Design Panel in conjunction with regional and local panels, whose recommendations become an integral part of consent processes.

3.12 New Zealand Planning Institute (NZPI) Submission on Building Competitive Cities Discussion Document

The NZPI's submission is structured around the questions posed in the official feedback form prepared by the Ministry for the Environment. The Institute provides detailed answers to twenty out of the twenty three questions in the form.

3.13 Urban Planning System and Infrastructure Development

The NZPI strongly agrees that the current planning system "is unduly complicated" and there is "a lack of consistency in decisions and some barriers to effective implementation" (NZPI, 2010, p.4). The view on the infrastructure development is somehow vague and rather short calling for "stronger alignment of strategic goals and governance structures from the national to regional and local entities" (NZPI, 2010, p.4). More surprisingly, unlike the NZIA submission, which strongly supports the adequate and explicit recognition of the urban environment in the RMA framework, the NZPI takes the stance that the current legislation recognises the "environment" and its various aspects: social, cultural and economic. The argument that is put forward is that the existing concept of "environment" already incorporates the concepts of "urban environment" and "amenity values" and that the proposed amendments to their definitions would not necessarily lead to good urban design and planning. The view of NZPI is that the RMA "does not require alteration to give greater recognition to the urban environment" (NZPI, 2010, p.6). What is suggested instead is the further refinement of the "various mechanisms and tools available to the planning community to address the urban or built environment" (NZPI, 2010, p.6).

According to the NZPI the current problems arise from the interpretation and implementation of the various statutes and rules in the current legislation, which is permissive and allows for variations in the "practice of planning" (NZPI, 2010). The submission does not distinguish though between the natural and built environment, which are two separate components in the context of any town or city. According to the NZPI the provision of guidance notes to aid planning practice could help improve the quality of future urban developments. The possibility to put in place special mechanisms or urban panels to help urban planning practice is not perceived as necessary (NZPI, 2010).

The NZPI also believes that "it is not possible to legislate for good planning" and suggests "stronger leadership, direction and guidance at a national level" (NZPI, 2010,

p.6). As the current RMA 1991 is concerned mainly with assessing the effects of a potential development and minimising the harm to the natural environment, it remains unclear how maintaining the status quo can solve the massive urban design and planning problems in Auckland. The reality is that the magnificent natural setting seems to have been wasted with developments driven primarily by greedy property developers trying to make a quick return. Such developments of non-descript nature all seem to lack aesthetic qualities and vision.

3.14 Spatial Planning in Auckland

Similarly to the views of the NZIA in their submission, the NZPI supports incorporating the Auckland Regional Land Transport Strategy (RLTS) and Auckland Regional Policy Statement (RPS) to avoid inconsistencies between the two and encourage integrated transport and land use planning. As there is certain criticism towards the existing RMA plans in Auckland, associated with the lack of consideration to growth, economic development, transport or environmental outcomes, the NZPI recommends the development of plans in close collaboration with communities, individual citizens, organised groups and other government agencies. Similarly to the NZIA, the NZPI also supports the development of a single Unitary Plan "from the perspective of best practice" (NZPI, 2010, p.8). The Institute believes that the effectiveness of the Auckland Spatial Plan could be improved by giving it an appropriate level of statutory influence and by achieving a level of consistency with other pieces of national legislation, such as the Resource Management Act (RMA), Local Government Act (LGA) and Local Transport Management Act (LTMA). It also needs to be developed in close consultation with all the stakeholders in the Auckland area, such as central government agencies and departments (NZPI, 2010).

3.15 Greater National Direction and Consistency

The NZPI's view that a strong National Policy Statement (NPS) should be prepared to clarify national direction on urban planning is similar to the NZIA's one. Central government should direct the content of plans though this NPS and associated National Environmental Standard (NES). The NZPI believes that the development of a national template would be useful in achieving alignment and at the same time facilitating the inclusion of local and regional interests and needs. The purpose of the NPS is seen as a mechanism that ensures the seamless integration of district and regional planning with local planning, which is usually broader by nature (NZPI, 2010).

4 Conclusion

The *Building Competitive Cities* Discussion Document launched by the Ministry for the Environment in October 2010 is a long overdue adjustment of the Resource Management Act (RMA) 1991. The document sets out four problems with urban planning and five problems with the infrastructure development in New Zealand and provides a number of options to address the identified issues. Three of these topics directly relate to urban design: recognition of the built environment in the RMA; National Policy Statement on urban design; and additional tools aiming at the provision of more direction on the content of plans, increase government involvement in urban design through the appointment of a government architect and improve the ability for councils to acquire and assemble land.

The Discussion Document outlines four options aiming at specific changes in urban planning and urban design and six options for change in the social and economic infrastructure development. Some of these proposals put forward will definitely make a positive change in the urban environment but the fairly limited extent of these changes suggests that they might play only a small role in the process of making cities more sustainable, competitive and economically successful.

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Is capturing the "unearned increment" in land value still a viable idea? A cross-national analysis*

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Abstract*
The financial aspects linked to planning regulatoin impact the built environemnt. The idea that the public should reaping the "unearned increment" or the "plus value" of land is by no means new. The underlying rationale is that much of the value of real property is created not by the landowner's work, but by government policies that grant development rights or by broad economic and social trends.

Drawing on the author's comparative research on the laws and practices in 13 advanced-economy countries around the world, the paper addresses the degree to which recapture of the "unearned increment" is indeed a useful approach that policymakers should adopt for financing or incentivizing the delivery of public services and affordable housing.

The idea of value capture in its pure form has failed to catch on widely among advanced economies, but the basic idea has not died away. In recent decades, several "mutations' of this idea have been gaining popularity in many countries, but in widely different forms and degrees.

Keywords:
betterment tax, development control, planning law, real-property taxation, value capture

1 Introduction

The built environment is shaped not only by the direct regulatory instruments that planning law provides, but also by the ancillary financial aspects. These deserve more attention. Few issues in land-use planning are as universal as the bipolar relationship between planning regulation and property values. This issue carries deep economic, social, and distributive-justice implications. Do governments have the right to reap some of the increment in value attributable to planning decisions? And the corollary: Do governments have an obligation to compensate private landowners for value decline due to land-use

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regulations? Two American scholars have whimsically tabbed this issue as "windfalls" and "wipeouts" (Hagman and Misczynski 1978). This topic has trailed planning policy

for a long time, yet is no closer today to being resolved in a politically or legally sustainable manner.

This paper revisits the upward side of the land-value coin: How relevant is it today around the world, and especially among advanced-economy countries? The idea that landowners should share some of the increased value of their land with society encompasses a wide range of situations and policies. I will first address the issue broadly and then focus on one specific type of value capture—where the rise in property values is due to land-use regulations or public works. This topic has not benefited from enough comparative research.[1] By analyzing the experiences of a large sample of advanced-economy countries, this paper seeks to contribute to knowledge sharing on this important issue.

2 The Idea of Land-Value Capture

The idea that the value of land is created by society and should therefore be reaped for the public is by no means new. The brief survey reported here first looks at the evolution of the notion of the "unearned increment" in land in general, and then specifically at the idea of capturing increments created by land-use regulation.

2.1 Henry George and the "Single Tax" Idea

In 1879 the American thinker Henry George famously proposed the "single tax" idea in his book *Progress and Poverty.* He argued that if the rent from land alone (without the buildings and other "improvements") were to be paid to the government authority on an ongoing basis, it would suffice to finance the entire set of society's public needs (Andelson 2000, xxii -xxiv). A tax on land would avoid causing the kind of economic turbulence that taxes on labor and mobile or financial capital inevitably create. This latter view is supported by many economists (Ingram and Hong 2007; England 2007; Netzer 1998). George (1962) argued that public capturing of land values represents "a takings by the community, for the use of the community, of that value which is the creation of the community" (421). At the time, his proposal did not link value capture with land-use regulation because he wrote the book long before these were established in their modern format.

The "Georgian movement" still draws dedicated followers around the world (as well as many critics; see Andelson 2004).[2] (as well as many critics; see Andelson 2004). However, as attractive as the Henry George theory may be, 130 years after he published his seminal book, the "vote" around the world is clear: "no" to the single-tax idea, with

[1] Despite the ubiquity of the land-value issue, it has not benefited from much systematic comparative research. The only major academic work that looks at both sides of this issue comparatively is the seminal book by Hagman and Misczynski (1977). It surveyed five English-speaking countries (the United States, Canada, Australia, New Zealand, and England) and contributed considerably to the theoretical framing of the issue. Another book, by McCluskey and Franzsen (2005), focuses mostly on developing countries. The "wipeouts" side—called "regulatory takings" in American lingo—has recently benefited from greater comparative attention. My recent book (Alterman 2010) presents an in-depth comparative analysis of the laws and policies of thirteen countries. Alexander's 2006 book analyses four countries in depth.

[2] For an example of one of the movement's organizations, see http://www.henrygeorgefoundation.org/. See also http://www.earthrights.net/wg/wg1.html.

a few small local exceptions. Yet the underlying rationale of the Georgian argument is still compelling to many. It is often cited in support of the idea that the added value specifically created by land-use regulation decisions should be shared with the public.

2.2 Value Capture and Land-Use Regulation: The "Betterment Capture" Idea

Historically, Britain led the way in the world discussion about the nexus between planning regulations and property values. The phrases that the British coined for the issue—"betterment and compensation" or "betterment and worsement" (or "worsenment")—date back to the late nineteenth century (Baumann 1894). In 1909 a British prime minster made the following eloquent statement when introducing a national betterment capture levy as part of the world's first national planning act (Housing, Town Planning, Etc. Act 1909 (c. 44)): "It is undoubtedly one of the worst evils of our present system of land that instead of reaping the benefit of the common Endeavour of its citizens a community has always to pay a heavy penalty to its ground landlords for putting up the value of their land."[1]

The failure of this British experiment cannot be attributed to lack of enthusiasm. Unlike the United States, Britain has had a long tradition of legislative responses to both sides of the property value effects. Subsequent legislation tried various other formulas, and these ideas were exported to many of the colonies (McAuslan 2003; Home 1997). However, neither side ever worked satisfactorily (Grant 1999), as discussed in section 4.

Since World War II the betterment and compensation sides have been decoupled in Britain. During the height of the war, the British government appointed the Expert Committee on Compensation and Betterment to guide the government in the laws and policies it should adopt for postwar reconstruction. The influential *Uthwatt Committee Report*[2] introduced two important concepts—"shifting value" and "floating value" (Replogle 1978; Tichelar 2003).

"Shifting value" assumes that the demand for any given type of land use in a particular region is finite. Land-use restrictions in one municipality (or in one part of a city) may cause downward value changes, but at the same time may increase the value of land in another locality where the regulations do permit development. "Floating value" refers to the speculative nature of potential land values. Landowners tend to assume that if only planning regulations did not stand in their way, a lucrative type of development would "land" on their own plot of land. However, the notion of shifting value implies that even if land-use regulations were to be abolished, not all landowners would benefit from development (Moore 2005, 3). The assumption that landowners are entitled to compensation for reduction in development rights was thus shaken, while the justification for capturing the added value was reinforced.

Based on this thinking, the UK Town and Country Planning Act of 1947 reformed the entire system. It discarded the idea of "development rights" granted by plans years in advance and substituted a system whereby each development is approved "case by case" through a "planning permission" (Booth 2003). Local government must prepare local plans, but their function is to guide decisions, not to grant development rights. Thus, the

[1] *Hansard* (1909).

[2] The *British Expert Committee on Compensation and Betterment*, Cmd 6386 (1942). This report is known by the name of its chair, as the *Uthwatt Report*. Its importance in shaping British recovery is recognized not only by planners and lawyers but also by historians of British history. See Tichelar (2003).

very notion of entitlement to compensation was abolished (Purdue 2010). At the same time, the other side of the coin—capturing the betterment value—was fortified. For several decades hence, the United Kingdom seemed to have "volunteered" to serve as the world's laboratory for testing the betterment capture idea, as detailed in section 4.

2.3 Is There Symmetry between Windfalls and Wipeouts?

The UK story brings to mind an obvious question: If landowners are required to share the windfall derived from land-use decisions, should they also have the right to compensation for decrease in property values due to such regulations? And the converse: If landowners are allowed to keep the windfalls, then symmetry of logic would hold that they should absorb the wipeouts and not be eligible to compensation from the public purse.

However, my recent thirteen-country comparative analysis has produced some counterintuitive findings: In most countries, the two sides of the coin are not symmetric either in law or in practice (Alterman 2010, 3–5). The lack of symmetry is usually not even a public or legal issue, except as a teaser by proponents of one side of the debate who wish to highlight the other side's ostensibly faulted logic. In all but two among the sample countries (Poland and Israel), the two sides of the land-value coin are currently disassociated. Thus real-life laws and policies do not operate according to the axioms of pure logic.

The following sections take a closer look at specific instruments for value capture, with a particular focus on those directly targeted to capturing value created by land-use regulatory decisions.

3 Three Types of Value Capture: Macro, Direct, and Indirect

Despite considerable scholarly literature, *value capture* remains an open-ended term, variously defined and used. Some use the generic term *value capture* to cover any type of policy or legal instruments whose purpose is to tap any form of "unearned increment," regardless of the cause of the value rise. Others use the same term to denote only the policy instruments targeted at value arising directly from land-use regulation or public works. The most direct term available to denote the latter type of value increase is *betterment*—a word that originated in British English and still has no specific American English counterpart.

There is also considerable vagueness in the literature on whether a policy should be classified as value capture based on its *purpose* or its *outcome.* Some policies not primarily or overtly intended to reap the unearned increment do in fact exact from landowners or developers monetary or money-equivalent contributions. To provide a more level field for research and knowledge exchange, I propose a distinction among three sets of policy instruments that relate to value capture: (1) *macro,* (2) *direct*, and *(3) indirect* instruments.

3.1 Macro Value Capture Embedded in Broader Land Regimes

Macro value capture instruments are not freestanding. They are embedded in some overarching land policy regime, motivated by some broader rationale and ideology. These regimes are assumed to provide a better land and development policy than a market regime. Four major types of land policy regimes have value capture embedded in them—at least in theory. Some authors regard these macro land policies as value

capture instruments (e.g., Smolka and Amborski 2007). The four are: 1. Nationalization of all land and direct government control over its use; 2. Substitution of private property by long-term public leaseholds; 3. Land banking; 4. Land readjustment. Because these macro land policies don't feature value capture overtly, they will not be discussed further in this paper.

3.2 Direct Value Capture

Direct instruments for value capture are policies that seek to capture all or some of the value rise in real property under the explicit rationale that it is a legal or moral obligation for landowners to contribute a share of their community-derived wealth to the public pocket. As a wealth redistribution instrument, direct value capture is often regarded as a tax and requires legislative authority. Direct instruments do not need to seek any additional rationales—for example, they do not need to show that the funds are necessary to mitigate negative impacts of the project, or that the properties that generated the funds will also benefit from the services financed by them. The rationale for direct value capture stands in its own right.

Direct value capture may be divided into two subtypes, and the second subtype is further divided into two subtypes:

a. Capture of the unearned increment: Where the value rise is not linked to a specific government decision but rather to general economic or community trends.

b. Capture of betterment: Where the value rise is due to a specific government decisions is directly caused by specific types of land-use regulatory decisions or by the execution of public infrastructure.

The betterment levy, too, may be further divided into two subtypes. Confusingly, both are often denoted by the same term: *betterment*. I propose to dedicate specific terms for these two types:

b1. Development-rights-based betterment: Where the value rise is due to a planning or development-control decision that applies directly to the land parcel in question and raises its value.

b2. Infrastructure-based betterment: Where the value rise is due to positive externalities from a government decision to approve or execute public infrastructure, parks, or other services.

Capture of the unearned increment type may take many forms, including a capital gains tax on land or real property, an “unearned increment” tax upon transfer of title, sometimes time-adjusted to curb speculation, or an annual property tax that is closely tuned to the rise in property values. Taxation of the unearned increment is found in several countries. Americans know the examples of Vermont and Pennsylvania (Daniels, Daniels, and Lapping 1986 and by Gihring 1999). In the Far East reported cases are Taiwan (Lam and Tsui 1998), Hong Kong, and Singapore (Hui, Ho, and Ho, 2004) . . .

This paper focuses on the second subtype—capture of betterment arising from government land-use decisions. In sections 4 and 5 I will report on the international experience.

3.3 Indirect Value Capture

The rationale of the indirect instruments differs from the direct ones. The indirect instruments do not seek to capture the added value for its own sake, because it is "unearned," but in order to generate revenues (or in-kind substitutes) for specific public services. Indirect instruments are usually practiced on the local government level. The objectives behind the indirect tools are usually more pragmatic and less ideological than the objective behind either the macro or the direct capture instruments. To survive legal and political challenge, the indirect instruments usually need the "cover" of other rationales beyond the desire to capture the unearned increment. It is easy to confuse the indirect instruments with the direct ones because both types harness the same source of wealth—the additional value of real property derived from government land-use and development decisions.

Unlike the direct instruments, indirect value capture is an ever-evolving category of policies that varies greatly among countries and localities. This topic merits its own comparative research. In section 6 I will discuss this topic only to contrast it with direct value capture.

4 Betterment Capture: The International Experience

How prevalent is direct betterment capture around the world? In this section and the following one I report on my international comparative research that focuses on betterment capture practices among advanced-economy countries (with a small detour to South America too).

Many types of government land-use or development decisions could serve as grounds for direct value capture.[1] These vary from country to country and possibly also from one municipality to another. Infrastructure-based betterment levies are historically the earliest form of betterment capture. I will discuss this type first and then proceeding to focus on development-rights-based betterment capture instruments.

4.1 Infrastructure-Based Betterment Capture

The oldest types of the betterment capture instruments are "infrastructure-based." They focus on value increase to neighboring properties caused by public infrastructure. Public works are a government function that preceded land-use planning laws by centuries. When the British enacted the first town planning act in 1909, they instituted a 50 percent levy on infrastructure-based betterment—an instrument that predated that act. This instrument migrated to many of the British colonies and protectorates but experienced many failures (Peterson 2009, 36–38; Grant 1999; Alterman 1982). Apparently, linking value rise to the execution of public works is not easy. The reasons may include difficulties of proving the causal relationship to the infrastructure works; difficulties in determining the geographic range of impact; and difficulties in levying the charge at a time frame reasonably close to the execution of the public works (because the windfall is usually not realized at that point in time).

[1] In theory, other types of government decisions unrelated to land use could also be the cause of land value increases—for example, a new trade treaty that will influence a border town. However, these have not generated a significant body of law or scholarship and are not discussed here.

Yet this idea resurfaces from time to time. For example, in 2004 the Scottish government commissioned a report on whether betterment could be captured from value increase directly due to new transport facilities. Peterson (2009), writing for the World Bank, and Medda (2010) for the UN report on similar initiatives in both developing countries and advanced economies. These initiatives usually stand alone, unrelated to capture of development-rights-based betterment.

4.2 Development-Rights-Based Betterment Capture

Betterment capture policies may target a variety of land-use planning and development-control decisions. I do not know of any country or locality that has ever implemented value capture instruments to tap all the possible "stations" along the planning-to-permitting procedures. The international experience shows that only a few of these stations have ever served as grounds for this type of betterment capture.

As part of a large research project on compensation for value decrease (Alterman 2010), I also looked at the value capture side. The sample of countries encompasses fourteen advanced-economy and democratic jurisdictions (thirteen nations and an additional U.S. state). This sample constituted about 40 percent of the thirty-four members of the OECD in 2010. In alphabetical order the sample countries are Australia, Austria, Canada, Finland, France, Germany, Greece, Israel, the Netherlands, Poland, Sweden, the United Kingdom, and the United States (with additional focus on Oregon). The sample was selected to represent a variety of legal and geographic contexts: large and small countries located on four continents; federal and unitary jurisdictions;[1] common-law as well as civil-law countries with varying degrees of constitutional protection of private property;[2] countries belonging to the EU and those outside it; different cultural and language backgrounds, and so forth.

A finding that may surprise many is that most of the sample countries do not practice *direct* betterment capture today. There are only three countries in this sample with significant experience in direct betterment capture instruments: the United Kingdom in the past, and Israel and Poland currently. These countries applied a variety of capture policies, so cumulatively their experiences contain a wealth of potential lessons from which other countries may learn.

4.3 Britain: The World's Former "Laboratory" of Betterment-Capture Instruments

Britain's vicissitudes with various types of betterment capture policies make it the world's most distinctive laboratory. Between 1909 and the early 1980s, Britain exhibited pendulum-like shifts in policies about compensation and betterment as power changed hands between Labor and the Conservatives (Tories; Cox 2002; Tiechelar 2003; Lichfield and Darin-Drabkin 1980, 144–145). These shifts were accompanied by ideological debates and significant public exposure.

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[1] The United States, Canada, Australia, Germany, and Austria are federal jurisdictions.

[2] The United Kingdom, Ireland, Canada, United States, Australia, and Israel have a common-law tradition (Israel is regarded as a mixed system, but in the area of planning and property law it resembles other common-law systems with former British influence). For an analysis of the constitutional protection of property in these countries, see Alterman (2010, 26–35).

The various policies adopted and repealed represent a large range of rates of recoupment: the 1909 Housing, Town Planning, Etc. Act and its successors imposed a 50 percent levy on betterment arising from the approval of a land-use plan (called "scheme" and functioning similarly to zoning). The British exported this instrument too to many of their colonies around the world. It too proved to be almost inoperable due to difficulties in exacting the levy from landowners at the time of approval of the scheme (Peterson 2009, 36–38; Grant 1999; Alterman 1982).

After World War II and the rethinking brought about by the Uthwatt Commission, Labor enacted the 1947 Town and Country Planning Act that imposed a 100 percent "development charge" on the full extent of betterment. The revenue was to go to central government (Grant 1999; Lichfield and Darin-Drabkin 1980, 136–142). The tax was ineffective (Williams and Hallett 1988, 119), but scholars remain divided about whether it might have succeeded with time (Lichfield and Darin-Drabkin 1980, 142–144). In 1953 the Tories abolished the act.

When Labor returned to power, it enacted the 1967 Land Commission Act along with a new far-reaching plan: in the long run the national Land Commission would assemble a large national land bank by compulsorily purchasing all land coming in for development. In the short run, a 40 percent betterment levy was imposed on all land transacted on the open market, and the levy's rate was to go up gradually. The revenues were to go to the central government. However, this act too was repealed by the Tories, who came back to power in 1971 (Grant 1999; Lichfield and Darin-Drabkin 1980, 144–145; Tiechelar 2003).

Labor's last attempt (so far?) to institute a direct tax on the betterment value was made in the linked acts of 1975 and 1976. The 1975 Community Land Act was a local-government-based version of the Land Commission Act. It would have ultimately made it mandatory for local authorities to purchase all development land (Cornfield and Carnwath 1975; Lichfield and Darin-Drabkin 1980, 169–191; Tiechelar 2003). In the interim, the 1976 Development Land Tax Act (DLT) instituted an 80 percent charge on the betterment value. This time the municipalities were allowed to keep some of the tax revenues, but most still went to central government. A team of researchers commissioned to evaluate the DLT in "real time" found that its partial implementation was due to the lack of financial incentives for local governments to administer the tax effectively (Barrett, Bobby, and Stewart 1979; McAuslan 1980, 118–142).

The Tories kept the DLT in the books for a few years, making it the longest-surviving postwar betterment tax in Britain. However, the Tories broadened the exemptions clauses so much that the tax gradually became ineffective and was formally abolished in 1985 (Denyer-Green 1998, 274–275). Since then, Britain's policy has so far said "no" to betterment capture.

However, the issue is by no means dead. In 2004 the Labor government commissioned the Barker Report, which recommended reintroduction of a mandatory national betterment levy to be called the Planning Gain Supplement. It would have captured 20 percent of the increase in land values resulting from the grant of planning permission. This proposal was rejected, partially because developers feared that the indirect value

capture would continue in addition, and partly because local governments would not have been the direct recipients of the proceeds.[1]

Instead of going dramatically back to the tradition of direct betterment capture, the Labor government preferred a hybrid type of levy—a graft of direct and indirect value capture called the Community Infrastructure Levy (CIL). Ironically, the new levy was to commence on April 6, 2010, on the eve of the national elections. The levy would be discretionary, based on a preset formula that reflects the additional floor space allowed by a planning permission rather than the property's additional value. There is flexibility in the types of infrastructure that may be financed by the levy, and the geographic range is broad. However, the new levy specifically excludes affordable housing, to continue to be delivered by means of "planning obligations" negotiated with developers—a well-established type of indirect value capture extensively used in the United Kingdom (Crook et al. 2002; see also section 6 of this paper). The Conservatives who gained power in the May 2010 elections had declared all along that they would abolish the levy, and the new cabinet decided to review is.[2] Will the fate of the CIL be even more short-lived than its historic predecessors?

With this history, no direct betterment recapture policy (meaning, no Labor government) has yet lasted long enough for evaluation research to provide evidence for future policy makers. Since all betterment policies were adopted by Labor yet were altered by Labor itself at the next opportunity, it is clear that none were deemed good enough for re-adoption. Nevertheless, the British experience does provide some tentative lessons about why betterment capture policies may not work, to be summed up in section 5.

4.4 Israel: A Sustainable Betterment Levy

Israel's experience with betterment capture is the longest-lasting current policy among the sample countries (or reported in the international literature). The betterment levy dates back to the 1930s during the British administration over the region. Like many other former British colonies and protectorates, Israel imported unworkable notions of a betterment tax similar to the old British laws. But in 1981, an extensive revision to the betterment tax was enacted that sets out clear and workable rules for levying the net betterment derived from land-use decisions. The law also provides several types of socially based exceptions, including deprived town and neighborhoods, urban regeneration areas, and individually built homes of modest size.

All local planning commissions are obliged to levy 50 percent of the real increment in land value, to be assessed parcel by parcel. Three types of planning and development-control decisions are the legal grounds for the levy: approval of a local or detailed plan, approval of a variance, and approval of a nonconforming use. A bill submitted to the Knesset in April 2010 would add approval of a subdivision plat. The law wisely separates out the grounds from the occasion for levying so as to avoid the mistakes of the old British legislation. The levy is paid upon the sale of the property or application

[1] UK Department for Communities and Local Government (2008). ;

UK Department for Communities and Local Government (2010).

[2] Report to Cabinet Title: Community Infrastructure Levy Regulations (CIL) – (Proposals to Replace S106 Planning Agreements) – Update Following Government Consultation,

May 27, 2010, http://www.rbwm.gov.uk/public/meetings_100510_peosp_community_infrastr_levy_regs.pdf.

for building permission. Importantly for a country where nationally owned land is more prevalent, the levy applies to both private land and public land on long-term leases (which in Israel function almost like freehold land; Alterman 2003).

In addition to the compulsory betterment levy, Israel also imposes a 25 percent unearned increment tax upon sale of a property to tap the added value in general (not necessarily linked to land-use decisions). Sale of a private residential unit is usually exempt. When both the betterment levy and the unearned increment tax apply, the two are offset against each other.

The Israeli betterment levy is an important though highly fluctuating source of income for local governments. Its success is partly due to the fact that the municipalities keep the full proceeds. However, this type of levy is not free of distributive-justice issues. On the intermunicipal level, the levy is inherently uneven because the opportunities for development are a matter of "luck," depending on a town's location, past development patterns, and vacant land. Any betterment such levy of this type would be inherently regressive because the revenues per unit of land will be higher in localities where land values are higher. The revenues are also intrinsically uneven over time because land reserves deplete whereas urban regeneration is slow to occur.

The success of the Israeli betterment levy has several additional reasons: its rationale is clear; the appraisal is plot-specific and provides for fair procedures; the rate is uniform, nondiscretionary, and high enough to justify administrative costs; there are reasonable socially based exceptions; and the revenues may be used for an open-ended set of public services. The levy has never become a major issue in national or local electoral campaigns. In addition to the betterment levy and unearned-increment tax, Israeli planning bodies also practice indirect capture mechanisms (exactions) in varying degrees (Alterman 1990, 2001, 2007). The Israeli example thus shows that, where the real estate market is vibrant, land values may be able to tolerate cumulative layers of value capture mechanisms.

4.5 Poland: A Nonoperational Betterment Levy

Poland too currently has a direct betterment capture mechanism. In the 1990s, after the demise of the Communist regime, Poland legislated a new planning law that introduced a levy on the betterment value created by the approval of an area plan. In view of the strong private property ideology that prevails in Poland, the adoption of the betterment levy at that junction was not a trivial decision. However, the levy as instituted was in fact destined to be barely operational. The legislators should have looked more closely at other countries' experiences in order to avoid repeating mistakes.

Some aspects of the Polish levy are potentially robust. It taps only the real value increase by requiring parcel by parcel appraisal, and the local governments in charge of collection are also allowed to keep the revenues. But several factors weaken the Polish levy. First, the Polish legislature anchored the levy in the approval of a local land-use plan even though such plans did not exist at the time, and still cover only a minority of the country. Most development decisions are granted by means of ad hoc development permits to which the betterment levy does not apply. Second, the law provides for a discretionary rate of between 0 and 30 percent, which may vary even within a single plan. Thus a fairness criterion among landowners is not built in. If a rate lower than 30 percent is applied, the administrative costs may be too high. Third, the law leaves gaping "escape loops" for landowners. The Polish legislators repeated the mistakes of

the British Town and Country Planning Act of 1932 by adopting the occasion of sale of the property as the only tax collection point and by stipulating a maximum number of five years beyond which the authority to tax would expire (Gdesz 2010).

Therefore, direct betterment levies in Poland exist largely on paper. When a legal framework is weak, there is room for differential application (not to say favoritism and corruption). There is currently some discussion in the Polish government about major revisions to the law.[1]

4.6 The Spanish Tradition and Beyond

Spain is another OECD country that, although not in my sample of countries, merits a quick look at its plus-value capture policy because the Spanish tradition, like the British one, has been influential beyond its borders. The Spanish Constitution of 1978 enshrines the betterment capture principle: "The community shall have a share in the benefits accruing from the town-planning policies of public bodies" (section 47). The rate of the operative levies is about 10 to 15 percent—much lower than those of the three countries discussed earlier in this paper (Calavita and Mallach 2009; Calavita et al. 2010; Gielen 2008). Unlike Israel and Poland, in Spain the betterment levy is not necessarily assessed parcel by parcel and may not reflect the real value increments of specific plots. In addition to direct betterment capture, Spanish law obliges developers to finance a wide range of public services as well as to dedicate land to the municipality.

The importance of Spain extends to South American countries, most of which are not OECD members. In these countries, the discussion of the "plus value" as it is called in Spanish, often occupies a high place in both political and scholarly discourse. Legislated instruments of various types have been enacted (Furtado 2000; Smolka and Furtado 2001, 2003; Smolka and Amborski 2007). However, the evidence shows that actual implementation is weak due to the rampant informal development and other administrative and governance weaknesses. Smolka and Amborski's (2007) comparative assessment of South America and North America leads to the conclusion that the former is very strong in rhetoric about direct value capture, while the latter shuns direct value capture but is strong on indirect value capture mechanisms.

What about the other advanced-economy countries not included in my sample? Because the sample of OECD countries is large and varied, my tentative assessment is that not many other OECD countries practice direct betterment capture. In developing countries, where public administration is often weak, even where such levies are on the books (perhaps as relicts from former colonial status), they are unlikely to be effective in practice.

5 Distilling Lessons from the International Experience

Why have most countries avoided adopting direct betterment capture policies? Unless each country insists on making its own mistakes, the experiences gained by Britain, Israel, and Poland should be mined to draw out the relevant lessons. In the absence of any comparative empirical research on outputs, outcomes, or impacts of betterment

[1] Based on personal conversations with Polish government representatives during two visits as a guest of the Polish government in spring and summer 2009. Based also on ongoing conversations with Dr. Miroslaw Gdesz, an administrative court judge in Warsaw.

capture policies, I shall rely on the tentative observations based on the analysis presented earlier. Here are some observations:

- The rationale for plus-value policy is not as easy to "sell" to politicians and voters as may seem from the logic of the argument. The British experience is a real-life laboratory of how the absence of political support can lead to the rise and demise of betterment capture policies along with shuffles in the ruling parties. To adopt a successful betterment-capture policy, proponents must be able to package a rationale that transcends party ideologies. This of course is no easy task, but it is a sine qua non. In the Israeli and Polish cases, the betterment tax has not been a party-political issue and thus has escaped the tug-of-war that its British counterparts have experienced.
- One of the arguments used against direct betterment-capture policies is that they may raise real-property prices because the price of land component would rise. If that were true, it would erode some of the justification for recapture policies. The British experience has not generated much evidence on this issue despite the experimentation with a broad range of tax rates. All of Britain's direct value capture policies installed between 1909 and the mid-1980s were too short-lived to enable systematic evaluation. Nor has the Israeli experience delivered reliable empirical evidence because the 50 percent rate has been uniform over time and place (unless exceptions apply). Thus there has never been a "control group" to analyze. The scholarly literature on related taxes and exactions indicates that their effect on property values depends on a variety of extraneous market and contextual variables (Skaburskis and Qadeer 1992; Evans-Cowley and Lawhon 2003). Empirical research has shown, for example, that the impact may differ between raw land and built-up areas and that these may offset each other (Ihlanfeldt and Shaughnessy 2004). Since the authority to tax must usually be derived from primary legislation and applied equally, policy makers have little flexibility to adjust the level of the levy and its grounds to accommodate market fluctuations. In considering betterment capture it is important to conduct as much prior economic modeling as feasible (see also Vickars 2003).
- The British experience also teaches us that in order to sustain a betterment capture policy; there should probably be a direct link between the government authority charged with collecting the tax and the one that benefits from the revenues. Research evidence conducted in "real time" during the life of the last British recapture policy in the latter 1970s indicates that when local governments had a lesser interest in the revenues, collection was not robust enough. In the Israeli and Polish cases, the levy is administered and kept by the local governments, and they have been its major watchdogs.
- In order to retain public support, the legislation should determine in advance which public services may be financed by the levy and should expose this to the public. However, there is built-in tension between this objective and the need to maintain flexibility to accommodate changing needs for public services or changing public perceptions about what services merit public support. The traditional services such as linear infrastructure and educational facilities may compete with newer items on the list such as environmental conservation, historic preservation, or affordable housing. There are always many mouths to feed, while the potential income from a betterment levy is finite. It is difficult to "square the circle" and resolve this inherent tension between earmarking and flexibility.

- Developers are likely to argue that the revenues should be reinvested in public services for the benefit of the project that generated the funds. This argument should be resisted because it turns betterment recapture into an indirect value capture instrument with a rationale based on mitigation of negative impact or on indemnification of a burden on public services. If so, this type of value capture policy should be designed from the start as an indirect value capture instrument with an impacts-based rationale at its forefront.
- To retain its rationale, the betterment levy should be assessed parcel by parcel so as to capture only the real rise in value, as successfully applied in Israel (and potentially in Poland). However, this raises the administrative costs significantly. To allow a reasonable net yield, the rate of the levy must be relatively high. Public agencies might be tempted to simplify the levy by adopting a preset charge based on some easy formula (such as per built-up area of per assumed average increase). This type of quasi-betterment levy was briefly proposed in Israel in 2006 but discarded following protest by the Association of Local Governments. Some scholars have recommended similar formula substitutes (Ihlanfeldt and Shaughnessy 2004; Gdesz 2005 for Poland). Such shortcuts gnaw away the very rationale of direct value capture and, with time, might lose the value capture justification and become just another tax.
- Direct value capture poses a tough distributive justice dilemma. Adoption of a uniform rate for all landowners and locations is fair in some ways but not in others. Although the rate may be ostensibly equal, the opportunities for revenue are never equal across place and time. Betterment levies also have inherent regressive attributes. Well-off towns where property values are usually high or where land reserves happen to be available will be able to reap higher revenues than less-advantaged or just historically unlucky towns. Thus an equal assessment rate by no means ensures equal revenues—by whatever indicator chosen.
- Finally, a similar ethical dilemma applies to the distribution of the revenues. On the one hand, the desire for local voter support justifies retention of the full revenues at the local level. But on the other hand, distributive justice considerations justify redistribution. Localities with high revenues do not necessarily need or merit the revenues most. Calibration of funds among municipalities could be done by means of the national or regional governments on the basis of various criteria. Two of the British postwar policies as well as the 2005 rejected proposal did incorporate a national-redistribution policy. However, these policies are deemed to have failed partly because they paid a price in lost local public support and in reduced efficiency in tax collection. This dilemma faces issues of both ethics and feasibility, and there is no sure and tested way to resolve it.

The fact that most countries have not adopted a direct form of betterment capture indicates that the shortfalls and dilemmas noted here are not easy to resolve. There are many built-in catch-22s and very little international experience from which to learn. Meantime, the indirect value capture instruments have been flourishing.

6 Indirect Value Capture

Even though direct betterment capture is not prevalent, the idea that government should reap the unearned increment on land has not died away; it has simply undergone various mutations. The need for innovative funding sources for public services has in fact

increased in recent years. There are three well-known reasons for this increase: growing voter reluctance to pay higher taxes, higher costs of many services, and—at the same time—voters' expectations for amplified services (Alterman 1988b; Altshuler and Gomez-Ibanez 1993, 1–4; Callies and Suarez 2003; Rosenberg 2006; Nelson et al. 2008, iv–xiv; 1–3).

Local governments therefore increasingly need to conjure up financial instruments that are less visible to voters than direct taxes or levies. The alternative is to leverage local governments' authority to regulate land use, and solicit from landowners or developers money, land, or construction services in exchange for an affirmative decision or fast-track processing. But instead of doing so through the front door of direct betterment capture, local governments in many countries increasingly adopt a smorgasbord of indirect value capture instruments.

6.1 A Variety of Terms and Instruments

Indirect capture instruments vary from country to country and locality to locality. They are known by a variety of terms. A general term proposed by Alterman and Kayden (1988) is *developer obligations*. In the United States indirect value capture instruments are generically called *exactions*. In the United Kingdom they are known as *planning gain*, or, more recently, *planning obligations*. In France the term is *participation*. (Renard 1988). If based on preset formulas indirect instruments may be called *impact fees* in the United States or *development charges* in Canada (Slack 2004). In the Netherlands the term (as translated into English) would be *cost retrieval* or *cost allocation*.[1] The term *incentive zoning*—born in the United States but of recent international spread—refer to two-tier discretionary instruments whereby the developer may choose to grant the desired good or obtain lesser development rights.

6.2 Alternative Rationales for Indirect Value Capture

How do indirect value capture instruments relate to the direct ones? The same generator propels indirect and direct value capture—the increase in land values due to land-use decisions. However, the unearned-increment rationale remains only in the background. Under some legal regimes, such as the United Kingdom, to survive legal scrutiny, users of an indirect instrument may even have to prove that they are *not* motivated by the desire to recoup "betterment by stealth."[2] Alternative rationales must be conjured up. I propose the following classification (compare Healey, Purdue, and Ennis 1993):

- Indemnification of direct public costs of public services generated by the particular project ("cost recovery"). In cases where cost recovery is capped by the amount of betterment, the instrument becomes a hybrid between direct and indirect value capture.
- Need for public services, infrastructure, housing, or ecological services that are not met by the market or by existing funding sources.
- Internalization of negative externalities such as noise, radiation, or pollution.

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[1] These are the official terms in the English translation of the Dutch Land Development Act that came into effect in July 2008. Available at http://www.vrom.nl/docs/internationaal/Land%20Development%20Act.pdf.

[2] The official UK government circular on "planning obligations" states in section B7: "Planning obligations should never be used purely as a means of securing for the local community a share in the profits of development, i.e. as a means of securing a 'betterment levy.'" (July 2005 Circular 05/2005, Office of the Deputy Prime Minister).

- Mitigation of impacts on the natural environment or on historic buildings.
- Mitigation of perceived social injustices such as social exclusion or higher housing prices.

In practice, a mixture of these rationales may serve as the legal or public-policy ground. Real-life application of indirect instrument often contains ambiguities about which of the alternative notions is being applied in a particular case. Indirect instrument also vary in how the contribution is delivered: some are in money, others in kind whereby the developer constructs a public service, delivers mitigating technologies, supplies land, or builds housing.

6.3 An International View of Indirect Value Capture

Among the sample of thirteen OECD countries, all except Sweden and the Netherlands have decades-long experiences with shifting the costs of public services onto developers. Since the 1990s Sweden too has been gradually joining the group. The Netherlands is the last in the set to adopt indirect capture instruments, formally enabled for the first time by the 2008 Land Act. So even the Netherlands—with its uniquely strong tradition of direct government action in land purchase and development—must now rely more and more on land-use regulation and private developers as a source of financing for public services (Needham, 2007, 176–177).

Indirect instruments differ from direct ones in the way they emerge. Direct capture instruments are usually enacted or otherwise adopted "top down," often for an entire jurisdiction. This is because in well-governed countries, authority for direct value capture may entail special enabling legislation (at times even constitutional amendments). By contrast, indirect instruments often emerge "from the bottom," by dispersed locally grown policies. If the instruments are viewed as successful and survive legal challenges, they are likely to be copied by other localities. The United States has been an especially rich breeding ground for a wide variety of innovative value capture instruments that are recently being "exported" overseas (Alterman 2005; Spaans, van der Veen, and Janssen-Jansen 2008, 17–22).

Because the indirect instruments are usually locally determined and may not require explicit legislation, they have several advantages over direct betterment capture:

- They can more easily go "under the radar" of party-political debates and can therefore better survive changes in party ideology and voter resistance to new taxes.
- They can more easily be justified to the project's consumers and to the general public if they are linked to the burden that the project would have otherwise placed on the public.
- They are more flexible for financing changing public needs because they are usually applied only when development is ripe.
- They can be fine-tuned to be politically more acceptable when sociopolitical positions change in the community
- They may be adjusted to accommodate the changing economics of real estate so as not to drive away development.

Yet, indirect capture instruments are not a panacea. They are often applied case by case, without ensuring equality among landowners. These instruments are therefore open to political and legal challenges regarding bias and favoritism. The value of the financial

or in-kind resources delivered by developers is often unpredictable because it depends on uncertainty about estimates of anticipated impact or on the success of negotiations. The extent of financial gains to the community may vary even among parallel projects. There is some evidence that the financial gains to the public may represent only a few percent of the unearned increment (Alterman 1988a).

6.4 Some Preconditions for Adoption of Indirect Value Capture

Indirect value capture policies are likely to expand and intensify around the world. Because of the complexity of these instruments, there is great need to exchange knowledge between jurisdictions, so more systematic comparative analysis is necessary. I hypothesize four preconditions for reasonably successful application of indirect modes of value capture:

- Governments should have well-trained professionals (planners or real estate experts) to negotiate with the developers or to develop preset formulas of impact assessment. The professionals need to be savvy in real estate economics to be able to assess the limits of how much may be exacted from the developer without "killing" the projects.
- Local government should conduct good monitoring of fluctuations in land prices in order to be able to challenge developers' arguments that the exactions in fact raise the cost of housing or other products. This type of argument—not necessarily true in specific market situations—may generate public opposition.
- There should be enough transparency in negotiated exactions to help withstand legal challenges (yet full disclosure is often not possible in order to protect the legitimate economic interests of the developers).
- Countries or local authorities known for high levels of corruption should refrain from adopting value capture instruments with discretionary elements. A reasonable good level of trust in government is a precondition for their successful operation.

7 The Future of Direct and Indirect Value Capture

An obvious issue is the interrelationship between the two categories of value capture. In those few countries that do practice betterment capture, does it in fact replace the need for indirect capture instruments? The state of current knowledge does not provide empirical answers to this question, and the body of law is also skimpy. However, the underlying logic of the two modes leads me to conclude that they are not mutually exclusive. The indirect capture instruments are often open-ended and evolving, and they possess the capacity to "fill in the holes." So long as governments have insufficient resources for public services (as they often do) and so long as they have the authority to refuse permission to develop, indirect value capture, especially its negotiated modes, is likely to be practiced to some extent.

The experiences of the United Kingdom and Israel shed some light on this issue. In Israel, negotiated exactions are sometimes applied over and above the 50 percent betterment levy, and case law has not ruled them illegal. In the United Kingdom, negotiated planning gain (today called "planning obligations") likely existed to some extent in parallel to the various direct betterment capture modes exercised until the early 1980s. The current debate surrounding the 2010 Community Infrastructure Levy illustrates the difficulties of drawing a solid boundary between the two modes of value

capture. Although the policy statement makes an effort to restrain double charging, developers and the new Tory-led government are not yet convinced.

The bottom line is that the rationale for direct betterment capture may be convincing on paper, but it has not caught on widely across the world. At the same time, indirect value capture tools have proliferated. As counterintuitive as it may seem to those who have not walked through this paper, these instruments—with their "messy" rationales and exposure to legal challenges—hold the more realistic potential for funding public services than their elegant direct-capture siblings.

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Professional Liability & Ethics

Just how smart is "smart regulation": evolving architectures in the governance of regulation?

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Abstract:

Government endorses the idea of "smart regulation", seeing it as an attractive wrapper for a business-friendly approach to regulation that could make savings to the public purse whilst offering improvements in consumer protection. The result is to bring the regulation of commercial providers of goods and services closer to previously privileged concepts of professional self-regulation on the basis that it offers "cost-free" regulation.

This paper examines whether smart regulation is just another manifestation of a "fictional commodity" enabling producers to cloak their activities in a favourable light. Alternatively, smart regulation could result in greater transparency, giving legitimacy to the providers of goods and services and better protection for consumers. The drama of smart regulation in disarray in the financial sector since the 2008 "crunch" provides one perspective, but the authors argue that now is the time to formulate a theory of regulation and governance that better captures recent developments.

Having published separately on disparate issues of regulation (including food law, statutory nuisance, professions, service charge management and financial accounting), the authors draw these together here. Our model is based on Gunningham's (2009) concept of regulatory "architecture". This has been developed further into a "Triptych" of regulatory processes that better describes the relations between regulator and the regulated.

Keywords:

smart regulation, regulation, self-regulation, governance, nuisance, building control

1 Introduction

The professions and business refer to, generally accept the need for, and may even promote regulation. The key issues are: who regulates and who pays? Self-regulation has the official support of government in the form of the Better Regulation Executive (BRE), an arm of the Department for Business, Innovation and Skills (BIS), whose brief is to lead the regulatory reform agenda across government as a whole. This apparatus could be seen as the swansong of a Labour Government profoundly discredited by the failure of regulatory institutions to regulate the financial sector effectively, so contributing to the "crunch" of 2008. But its roots go back to the 1990s and it has survived - at the time of writing (May 2011) - a year of centre-right Coalition Government.

Self-regulation provides an alternative to direct regulation by the regulator. It is closely linked to "smart regulation" which provides the focus to this paper. Smart regulation has its origins in the broader principles of deregulation, risk analysis and no-cost regulation - a process that has been exhaustively examined by a number of writers over the years. It is a somewhat broad concept: "used to refer to an emerging form of wide-angled regulation that seeks to harness not just governments but also business and third parties to provide policy alternatives that include, but also go beyond, direct regulation" (Gunningham 2009: 200).

These are very broad and ambitious claims. Smart regulation was originally developed in the context of environmental regulation in developed economies, in part as a response to the failure of state agencies to regulate pollution effectively, or to prevent exporting the collateral damage of industrial pollution to developing economies (Black 2007). Its smart characteristics are rooted in its flexibility and diversity as distinct from "single instrument or single party approaches" (Gunningham 2009: 200). The overall purpose, then, is for smart regulation to:

...allow the implementation of complementary combinations of instruments and participants tailored to meet the imperatives of specific environmental issues, and will result in a more flexible, efficient and effective approach to environmental regulation than has so far been adopted in most circumstances (Gunningham 2009: 200).

The problem with attributing such broad aims and general applications to smart regulation is that it becomes a bit too vague, flexible and all-embracing. An advantage is that it provides a way of stepping back from the detail to examine the underlying structures of regulation. Gunningham's analysis applies to changes in environmental regulation over time. It provides a useful way of understanding processes across national and regional boundaries as well as for evaluating changes in policy. But it also has a wider application for analysing changes within occupational and business structures. Thus, the modernising thrust of smart environmental regulation is to:

... embed environmental values and processes within corporate culture in such a way that it becomes self-regulating, relying on oversight from local communities and perhaps third-party auditors, to supplement or even replace direct regulation (Gunningham 2009: 202).

This framework invites comparison with other areas of regulation and in this paper we will examine an example of professional self-regulation and the Primary Authority Scheme for local authority enforcement. Both these examples reveal that high expectations are placed on making improvements to the process of regulation. Whether regulation is smarter as a result is in issue; if present, it needs to be specified what this actually entails.

1.1 Background to Deregulation

The background to deregulation has been extensively analysed and talked about. There is basic agreement that in the course of the 1980s and 1990s a crisis emerged in the developed economies over the role of the state and its executive agencies as regulator (Braithwaite 1999, 2008; Black 2007). This was accompanied by a strongly

deregulatory rhetoric that included attacks by economically liberal politicians on the costs of over-regulation for businesses (Hutter 2005).

The legalism and inflexibility of regulators were singled out for castigation. Sometimes this amounted to verbal abuse. For example, in the UK, Neil Hamilton, the Deregulation Minister, in addressing the October 1994 Conservative Party Conference, famously described the proper role of local government enforcement officers as "handmaidens of business – helping them to comply – rather than the local branch of the Gestapo" (Andrews 1998: 21). Interestingly, soon after the Deregulation and Contracting Out Act 1994 became law, section 37 was criticised for giving ministers dictatorial powers to use regulations to repeal legislation without requiring scrutiny by Parliament (Williams 1995).

The type of regulation that was castigated here was derived from "command and control", where the system is based on the regulator making frequent inspections, with reliance on formal methods of enforcement, and showing a readiness to resort to prosecution for infringement of regulations (Hawkins 2002). The reality was somewhat different and the practice of state regulators, at least since the 1980s, has been to rely heavily on persuasion and encouragement to comply with regulatory requirements, with formal enforcement powers – particularly prosecution – being used only as a last resort (Hawkins 2002). But the underlying purpose of the Deregulation Minister's jibe was to promote the superiority of techniques developed in the private sector. These were (and still are) very attractive to politicians, their advisers from business and to ministers' policy advisers. Providing credibility to the deregulation agenda has been assisted by academics, who from the late-1990s were being nurtured by rich sources of funding drawn from both central government and business as a source of intellectual support to the ideology. The key private sector virtues incorporated into the regulatory agencies have included: the setting of explicit standards and measures of performance; a stress on private sector styles of management practice, including hands-on professional management; and an emphasis on greater discipline and parsimony in resource use (Hood 1991: 4-5).

1.2 Professionals and Deregulation

Professions face particular problems in the ideological battle over regulation since they are the dominating example of a powerful elite allowed to self-regulate in anti-competitive and monopolistic forms. Therefore, theirs is a different experience to that of the wider business community. Whilst smart regulation does have similarities to self-regulation, this difference in experience creates a very different environment for professions. We have adopted the concept of late modernity to explain this context and the paradox it creates. The idea is taken by Reed (1996) in his discussion of expert power, where he describes professions as not only engaged in a battle to retain occupational control, but that they are losing (see for example Muzio 2004 on the legal profession). The rise of the knowledge-based economy and its new classes of worker are seen as a fundamentally new paradigm in social, political, economic and market contexts (see for example Evetts 2003a, 2003b) and are destroying traditional forms of occupational control.

Late modernity is drawn from the work of Lord Giddens (1990, 1991, 1994). He devised the concept to refer to the various ways in which a culture of radical scepticism and uncertainty has penetrated deep into the social fabric of everyday life in modern societies. The knowledge that underpins professions becomes submissive, provisional

and abstract, rather than a body of expertise. Late modernity is characterised by uncertainty, powerlessness and the loss of determining authority.

There are no authorities which span the diverse fields within which expertise is claimed – another way of repeating the point that everyone in modern systems is a lay person in virtually all aspects of social activity (Giddens 1991: 195).

Organisations permanently monitor and control all operations and the application of knowledge through a process of institutional reflexivity. From this others have created the concept of a "post-bureaucratic" or neo-bureaucratic" state (for example Farrell and Morris 2003), which further strengthens the view of the expert as a servile functionary. What generates smart regulation is destroying self-regulation since it is not based upon expertise as much as a desire to engage as a collaborator with other parties on creating 'safe' goods and services.

Late modern, therefore, is used in this work to represent the erosion of traditional forms of respect together with a growing scepticism regarding the idea of an elite. It reflects the increasing orthodoxy towards deprofessionalised and managerialised professions, of fundamental technical changes within occupations that undermine the control of expertise and which traditionally form the foundations for the social superiority of the concept of profession. Giddens (1991) points to common themes of powerlessness, uncertainty and commodification within modernity. Whilst "smart regulation" provides an opportunity to create, or recreate, occupational control and establish a determining authority, reinforced and recognised by the State, it is also a threat. Whilst this is particularly an issue for professions, all forms of expertise are similarly affected and the concept of late modernity provides a useful background in which to explain the events discussed here.

1.3 Smart-regulating the Professions: the Case of Building Control

The particular problems faced by professions derive from the very meaning of a profession. Professions exist because they have created an occupational jurisdiction (Abbott 1981, 1986, 1988, 1991) recognised by clients and the State. Professional work requires the establishment of difference, of distance between professional and client (see, for example, Johnson 1972) and the creation of a fictional commodity (Larson 1977). The resulting dialogue of professional versus charlatan provides a particularly illustrative example of the importance of regulation to the concept of profession. It helps maintain occupational control, an authority that is swept away by internationalising modernity (see, for example, Giddens 1991) and, potentially, by smart regulation.

Building control was the very first profession to face directly the introduction of what we now know as smart regulation. The 1984 Building Act and the statements set out within the Building (Approved Inspectors etc) Regulations 1985 proved a key piece of legislation in developing the deregulation agenda within the building industry. It removed building control from within the domain of public sector Building Control Officers to a market-orientated competition between public and private sector provision. Government application of the Deregulation and Contracting Out 1994 Act led to the acceptance of approved private sector inspectors as clarified in the Building (Approved Inspectors) (Amendment) Regulations 1996. This removed the specialist nature of building control from its previously prescribed body of public sector professionals and opened the way to other operatives. Those seeking to operate as such must apply to the

Designated Body, which the legislation created to ensure the maintenance of inspection standards. This body is currently the Construction Industry Council (CIC).

The particularly interesting development within building control is that the CIC awards the status Building Control Body (BCB) to those deemed worthy of carrying out building control work. The first body to be given approval was on 11th November 1985 to NHBC Building Control Services Ltd. As part of NHBC they obviously had prior experience of this line of work given the nature of the NHBC guarantee and their long experience of carrying out inspections. The legislation was originally intended to apply only to individuals since the Building (Approved Inspectors etc) Regulations 1985 required any corporate bodies seeking approved inspector status to apply directly to the Secretary of State for the Environment, Transport and the Regions, rather than to the CIC. An indication to revise this was given in a written response by Construction Minister, Nick Raynsford (DETR press release 1998: 188/ENV) on 11th March 1998. By this time, the number of inspectors had risen to seven companies and 30 individuals, increasing by July 1999 to 12 companies and 35 individuals.

Within building control and the general enforcement of Building Regulations there has been a consistent drive since the Building Act 1984 came into force to avoid the need (and expense) of inspecting building work. This led to the search for so called competent persons whose work is of a high quality that does not need checking and may be self-certified (DETR 1997). DETR (1999a: 3) places emphasis on cost, that "building control must also be efficient, to minimise cost and delay for those carrying out the building work." The result was that membership of a professional body was deemed appropriate to qualify the expertise and regulate competence of building control service providers (DETR 1999a, 1999b). Of course, this returns to professions as regulators. Not exactly self-regulation, but close enough at the time to appease the wider professions whose private sector members saw business opportunities at the expense of their public sector colleagues. Similarly, the Royal Institution of Chartered Surveyors saw the opportunities for itself and its members in becoming the dominant professional authority under this new regulatory paradigm.

1.4 Self-regulation of Businesses

The Local Better Regulation Office (LBRO) sits in the vanguard of change in the relationship between local authority regulators and businesses. The Office was established under the Regulatory Enforcement and Sanctions Act 2008 as a public body accountable to the Department for Business, Innovation and Skills (BIS) through the Better Regulation Executive (BRE). The LBRO launched the Primary Authority scheme in April 2009, the essential objective being for local authorities and companies to reach agreements about how their regulatory relationship should operate (LBRO 2010). Instead of companies with many outlets having to deal with various local authority regulators, implementation of the agreement would simplify and centralise regulatory activity by funnelling advice and enforcement action. As a result, only one local authority acting as the Primary Authority enforces environmental health, licensing, health and safety, and trading standards law. The aim is that enforcement is carried out consistently by the primary authority with respect to many, if not all, of the activities of the company subject to regulation by local authorities. If successful, the regulatory model presaged by the Primary Authority Scheme produces benefits in terms of rationality, legitimacy and effectiveness; and savings in the costs of regulation can be hoped for too.

The building up of a relationship of trust between the regulator and company is anticipated to mean that more of the regulatory burden is managed willingly by the company. The nature of the burden is legitimated, so that a climate is induced that allows self-regulation to flourish. The role of regulation thereby changes, with the regulator taking a less direct, more supervisory role, so resulting in cost savings. This process has been described as "meta-regulation" in which:

The role of regulation ceases to be primarily about inspectors or auditors checking compliance with rules, and becomes more about encouraging the industry or facility to put in place processes and managerial systems which are then scrutinised by regulators or corporate auditors

(Gunningham 2007: 190-91).

All this "regulatory goodness" contrasts favourably with the vagaries that may ensue when individual local authorities are left to their own devices. Without the guidance and support provided by enlightened officials, such as those employed by the LBRO, local councils become liable to corporate drift, such as may occur when there is a mismatch between the agendas of local cabinets and the practices of council officials. Councils may be powered by inconsistent political agendas; they are structured as separate corporate entities and have a margin of discretion to formulate enforcement policies. These forms of particularism are not removed by the Better Regulation Agenda; and the Primary Authority Scheme has not been imposed by central Government, only promoted and led by the LBRO.

The Better Regulation Agenda calls for the regulator to change its behaviour – by operating more like a private company – and for the company to cooperate and become a party to the regulatory endeavour. This way of thinking goes back to the *Enforcement Concordat* (1998) which:

Signified an agreement between government, business and local authority regulators over the use of a risk-based approach to enforcement which was designed to be more business-friendly and in line with the prevailing deregulation ideology (Pointing 2009: 595).

The Better Regulation Agenda is very appealing to those wanting to change the ways local authorities have traditionally gone about their business. Responses to the Primary Authority Scheme have also been positive. Judging from published responses by key professional bodies, such as the Chartered Institute of Environmental Health (CIEH 2008), there seems to be wide support for smarter, risk-based models of enforcement as a better alternative to "command and control" (Hawkins 2002: 13-16) and other forms of direct regulation.

The benefits appear to be "win-win" for all concerned. With cooperation and partnership the gate is opened "to simpler, more successful local regulation, based on a new relationship between businesses and local authorities (LBRO 2010: 2). Better regulation is directly equated with better relationships:

Better relationships between the regulated and the regulators mean better regulation. Primary Authority can increase the prosperity of businesses and communities, and offer protection for vulnerable consumers and traders facing unfair competition (LBRO 2010: 3).

Consistency in regulatory approach, better relationships and simplicity in dealings are the key watch words. The central state acts as the referee in this process, with the LBRO presiding as a helpful, enabling "Dutch uncle" who ratifies a successful relationship brokered between the regulator and firm. Should the need arise it even provides a dedicated dispute resolution service (LBRO 2010: 3).

2 "Better" Regulation?

Despite the intentions of government to free businesses from the burdens of over-regulation and all the talk about it, there has been little winding back of regulation in the longer term (Braithwaite 2008: ch 1). Indeed, Braithwaite (2008, Foreword) argues that there has been an explosion of regulation going back to the dark age of Reagan and Thatcher. This phenomenon has profoundly changed the structure of social relations, amounting to a paradigm shift towards "regulatory capitalism". Such changes go beyond the "regulatory state" not least because non-state regulators have proliferated not just ones deriving authority from governments.

Stepping back from the wider picture, in the environmental sphere, claims made in the 1990s that negotiated agreements would reduce administrative burdens have not been made out (OECD 2000:131). It is still too early to judge whether the agreements brokered by the LBRO will increase or decrease the amount of regulatory activity. But even if relations do improve between regulator and company this is not necessarily in the interests of the wider public. Better relationships, as distinct from better regulation, could result because the regulator has been "captured" by the company, perhaps dazzled or over-awed by the corporate power imbued in the company.

Sometimes the relationship between regulator and company becomes very fraught. An instance of this can be found in the case of *Derrick Barr and Others v. Biffa Waste Services Ltd* [2011] EWHC 1003(TCC). Here, the company did make initial attempts to engage with local residents and to keep them better informed about its land-fill operations which were causing a nuisance. The relationship deteriorated over time between the company and the regulator (the Environment Agency) and between the residents and both the EA and Biffa. Difficult nuisance problems to do with landfill sites, waste disposal facilities and sewerage works have a tendency to drag on for years. An acceptable solution to odour, noise and dust problems from such sites can be elusive, leaving one or more stakeholders dissatisfied, perhaps irreconcilably so.

Mr Justice Coulson heard the case over an 18-day period in the High Court. His Lordship was concerned about many aspects of the case in which Biffa were denying that any actionable nuisance had been caused from their operation of the waste site. The company asserted that they were entitled under the doctrine of statutory authority to operate the site as they wished, provided they did not do so negligently and acted in accordance with the terms of their waste licence. The case is a particularly interesting one because it reveals the drama of deteriorating relationships. His Lordship was "particularly troubled" by Biffa's confrontational stance towards the Environment Agency (para. 570), finding that the company's "unnecessarily aggressive approach"

spilled over into the trial itself and created an "unfortunate impression" (paras. 572-3). On the other hand, the "pusillanimous attitude of the EA" came up for criticism, his Lordship finding that they "should have been much more forceful with Biffa" (paras.579-80). Over time, co-operation between the EA and Biffa was in "very short supply" (para. 580) and the interests of the public were hardly served at all. Indeed, the quality of relationships fell to just about the lowest point imaginable in a civilised society.

The judgment is a salutary lesson regarding the idealisation that permeates the Better Regulation Agenda when being promoted by government agencies. The notion that better relationships between regulators and businesses are closely linked to improvements in the system of regulation is an untested assumption, and possibly one that is simplistic and flawed. Further, the possibilities for self-regulation depend very much on the type of problem subject to regulation and on the nature of the business. A waste operation can be run by a highly organised, properly licensed, competent and professional company (one like Biffa). On the other hand, there are people running waste companies illegally, without a licence, who could be better described as serial fly-tippers than as businessmen. Obviously, the approach taken by the regulator towards these extremes will need to be different, with recourse to prosecution coming very early on in the relationship with the latter. A regulator may be operating in accordance with smart regulation principles, but just because it decides to prosecute a fly-by-night waste operator promptly for illegally depositing regulated waste does not mean there has been a paradigm shift back to "command and control".

There are also substantive limits to the extension of Better Regulation methods which may be established in legislation. For example, section 80 of the Environmental Protection Act 1990 places a duty on a local authority to serve an abatement notice on the person responsible for causing a statutory nuisance in its area (Malcolm & Pointing 2011). The Act requires an opinion to be formed about whether a statutory nuisance exists, or is likely to occur or recur, before the notice can be served. Such an opinion is made on behalf of the council; if it is to be made properly that opinion should be reached by an environmental health practitioner. The principle enshrined in the legislation is for the regulatory decisions to be made locally, not by another local authority under the Primary Authority Scheme. The Environmental Protection Act 1990 was deemed to come within the scope of the Primary Authority Scheme when the government published its consultation document (BERR 2008). The specifically local enforcement implications of the statutory nuisance regime may not have been fully appreciated by those who drafted this document.

3 Towards an Architectural Triptych

The model we are proposing for testing the smartness of regulation takes into account differences in the capacity of businesses or professional entities to engage with the regulatory process. It also takes on board the policies and modes of regulation being pursued by the regulatory body. The model has to accommodate differences in the capacities of the regulated entity to understand, relate to and accept the legitimacy of the regulatory process. Underpinning the model is the work of Gunningham (2009), in particular the concept of "shifting architectures". This term is useful for putting changes over time into perspective. It also incorporates the trend towards indirect regulation in which the responsibility for, and costs of, regulation is increasingly internalised by the business or professional organisation.

Our model identifies three stages comprising a "triptych", a term indicating that these stages are linked. Implicit within the dynamics of the triptych is that regulated entities will move through these levels.

Neophyte

All entities seek to self-regulate in some way, particularly when starting up. Neophytes need encouragement rather than penalisation, and will often seek guidance, advice and help from the regulator. Neophytes may be enthusiastic, but often lack confidence and skills. The approach of the smart regulator is to assist in providing neophytes with a path to the next level. Not all neophytes will want or be able to engage with this process. Some will be incompetent, dishonest, or even running criminal businesses that are "beyond regulation" (Pointing 2005:49).

Self-Improvers

The second stage recognises that firms will learn and develop given appropriate support, guidance and help from the regulator. Recourse to intrusive types of enforcement – disciplinary action, serving of formal notices or prosecution – should not be necessary and smart regulators will use their powers sparingly and as a last resort. This is a transitionary stage, not an end result. Businesses and professional entities are assumed to be striving towards the next stage. This can be seen as a form of professionalization whereby firms are in the process of a transformation.

Champions

This is the ultimate end to the regulatory process. The steady-state stage of the model is that businesses and professional groups seek to establish themselves as self-regulating paragons. To reach this stage, the costs of regulation are largely met by the body being regulated; the regulator can adopt a removed, supervisory relationship that is only rarely visible. Professional associations reflect this ideal, but trade associations aim to reach similar status. Business champions can demonstrate a clear "difference" between themselves and their less competent competitors. This allows them to create a "fictional commodity" (Larson 1977) – incorporating branding and competitive advantage.

4 Conclusions

The paper identifies the philosophical (Late Modern) and legislative environment driving the ideas of smart regulation, concluding with a "Triptych" modelling the agents upon whom it acts. We overviewed two examples, one as the first example of the "smartening" of regulation (Building Control) and one that offers insight into its current form (the role of the LBRO).

Our adoption of Late Modernity allows us to draw attention to the competing authorities seeking to dominate legislation, whilst recognising that there is no single, determining authority. Government (local and national) is increasingly unable to "command and control" and traditional professional expertise is unacceptable for legitimising a right to self-regulate. Whilst it is tempting to describe LBRO as a determining authority, it is exactly the opposite, depending upon voluntary adoption and a willingness to learn from mistakes – rather than a determination to enforce and punish. Late Modernity offers intriguing insights into self- versus smart regulation.

Our Triptych emphasises the role of the regulated rather than the enforcer. It illuminates the role of encouragement, negotiation and an acceptance that mistakes happen. One obvious area for further development is those entities "beyond regulation" since the model presumes some degree of engagement and a willingness to comply. This requires consideration of the dynamics of change and the basis of the desire to self-regulate.

There is a need for empirical data to flesh out both the model and the principles of smart regulation. Objectively, is smart regulation "better" and/or cheaper, or is it a surrender of independence to vested interests? Is cost-free to the consumer actually a cheaper option? Such questions will be the subject of future work as we develop our ideas and create data to test them.

One case study identified for further work concerns Somali shop owners in Hayes, whose encouragement is derived from an engaged local authority and local community champion. In the case of trade associations, whilst some are little more than "badge associations", others engage their membership in moving through the Triptych. This process by which trade associations "professionalise" through a variety of actions (enforced CPD and PII, for example) as well as regulatory control provides a particular organisation as the driver of change.

Whilst professional firms might be expected to be champions within the Triptych framework, due to professional regulation this possibility is inconsistent, as shown by recent work into service charge management (see, for example, Eccles and Holt 2009). This shows the need for the model to engage with a wider secondary literature, such as Di Maggio and Powell (1983) on why firms change and the role of smart regulation in inducing change. Equally, the grounded theory being developed must be taken into the real world of the specific, and tested and fleshed out against empirical studies. This is our next endeavour.

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Professional Liability of the Construction Professional as an Expert Witness in the Spanish Legal Framework

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Abstract:

Inside COBRA 2011 RICS International Research Conference, the present paper is linked to analyze the liability of the construction professional in his practice as a expert witness in the Spanish legal framework. In a large number of legal procedures related to the building it is necessary the intervention of the expert witness to report on the subject of litigation, and to give an opinion about possible causes and solutions. This field is increasingly importantly for the practice of construction professional that requires an important specialization. The expert provides his knowledge to the judge in the matter he is dealing with (construction, planning, assessment, legal, ...), providing arguments or reasons as the base for his case and acting as part of the evidence.

Although the importance of expert intervention in the judicial process, the responsibilities arising from their activity is a slightly studied field. Therefore, the study has as purpose to think about the regulation of professional activities raising different aims. The first is to define the action of the construction professional-expert witness and the need for expert evidence, establishing the legal implications of this professional activity. The different types of responsibilities (the civil, criminal and administrative) have been established as well as the economic, penal or disciplinary damages that can be derived from the expert report.

Keywords:

expert report, expert witness, law of evidence, professional liability

1 Introduction

In a large number of judicial processes relating to the building is required the intervention of a Expert witness to report on the subject of litigation, giving an informed view on possible causes and solutions (Sido, 2005). An expert can only bring to the attention of the judge matters of fact, so dominant that can only be issued by anyone who is trained in a particular branch of knowledge, whether scientific, artistic, technical, or a particular practice. The expert provides the judge the knowledge he is not required to master (building, planning, valuations, legal architecture, ...), providing arguments or reasons for the building of his trial thus acting as a test. Expert intervention is used as a means that can be used in court to assess the facts (Xiol, 2002). The survey will be made based on the mere knowledge of an expert, or rather the application of such knowledge in evaluating a particular test. The expert may be appointed judicially or

proposed legal action by one or both parties. He may exercise the same influence on both the trial and his performance making his task indispensable in the investigation phase and the probative value on the course of proceedings.

This field is increasingly important for the professional practice of architects and other professionals related to construction, which requires significant expertise. The Civil law procedure (Article 340) defines the need. The same law states that experts should be legally qualified (article 457) by holding a university degree attesting to their expertise or not (Xiol, 2002), despite not having the same, proving to be versed in the speciality. According to Royal Decree 25/12/1977, of June 17 expert opinions are part of the professional work of the architect.

In spite of the importance of expert intervention in the judicial process, the responsibilities derived from his activities are a scarcely studied field. The responsibility can be defined as demand for compensation incase of damage or harm resulting from an act done freely (Gamble, 1987). Therefore, from the legal point of view, there must be accountability first, the course of damage, and secondly, personal conduct which could be attributed to the former. That is, there must be a causal or cause-effect relationship between a specific behaviour and the damage caused by it. This damage can result from breach of any law or any contractual obligation of the bond created by the free agreement of the parties to a contract. Therefore, to prove the causal relationship between a particular breach and expert performance it is essential to define the responsibility of the expert.

Both situations action-damage provide a third element of responsibility, which involves the duty to indemnify or compensate the damage caused. The way in which it materializes depends on the origin of responsibility. Legally there are, broadly, three types of responsibilities, civil, penal and administrative, describing their nature and their damages (Gillardin, 1989).

2 Civil responsability

2.1 Nature of civil liability

Expert's civil liability starts on voluntary or involuntary acts or omissions linked to his activity (Farr, 2005). These result in damage or harmful outcome which could have been avoided having acted diligently. This negligent conduct may occur in the content of the opinion, as the way to such issue (for example, the delay in the issuance) in operations involved in expert performance as the recognition of places (art. 345 LEC) or where appropriate, the assistance in the trial for oral ratification of the dictum. (art. 347 LEC).

Therefore the civil responsibility occurs within the scope of the activity of the experts in their individual relationships with the parties involved in the process. The judicial interpretation of such responsibility is based on the so-called 'theory of cost-benefit '. It states that anyone who takes advantage of an activity (in this case, which involves the provision of services as an expert), takes full responsibility in consequences resulting therefrom. Therefore the offended party does not need to prove the guilt of the perpetrator, but only the relationship between the damage and the conduct of the perpetrator. This theory is fully applicable to the professional activity of the expert.

From the practice of the whole profession we get enforcement of the lex artis, i.e, rules or obligations established for the exercise of a profession. Therefore, there is liability if there is damage or harm to the author of the commissioning of expert dictum or other persons resulting from a breach of those duties and standards. In any case, the expert's responsibility is not linked to the fact that the result of expertise is the cause of damage, but the latter is a consequence that the expert did not put the necessary means to obtain this result. This means performance rather than results:

"It is, in short, an obligation in the means used in the activity, not outcome, since it is not bound to the success of the action being taken but to exercise it appropriately (SSTS 8 June 2000 and 28 December 1996), it has been said that the provision of these professionals is the provision of means rather than result, therefore, for the obligation to be fulfilled, it is required stating that the practitioner has provided means to achieve the desired result, and these have been made in accordance with the lex artis, although the desired outcome has not been achieved (STS 7 February 2000) "(SAP Vizcaya of May 27, 2005)

Therefore, for the expert to be held responsible it is necessary to prove that the damage is caused directly by his activity as such (Font, 2000). However, in the event that it was so, the damage is caused by a judicial ruling against the interests of the affected party, issued on the basis of expert opinion. If the court assesses the valuations according to the rules of sound criticism (art. 348 LEC), it is questionable whether the lack of a direct relationship between the report and the damage (by the mediation of the sentence, when it has been called the "judicial filter"). This would prevent the allocation of liability to the expert, since the damage is caused by the judicial decision and not an erroneous or false opinion, although that was based on the latter. However, the Supreme Court has shown that the responsibility of the expert is independent from the evaluation of evidence by the court:

"The powers of the court under the law in order for the assessment of expert evidence, made in civil proceedings for a declaration does not exempt (...) of responsibilities to an expert opinion issued by the act in which he must act, according to their knowledge and belief, as the margin of discretion that the subjectivity of the expert with the legitimate claims and discrepancies with those of others who come, but always with the diligence of a good professional in knowledge, art or craft concerned and therefore subject to the lex artis of the profession he exercises, without making intention or negligence "(STS 16 October 1985)

2.2 Assumptions of civil responsibility

The general principle underlying the civil responsibility is determined by Article 1902 of the Civil Code (CC), it states: "Whoever by act or omission causes harm to another, intervening fault or negligence, is obliged to compensate the damage caused. "This principle governs the so-called 'contractual liability' (Xiol, 2002). There is also a 'contractual liability' determined by Article 1101 CC, which occurs when the damage comes from the breach of the terms of a contract.

In practice, the difference between the two types of liability, contractual or tort, is defined primarily by the various periods of prescription for action to demand accountability (Gillardin, 1989). The limitation period is the period of time the affected party legally exercises the right to claim for damages. This period begins to run from the time of manifestation of the damage (Article 1969 CC).

The Civil Code, Article 1968, states that the limitation period is one year if the tort liability incurred in nature. On the contrary, if the responsibility is contractual, it is charged under Section 1964, which states that personal actions have not been identified, special term of prescription expires after fifteen years. Thus, once defined the contractual or tort, the time to bring in proceedings will be 1 or 15 years from the date on which the said damage has been manifested.

Contractual liability cases are linked to the expert's report commissioned by one of the parts of the process, the expert being forced to do his job with due diligence, including the completion of the dictum within a reasonable time. Therefore, any loss or damage caused by breach of these commitments, intentionally or in bad faith, negligence or default (i.e, delay fault in compliance with agreed period or default delay (i.e, in the implementation of agreed at a reasonable period), is a breach of the terms of the contract.

"(...) regardless of official duties imposed by the position of the expert and public nature of the role, as is the case with lawyers or attorneys that link the relationship with your client or expert who is appointed from acceptance of the assignment, has a contractual nature, namely leasing of services by providing the required, according to their profession (...) "(STS 16 October 1985)

Part of the doctrine also esteems that there is contractual relationship between the expert appointed by the Judge and the parties involved in office. In this case, the expert voluntarily joins the listings of professional associations that he presents to courts and tribunals (art. 341.1 LEC), is appointed at the request of the plaintiff or defendant (art. 339 LEC). According to art. 342.3 LEC, the court-appointed expert may apply for funding on account of the final settlement of their fees, and all are satisfied all the requirements for the existence of a tenancy agreement for services as provided in Article . CC 1544.

However, for another sector of the doctrine, the liability of the court-appointed expert is not contractual in nature, but tort. In defense of this thesis argues that the acceptance and oath of office does not create any legal relationship between the expert and the parties, it remains possible that they require compensation or want amends of the damage caused, based on an inexistent contract.

Finally, we can extend to the intervention of experts STS, 1 ª, 16.12.1996 (RJ 8971) which deals with the tort activity of the lawyers. According to this the tort liability is reserved for those cases where their conduct falls outside the orbit of the contract by action, not under an onerous contract, but by relation of friendship or kinship, no consideration.

2.3 Damages or consequences of civil liability

Civil law seeks to redress the damage by paying monetary compensation or repair the damage. It is common practice by the expert from the obligation to indemnify a third party for damages caused by reason of the exercise of professional expert activity is covered by a policy ensuring civil liability expert (Gamble, 1987).

Contract guarantees are excluded, in general, the responsibilities arising from (Farr, 2005):

1. Intentional crimes criminally prosecuted for being established

2. Fines and penalties of any kind.

3. Inexcusable disregard of the rule book of good construction, rules and regulations related to the environment, town planning, building or safety, in this case, applied to the activity of the insured as an expert. Understood as 'inexcusable' deliberately violated that involves awareness of the harm likely and reckless acceptance without valid reason.

3 Penal responsability

3.1 Nature of penal responsibility

Criminal liability arises from the breach of any legal or contractual obligation regulated in the Penal Code in relation to expert testimony. Note that the Penal Code (CP), approved by Law 10/1995, of November 23, amended by Law 15/2003 of 25 November-regulates crimes and offenses that are defined (Article 10 CP) as fraudulent or negligent omissions punishable by law is considered willful act or omission that is committed with intent to cause harm. On the other hand, it is considered reckless omission of a duty of care or safety precautions needed to avoid harm, without any, in this case, intent on action.

The criminalization of the act or omission as a crime or offense provided for in Article 13 CP in terms of penalties, as provided in Article 33, amended by Law 15/2003- with those who are punished. Establishing the criminality in felonies, lesser offenses and offenses. The impact on the offense hits its limitation period, according to art. CP 131.

Penal law does not seek financial compensation to the injured, but social disapproval or punishment by penalizing the liable party. However, CP article 116 states that every person criminally responsible for crime or misdemeanor is also civilly liable if any damages arise. That is, criminal liability involves the liability of the person responsible, resulting in additional obligation to provide compensation for damages caused to the person or persons aggrieved by their professional performance. That it is determined by the lack of criminal responsibility does not imply, however, the absence of liability, but only the lack of criminal jurisdiction of the court to rule on it, in which case the injured party may initiate a lawsuit against the expert for recovery of civil damages.

3.2 Assumptions of penal responsibility

3.2.1 Crimes against the Administration of Justice

Title XX of the Criminal Code regulates crimes against the administration of justice and Chapter IV, relating to perjury, referring to the punishable acts of experts during the exercise of their profession. This rule has been interpreted by the Supreme Court warning that, to fall into the offense up for failure "to the truth maliciously" on the expert opinion is necessary:

• In objective terms, the sentiments expressed in the opinion or ratification be contrary to reality, not sufficiently motivated or alter the facts verified

• In subjective terms, conscious awareness and deliberately not telling the truth.

So says a ruling by the STS February 18, 2009.

"But if the designated document can not objectively prove the falsity of the defendant's expert report, much less can it prove that the alleged misrepresentation was malicious, willful and deliberate, that is, awareness and willingness to present as true and correct, as mentioned, is the subjective element of the crime charged. "(STS of 18 February 2009)

Overall, the doctrine of this provision is contained in the following Judgement:

"Under the doctrine of this Court (See SSTS de2-11-2005 [RJ 2006, 2556], no 1483/2005 of 30.1.1998 [RJ 1998, 388] and, 28/05/1992 [RJ 1992, 4392]) the actus reus of art. 459 (RCL 1995, RCL 3170 and 1996, 777) requires that the expert's statement be false, meaning that there is contradiction between the statements and reality, discrepancies and opinions are insufficient, as expressed in art. 459.

The basic element of the criminal activity listed in that provision (cf. STS 03.01.2005 [RJ 2005.3615], no. 265/2005 consists of missing the truth maliciously in the expert opinion given in court cases, so that the falsity must be apparent or manifested by the rest of the evidence. But along with this objective element, it requires the concurrence of a subjective element, the fraud, since this offense under the current Penal Code, is eminently intentional, excluding the reckless mode. The fraud in this type of crime is reflected in the intentional delivery of a statement or report forgers. The reported crime rate has an inherent fraud that doesn’t require anything more than cover the legal injury that may occur consciously and voluntarily, for the intentional characteristic of this crime, actually reach, without requiring additional intention of causing a particular injury in the Administration of Justice. The sentence of this Room of 5.5.1995 (RJ 1995, 4539) confirms this thesis, without requiring the author of these facts act with a special animosity or intent to injure any of the parties in dispute. The crime of perjury is a conscious and deliberate falsehood or lie of the witness's statement or a malicious lack of truth in the expert's report. But it requires not only the lack of objective truth in the statement or in the opinion but also the direct intent, consisting of discovering the falsehood and willing to express it. (STS of 15 June 2007).

3.2.2 Crimes against Public Administration

Among the offenses against public administration, the Penal Code includes the crime of bribery, that article CP 422 expressly extends to experts. The crime of bribery applies to those who "benefit for oneself or a third party, requests or receives, either directly or through intermediaries, gift or present or accept an offer or promise to perform in the exercise of his office an act or omission constituting crime "(art. 419 CP) This reference to experts should be considered extensible not only to the designated court, but also to those appointed by the parties, since the LEC equates to two (Article 335.1)

3.3 Damages or penalties resulting from penal liability

Criminal law, unlike civil law, seeking social disapproval of the individual whose conduct is covered or an offense under the Penal Code . The Code regulates various crimes or offenses that may be penalized by the imposition of sentences of imprisonment, disqualification from office of an expert, or the imposition of fines.

The offense is punishable by a penalty proportionate with the nature of the act or omission. In the case of expert testimony, the penalty can range from imprisonment (imprisonment and personal liability for unpaid fines subsidiary) to the deprivation of rights (specific disqualification from employment, public office or profession, in this

case, his tenure as an expert) and the fine. The penalties to be imposed according to the offense would be the following:

• Felony. In the case of the expert it never happens because it is not accounted for in the penal code, prison terms of more than 5 years or total disqualification from office.

• Misdemeanour. In expert performance, the imprisonment of six months to six years to twelve years disqualifications and fines of more than three months.

• Faults. For the expert, the fine of ten days to two months, applicable for cases where the fines are proportional to the amounts defrauded.

In the case of economic damages (Article 50 CP, as amended by Organic Law 15/2003) they will be applied by the system of "day-fine ', whose extension, in general, is at least 10 days and a maximum of two years, the have a minimum daily fee of 2 euros and a maximum of 400 euros the amount takes into account the economic situation of the defendant. In the art. CP 459 it establishes the penalties imposed "to experts and interpreters who alter the truth maliciously in its opinion or translation." These penalties are given by the upper half of those in the art. 458.1 (imprisonment for six months to two years and a fine of three to six months), also "punishable with the penalty of disqualification from a profession or occupation, employment or public office, for a period of six to twelve years."

Moreover, Article 460 CP introduces a notion of false testimony (in this case calls the doctrine as "partial" or "improper"), establishing fines for six to twelve months and, where appropriate, suspends the expert in charge for six months to three years for certain cases: "When a witness, expert or interpreter, without failing substantially to tell the truth, alters reluctantly, inaccuracies or silencing relevant facts or data that were known, shall be punished with a fine of six to twelve months and, where appropriate, suspension of employment or public office, profession or occupation, six months to three years. "

For the crime of bribery, the offense is punished with imprisonment from two to six years, a fine of three times the value of the donation and disqualification from office for a time of seven to 12 years without prejudice to the punishment for the crime committed because of the gift or promise (in this case, the false testimony of the arts. 459 and 460 PC). Art. 420 governs cases in which the wrongful act for which the expert receives compensation doesn’t constitute a crime, reducing the penalties to be imposed.

4 Administrative responsibility

4.1 Nature of administrative responsibility

Administrative responsibility has, in the case of expert testimony, a disciplinary character. It is caused by the infringement of legal provisions established both by the Administration of Justice and the professional bodies or organizations to which it is built by the expert. In general, the failure of the rule is penalized by a fine whose amount is imposed in each case depending on the seriousness of the violation or disciplinary action regarding the disqualification of the expert to exercise that capacity. This responsibility is entirely compatible with those of civil and criminal referring to the same event.

4.2 Assumptions of administrative responsability

4.2.1 Liability for breach of disciplinary rules in the Administration of Justice

Organic Law 6 / 1985 of 1 July, the judiciary, regulates in Article 193-1 (and, by reference to this, Article 192) to impose disciplinary measures to the experts who act incorrectly in the view and judicial acts. It establishes the possibility of expulsion from the room or fine when the consideration, respect and obedience due to judges, prosecutors, clerks and other personnel working for the Administration of Justice is not observed (Cristensen, 2004).

Within the civil and criminal jurisdiction it establishes the penalties applicable to the expert who breach their duty to appear before the judge. In addition, the Criminal Procedure Act allows damages for breach of certain duties by the expert. The expert must abstain from participating, and therefore does not accept the appointment by the courts, as specified in Article 105 of the LEC, when the circumstances indicated to the disqualification of expert witness in Section 124, which refers also to Article 219 of the Judicial Power Organization Act. The expert will be penalized if he accepts an appointment with prior knowledge that inconsistency is incurred for attending any of the circumstances:

- Technical failure to do the dictum

- Incompetence or favouritism manifested

- Assignment of responsibilities.

- Expressing oneself on matters not related to the object nor direct relationship to them.

The experts appointed by the parties may only be subject to reproach for the reasons and in the manner provided for in Articles 343 and 344 of the LEC, but they can never be challenged by the parties, as provided in paragraph 2 of Article 124). On the other hand, you cannot provide expert opinion in everyone who has been offended.

4.2.2 Liability for breach of professional school rules

The Rules of Professional Conduct ethical standards of the Architects of CSCAE establishes certain assumptions applicable to professional architects and experts involved. Certain items are extended to the expert performance as part of the architect's own professional activities:

Article 12. The architect shall act with honesty and sincerity in all professional activities. When acting on a mission of experts, expert witness or juror, or where in any of its fields of activity, be issuing any kind of certification, support its discretion in those proven facts so warrant.

Article 23. No architect may violate professional obligations, and shall assume legal responsibility not only derived from their performances, but also those of occupational responsibilities inherent in accepting the job. Without prejudice to the legal liabilities that may incur, will also respond before the professional school for the damage that may be caused by incompetence, negligence, error, lack of foresight, risk, lack of adequate commitment or failure in its performance.

Furthermore, Article 51 may apply to the expert critical analysis that he is required to do, both in his own dictum and in the statements made in the ratification of other opinions into the process and have been drawn up by architects (art. 347. January 5 th LEC) in conjunction with the formal content of such analysis:

Article 51. Every architect should be objective in his criticism of the works of his colleagues and accept criticism with the same objectivity. The architect must refrain from making statements that are personally offensive to their colleagues or to the profession. Shall, however, notify the school of any breach of professional duties that may arise.

4.3 Damages or penalties resulting from administrative responsibility

Therefore, damages or penalties resulting from administrative responsibility are economic or disciplinary action. As stated in Articles 192 and 193 of the CP, the expert may be sentenced to a fine of up to two months if he disrespects judges and other members of the Administration of Justice.

In turn, the Civil Procedure Law states in Article 292.1 of fines that will fall on the expert for breach of the obligation to appear at a hearing. Violation of this duty is punishable, upon hearing for five days, a fine of 180 to 600 euros (writing as RD 1417/2001)

In Article 420 CC states that if the expert resists to declare what he knew about the facts that might be asked he does not fall within the exemptions of the above items and will incur a fine of 200 to 5,000 euros, and if he persists in his resistance will be taken before the presence of the investigating judge by the agents of authority, and persecuted for the crime of obstruction of justice crime under article 463.1 of the Penal Code (cited below) In the second case he will also be pursued for serious disobedience to authority. The fine will be imposed when the breach is detected or done.

In Article 464 states , despite the expert being the offended party in the procedure, went ahead with the report without putting expert report before the judge who had appointed him he will incur a fine of 200 to 5,000 euros, unless the act produces a criminal liability. With respect to citations of experts in CP Article 175 establishes the obligation to attend the first appeal, under penalty of 200 to 5,000 euros, or longer if the second does occur, the to attend on pain of be prosecuted as liable of the crime of obstruction of justice crime under article 463.1 of the Penal Code (writing under Law 38/2002 of October 24). In turn, Article 463 of CC indicates that if referred to in legal form, fails to appear voluntarily without just cause, before a court or tribunal to convict in criminal proceedings on remand, causing the suspension of the trial, shall be punished with imprisonment for three to six months or a fine of six to 24 months. In the fine of six to 10 months will incur which, having been warned, do it for the second time in a criminal case without defendant in prison, has caused or not the suspension. (Writing under Law 15/2003 of 25 November)

Moreover, the breach of the Rules of Professional Conduct ethical standards of Architects for professional expert witness may incur lower Experts List to periodically move the competent bodies such as professional associations to different courts. Before agreeing to be granted forced down the person concerned a hearing within 10 days for claiming in his defense as it sees fit. This will require you petition the competent judicial body prior to the Board of Governors, who's moved to the Ethics Commission or the complaint filed against the former directly by any party interested in the opinion

or some college as it deems have been unfairly prejudiced by the expert's report. The low will be effective at the time that the penalty becomes final.

5 Conclusions

The professional who acts as an expert before the court intervenes as an expert in his discipline, so a lot is expected of him in the technical aspects related to the issue which prompted review. On the other hand, the technical opinion of the expert will form part of a process in which the judge must rule on the facts in accordance with the rules of law. The expert should be knowledgeable of the procedure that regulates his intervention before the court of law, whether they had been appointed by the judicial organ or his opinion had been brought to the process by the parties. And this responsibility takes place both in the field of criminal justice, civil and disciplinary, as in all of them may incur as a result.

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Project management

Sensemaking of Rework Causation in Offshore Structures: People, Organization and Project

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Abstract:
Cost and schedule overruns are norm in offshore hydrocarbon projects. With increasingly complex commercial and contracting arrangements, technical challenges, changing local economic and regulatory conditions and a shift toward project's being undertaken in peak oil frontier regions, the risks of overruns increase. A major factor contributing to such overruns is rework. Twenty three in-depth interviews with leading oil and gas industry practitioners were undertaken to acquire knowledge of their experiences of rework causation in offshore projects. Analysis of the dialogue and narratives obtained enabled a nomenclature for rework causal factors to be classified as *People*, *Organization* and *Project* for different types of offshore structure. The determination of rework causal factors provides the foundations for appropriate risk management strategies in future projects to be determined.

Keywords:
errors, change, sensemarking, offshore projects, rework

1 Introduction

The catastrophic failure of offshore structures such as Piper Alpha, Sleipner A, Petrobas-36 and Ranger I resulted in an intense period of introspection that resulted in major changes to safety, reliability and engineering assessments and standards (e.g., Moan, 2009). Detailed investigations and subsequent analysis of these accidents have attributed the causes of failure to be associated with an array of human and organizational errors (Bea *et al*., 2010). Such errors not only have been found to contribute to system failure and accidents, but also cost and schedule overruns in projects (Love *et al*., 2009). Between 1993 and 2003 one in eight major offshore developments with a capital expenditure (CAPEX) ranging from US$1 million to US$3 billion were deemed to be a financial disaster. These projects exceeded cost and/or schedule growth by 40%, or within the first year of operating were producing less than 50% of production capacity (Merrow, 2003a,b). Furthermore, more than 40% of capital

offshore projects in excess of US$1 billion overran budget by more than 10% (Merrow, 2003a,b). More recently, it has been estimated that the average cost overrun for offshore construction programs is 35% and average delays total seven months (Eriksen, 2010). The most common factors contributing to cost overruns in offshore projects are (Eriksen, 2010):

- the placing of orders before engineering is completed;
- the implementation of new technology without qualification;
- insufficient engineering with regard to operational robustness and maintainability;
- problems with component deliveries and documentation when transferring fabrication;
- fabrication yards having to build competence and resources during the project, and
- poor interface management.

Complex commercial and contracting arrangements, increased technical challenges, changing local economic and regulatory conditions, and a shift toward projects being undertaken in frontier regions (e.g., Bangladesh, Ecuador, Kazakhstan, and Peru) are increasing the risk of overruns, failures and accidents.

Failure to deliver megaprojects on budget and on schedule often generates negative publicity in the national and international news, thus adversely impacting stakeholders' perception of a company's ability to meet commitments. Poor project performance is not acceptable when capital markets are looking for predictability and strong returns (Love *et al*., 2011a). Projects that underperform, perhaps due to rework, are often explained away as being an isolated instance of unfortunate circumstance and considered not to be a part of normal practice (Love *et al*., 2009). Put differently, rework in such circumstances may be analogous to being a 'Black Swan' (Taleb, 2007); an outlier event within projects. In spite of its outlier status, explanations and justifications for its occurrence, after the fact, are often made by organizations in an attempt to make the event explainable and predictable (Taleb, 2007). The quandary is that many organizations are reluctant to admit to problems that may exist within their systems and processes for fear of being judged irresponsible by their stakeholders. To reduce the probability of cost and schedule overruns, failures and accidents, rework risks need to be identified and classified before they can be assessed, managed, and mitigated. A series of unstructured interviews with leading industry practitioners was undertaken to acquire knowledge about their experiences with rework in projects that they had been involved with. The dialogue and narrative derived provide valuable insights that enabled 'sensemaking' of rework causes to be identified for various different types of offshore structure.

2 Rework and Latent Conditions

Rework has been defined as "the unnecessary effort of redoing a process or task that was incorrectly implemented the first time" (Love, 2002:p.18). It has been identified as a problematic issue in construction and engineering projects and a major contributor to cost and schedule overruns (Hwang *et al*., 2009). Rework, on average, contributes to 52% of a total cost overrun incurred and can increase schedule by 22% (Love, 2002). Rework costs have been found to range from 5 to 20% of contract value in construction

and engineering projects (Love *et al*., 2011a). To date, there is limited knowledge available about rework costs and its causes in offshore projects.

Rework has been attributed to latent conditions that reside within the organizational and project systems (Love *et al*., 2009). Reason (1997) states that "latent conditions are to technological organizations what resident pathogens are to the human body" (p.10). For example, at an organizational level this may include insufficient training, resourcing levels and lack of a quality management focus. At a project level, lack of supervision, competitive tendering, and contracting strategy have been found to provide the conditions for errors to manifest (Love *et al*., 2011a). In effect, latent conditions lay dormant within a system until an error comes to light. Invariably, they arise as a result of strategic decisions taken by senior management, government, regulators, designers and key decision-makers. The impact of these decisions spreads throughout an organization and project, shaping their culture and creating error-producing factors within individual workplaces (Reason, 1997).

Errors can take the form of violations, mistakes, slips and lapses (Reason, 1990). Violations arise to due aberrant behaviour and are analogous to omission errors, though they may not always result in an error being made. Violations are deliberate deviations from practices deemed necessary (Reason, 1990). Before errors become apparent, participants often remain unaware of the impact upon project performance that particular decisions, practices or procedures can have (Love *et al*., 2009). Until errors are identified or a failure occurs they remain in a state of incubation and become an integral part of everyday work practices (Reason, 1990). If an error is identified, then rework can be undertaken. If schedule pressure becomes a problem during the rectification of the error, then there is a potential for safety to be compromised and accidents to occur (Goh *et al*., 2011).

Active failures are unsafe acts committed by people who are in direct contact with a system. They are often difficult to foresee and cannot be eliminated by simply reacting to the event that has occurred. When latent conditions combine with active failures, then the error consequences that arise can be significant (Reason, 1990). Active failures, such as those identified above, have an immediate impact and are committed at the human-system interface (Reason, 1997). Latent conditions provide an environment for increasing the likelihood for active failures to occur by creating the local factors that promote an individual to commit an error or violation (Reason, 1997). Through proactive management latent conditions can be identified and remedied before an adverse event occurs (Goh *et al*., 2011).

2.1 Project Complexity and Uncertainty

The management of errors in offshore operations has been extensively examined from a human and organizational perspective (Ren *et al*., 2008). Such research has been initiated by accidents and catastrophes that have occurred. While considerable advancements in the ability to reduce and predict their likelihood, errors have been made and still continue to prevail. A possible explanation for this can be derived from Tversky and Kahneman (1974) research on judgment and uncertainty. People are guided by their previous experiences and therefore will be inclined to underestimate irregularities in the future. Thus, they will plan for fewer contingencies than will actually occur. Tversky and Kahneman (1974) have suggested that people are influenced by the representativeness and availability of heuristics that are available to them. When people rely on individual representative heuristics they are likely to judge

causality on the basis of perceived similarities between the cause and effect of events they have experienced, or to their knowledge. If people rely on the availability heuristic then they will predict the frequency of an event, or a proportion within a population, based on how easily an event can be brought to mind. This is also compounded if a person believes that a given event has only one underlying cause (Nisbett and Ross, 1980). Love *et al*. (2011a) suggest that the causes and effects of committing errors are not unidirectional or linear, but are reciprocal or looped in their relationships. Understanding how such relationships emerge and interact with one another is necessary in the pursuit of error and rework reduction. The ideal error reduction approach is to view errors as symptoms of underlying problems, and in so doing, they become information sources that help explain how systems work. While underlying events may be similar in nature, the dynamic and chaotic nature of projects may produce large variations in system behaviour if a shift or deviation from initial conditions arises. Such a phenomenon is referred to as *sensitive dependence* (Hilborn, 2004).

Another issue that may explain why projects continue to experience cost and schedule overruns is the use of conventional project management within chaotic environments. Classical Newtonian scientific philosophy is somewhat akin to conventional project management and implies that order should be imposed from above (leading to top-down command and leadership) and that structures should be designed to support decision-makers. As projects have become more complex in nature, this philosophy to managing projects is deemed ineffective in reducing failures and assuring successful outcomes. Inherent within complex projects are unintended consequences and counterintuitive outcomes due to the structural complexity and uncertainty that prevails. According to Williams (2002) structural complexity is derived from the interaction between the number of elements that form the project and their interdependence. Uncertainty is derived from a lack of clarity concerning project goals and an absence of appropriate means with which to achieve those goals (Williams, 2002). The result is that project elements interact in complex and unpredictable ways, which can increase the likelihood of rework occurring (Love, 2002). This situation is further exacerbated when activities are undertaken concurrently due to issues associated with schedule pressure.

In an effort to meet a project's schedule completion date, additional resources may be employed, however such action may lead to a contradictory effect (McConnell, 1999). By pushing beyond the limits of concurrency, complexity increases and tasks are delayed, particularly when revisions, repairs and rework occur (Love, 2002). Paté-Cornell (1990) suggests that schedule pressure not only increases the probability of errors occurring but also decreases the chances that they are detected using regular procedures. Design errors that may be deemed minor in nature are likely to be overlooked due to the time that it would invariably take to correct them (Paté-Cornell, 1990). An 'escalation to commitment' may prevail if any ambiguities are identified and invalidate efforts of the initial design and engineering that has been undertaken (Paté-Cornell, 1990:p.1214). The inherent uncertainty that prevails within offshore projects can result in planning being problematic, especially when information is unavailable. Faced with high uncertainty, there is an over reliance on scope changes to solve problems that may arise during construction, installation and commissioning.

3 Research Methodology

An interpretative research approach was adopted to determine the systemic nature of rework. A similar approach has been advocated by Goh *et al*. (2011) who examined the systemic causes of organizational accidents. As limited research has addressed rework in offshore projects 'subjective idealism' was adopted (Farrell, 1996). In this instance, subjects construct their own views and opinions on the phenomena to be investigated based upon their experiences; an inclination to truth and pragmatism is deemed to prevail. This approach is similar in nature to Weick's (1988) 'sensemaking' where meaning is given to experience, dialogue and narratives about events that have occurred through a process of retrospection.

3.1 Data Collection

Twenty three in-depth interviews were conducted over a four month period with a variety of personnel including operations managers, project managers and engineering managers who were working for a major international oil and gas operator. The sample consisted of: operations managers (3), project manager (10), structural engineer (3), procurement manager (2), mechanical manager (2) and Engineering Manager (3). Interviews were chosen as the primary data collection mechanism as they are an effective tool for learning about matters that cannot be observed (Kvale, 1996). The firm was selected as the research team had a direct contact point within the organization that had an interest in understanding 'why' and 'how' rework emerged in projects. For reasons of commercial and individual confidentially, specific details about the organization are not presented. Personnel involved with the procurement of projects within the organization were invited to participate in the research and interviews were conducted at the offices of interviewees for their convenience. Interviews were digitally recorded and transcribed verbatim to allow for finer nuances of the interview to be documented.

The interviewees' details were coded to allow for anonymity, although all interviewees were aware that it might be possible to identify them from the content of the text. The format of the interviews was kept as consistent as possible following the themes associated with rework identified from the literature. The interview commenced by asking individuals about their experience within industry, and their current role within the organization. Interviewees were then asked to select a completed project they had been involved with and identify a particular rework incident that had taken place. The interviewee was then asked for their perspective how and why they thought it arose. Phrases such as 'tell me about it' or 'can you give me an example' were asked when further information was required. The open nature of the questions allowed for avenues of interest to be pursued as they arose without introducing bias in the response. Interviewees were asked to identify the main sources of rework that occurred in offshore projects that they had been involved with and to suggest strategies could be used to prevent it from reoccurring in the future. Notes were taken throughout the interview to support their digital recording to maintain validity. Interviews varied in length from one to three hours and sought to stimulate conversation whilst simultaneously breaking down any interpersonal barriers that may have existed between the interviewer and interviewee. Each interview was transcribed and a copy given to each interviewee for comment to check overall validity and accuracy. In conjunction with the interviews, documentary sources for each of the projects were provided.

4 Findings and Discussion

Each interviewee held views as to the reasons rework occurred in projects that they have been involved with, though a high degree of consensus emerged as to the underlying causes and risks that needed to be taken into account to reduce its materialization in projects. When rework in a project was deemed to be equivalent to a series of 'anaphylactic shocks' that destabilized a projects' performance, though the severity of its impact cost and schedule performance depended upon where and when an error was identified and how it was addressed. Narratives from completed projects that interviewees had been intimately involved with from different parts of the world were described. This led to a rich representation of the dynamics and risks associated with rework to be attained. The sharing of dialogue and narratives is pivotal for learning, though there is a proclivity for it to occur at different levels within organizations.

4.1 Rework Costs

Intuitive estimates of rework costs for projects were provided by interviewees. These ranged from 3% to 25% of CAPEX. Such costs are not measured even though they can contribute to increased project costs. Using an Engineering Procurement Construction (EPC) contract strategy, a 10% cost growth, with 5% due to rework, was deemed to be acceptable considering the uncertainty and complexity associated with offshore projects. Taking into account the potential for optimism bias (i.e. over estimating the likelihood of positive events and under estimating the likelihood of negative events), the actual rework costs could be considerably higher.

Cost overruns were deemed to be the norm. Having to undertake rework as a result of errors and omissions was an issue not *formally* recognized during the concept design and Front End Engineering Design (FEED) risk management processes that were in place within the organizations where interviewees had been employed. Despite the use of post mortems from completed projects being used as a formalized learning mechanism for future projects, the inclusion of any form of risk assessment or even acknowledgment of rework was eschewed: it is a 'taboo', its costs buried within a project's contingency sum. To the interviewees knowledge rework is not measured; it exists and occurs regularly, but is hidden deep within an organization's subconsciousness until a major incident arises. Then, as one engineering manager commented "the blame game begins and the contract comes out, and all hell breaks loose". An unwillingness to admit that rework was a problem was clearly evident from the opening statement made by a project manager who had more than 15 years experience working in offshore environments who initially stated "we don't have rework in our projects". This shielding comment was not the voice of the individual, but that of the organization they were representing. The mere recognition that errors occurred could potentially jeopardize the organizations corporate image and possibly the value of their 'shares'. As the interview unfolded, the voice and experience of the individual began to surface. It was clear that rework was indeed a costly issue in many projects that they had been involved with.

If rework costs of 5% of CAPEX are an acceptable norm, there is a danger that this 'norm' will insidiously creep up further and settle in at an uncomfortable level, particularly as demand for energy and hydrocarbons increases. If rework repeatedly occurs within offshore projects, it may become invisible or viewed complacently as being a necessary evil of doing business. The percentage increase in rework will undoubtedly be added to an organization's overall costs. If rework accounts for 5% of

regular work of an organization, this would lead to everything being increased by 5%: supervision, cycle time for administrative procedures, answering requests for information, and so on. The time element obviously translates into costs, which are then buried in what would be considered 'normal' operating costs. History suggests that those who fail to learn from their mistakes are invariably condemned to relive them again. Insight gained from previous mistakes or oversights made in projects can be gainfully employed in preventing future repetition. Learning from mistakes is difficult, but continuing to make the same ones is far harder and certainly more costly.

4.2 Narrative: Remember the Shareholder

In this narrative, the deck, hull and mooring system were constructed (fabricated and installed) by three different contractors simultaneously and importantly, contracts were let before the detailed engineering had been completed. This posed a problem during hull and Topside fabrication as the number of risers was not determined due to the uncertainty of the hydrocarbon well. In describing this issue a project manager stated:

> "We started the engineering of the Topsides when we'd not completed the reservoir simulation works. We were running before we could walk! We over designed on the number risers and wells that were going to be needed. Those assumptions turned out to be wrong. We kept going round in circles because we'd not finished the reservoir works. We were designing for too many uncertainties and complexities. Mistakes were made; we were under considerable pressure to get the project up and running. We always have to remember though that we have shareholders who expect dividends".

The fabrication process was staged until the number of risers could be finalized and detailed engineering completed. This staging inadvertently delayed the project's schedule, but it was still expected that the installation process would meet its original schedule. Any delay to the final completion date would adversely influence gas production and the company's share prices. Audits and reviews of the detailed engineering were undertaken, but this was seemingly done in a haphazard manner due to the imposed schedule pressures. It was not until the platforms components were being installed that engineering and fabrication errors began to materialise. While three-dimensional clash detection exercises had been undertaken during engineering, extensive clashing of pipe work occurred on-site during the installation of the deck and hull systems. A structural engineer revealed that an up-dated software version was used, but unfortunately several engineers were not completely familiar with the 'nuances' of the new application. An engineering manager stated:

> "We're experiencing a severe skills shortage. We just can't get people who have the skills and experience needed. The entire resource sector is experiencing a shortage of labour. We're just getting who we can and try to train them on the job – I don't know what we'll do if and when we get more work. We don't have time to train people. Sadly, it has to be done on the job. You only have to look at the quality of work undertaken by the contractors and their subcontractors. We have to hold their hands".

Evidence of this inexperience became apparent when the platforms components were being installed; poor quality materials and workmanship were prevalent. For example, issues related to weld contamination, and mismatching material grades were identified.

During Topside installation, it was observed that material grades had been ‘mixed up’. Type II steel had been used where only Type I had been specified. This was a major concern as the Topside’s structural integrity was brought into question. The Type I steel was subjected to rigorous testing and it was found that it achieved the performance level equivalent to that specified for Type II steel. A simple colour coding system in the fabrication yard would have eliminated these errors. There were instances where a weld had been contaminated by the inclusion of dissimilar materials. Pressure testing of pipe work and equipment during the fabrication process to ensure the integrity of the welds, revealed carbon steel particles had become engrained within a stainless steel weld. Once this happens the weld adopts the function of an anode to the stainless steel cathode, thus accelerating the process of corrosion. A structural engineer suggested that during fabrication the same grinders and steel brushes that had been used on the carbon steel were probably also used on stainless steel and copper nickel pipe work; a clear indication that the contractor did not implement stringent QC procedures. Minor works were undertaken, but the weld’s integrity needed to be constantly monitored.

4.3 Narrative: The Push for Production

In this next narrative, rework costs were estimated to be 3% of CAPEX, which according to the estimates identified above were below the level considered to be a ‘norm’. Like the aforementioned project, the determination of the hydrocarbon reservoir was identified as a problematic issue. A project manager project stated:

> “It’s very difficult determining in the size of a hydrocarbon reservoir. There are so many variables we have to take into account, though with the technology we have today you’d expect some degree of accuracy. When you’re dealing with Mother Nature you never know.”

Failing to assess the reservoir capacity impacted on the engineering and procurement of the Topside facility. The deck, hull and mooring system were constructed (fabricated and installed) by three separate contractors. The same contractors that had been involved with the project presented above were involved with this project, and therefore were familiar with the client’s eagerness to push ahead with the project to satisfy shareholder confidence. Again, contracts were let before the detailed engineering had been completed. Recognizing that a tight schedule had been established, the number of risers required was anticipated based upon preliminary forecasts of the reservoirs capacity and incorporated into the engineering design. Contractors began to fabricate based upon the original engineering design but changes to the design were required to accommodate for an increased production capacity. This resulted in significant changes to the platforms component parts. Fortuitously, the rework required was undertaken in the fabricating yard and not on-site. During fabrication the internal side of a caisson and riser guides were found to be unpainted. This was not noticed until they had been installed. Concerns over accelerated corrosion were raised due to water movement within the annulus casing and the removal of the corrosion product, which would have otherwise acted to protect the uncoated surface. It was deemed impractical to coat the internal caisson and riser guides through the small annulus gap. At such uncoated locations, corrosion can be exacerbated and therefore the caisson required continual monitoring; an unnecessary maintenance cost was created.

5 People, Organization and Project

Sensemaking of rework through dialogue and narratives provided by the interviewees revealed high degree interdependency existed between rework events. In Figure 1 the relationship between the nomenclatures of people, organization and project is identified. Apart from the organizational and project related influences, erroneous decisions during FEED can occur due to impaired human cognition. An individual's cognitive *ability* (i.e. measured by aptitude tests) and *style* (i.e. the way an individual thinks, perceives and remembers information) influences their ability to learn. The majority of errors that arise are due to human action or inaction by virtue of cognitive failure (Busby, 2001).

Cognitive failure can be defined as cognitive-based errors on simple and often replicative tasks that a person should normally complete without fault; these mistakes include problems with memory, attention or action (Reason, 1997). The inability to engage and sustain attention is seldom a direct consequence of boredom. Boredom is often described as an adverse affective or cognitive state, but is arguably more fundamentally an inability to engage and sustain attention (Wallace *et al*., 2002). Decisions taken by senior managers at an organizational level, which are often influenced by the demands imposed on them from their environment, can determine the extent that policies and procedures are adhered too as well as the resourcing capacity for a project. Decisions that are made by individual organizations can increase or decrease the likelihood of rework. Each participating organization has differing goals, objectives and learning capacity, which may further exacerbate problems that become embedded within project systems and processes. The contracting strategy adopted for a project therefore needs to ensure that goal alignment can be ensured. The current use of an EPC contracting strategy inhibits goal alignment between participating project organizations, especially when competitive price determination becomes a driver for the selection of their services. Instead, alliances with an in-built learning capability and performance incentives should be used to establish a project culture that is able to drive the behaviour of organizations to achieve a successful project outcome (Love *et al*., 2011b).

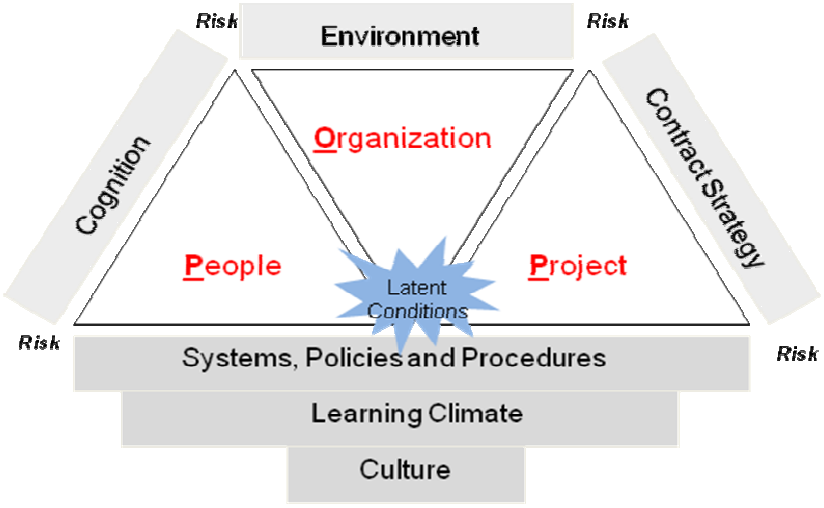

Figure 1. Relationship between people, organization and project

An organization's culture influences its ability to learn, particularly in the context of rework reduction (Love *et al*., 2000). A culture conducive to learning is necessary for stimulating innovation, as it enables an organization to anticipate and adapt to the dynamics of a changing environment. An organization where a learning culture exists is characterized as one where all its members value learning and strive for high performance through its application to innovative work (Love *et al*., 2000). A culture adept at learning emphasises open exchange of information and ideas in ways that facilitate exchange and dissemination of knowledge. Culture is based upon the beliefs that are shared within, whereas climate is based upon what an individual's senses about its organizational environment. In the context of a learning climate, it is not the work environment, but the way in which employees are encouraged to respond to it. According to Koppelman *et al*. (1990) it is the 'perceptual medium' through which culture and other work environment factors influence job-related attitudes and behaviours.

It would appear 'learning' is not given the priority that is needed by organizations as excessive cost and time overruns are regularly experienced. The same mistakes are being repeatedly made. Implementing strategies to maximize production capacity and profit to increase 'share price', by unnecessarily accelerating activities, can lead to safety and the environment being jeopardized. Such a strategic risk can cause not only a significant 'ripple effect' throughout the owner and operator's organization, but also other participating organizations in a project as they strive to meet the demands and constraints imposed upon. Mismanagement, mostly made by people with no training in managing risks has been identified as a basic condition contributing to the collapse of BP's Deepwater Horizon (Bea *et al*., 2010). There is an explicit expectation that BP should have learnt lessons from the incidents that occurred at its Grangemouth Complex in 2000 (HSE, 2003), Texas City refinery accident in 2005, and collapse of the Thunder Horse platform in the Gulf of Mexico in 2006 (Bea *et al*., 2010). Lack of training, poor communication, poor supervision and fatigue have been identified as contributors to BPs accidents. These findings are not dissimilar in nature to those reported in this paper contributing to rework. A notable difference, however, pertains to the interrelationships

that have been identified from the dialogue and narratives obtained and extrapolated to the nomenclatures of people, organization and project.

6 Conclusion

The increasing demand for and rising costs of energy has stimulated the need to extract and produce greater volumes of oil and gas. Consequently, a large number of offshore projects have been commissioned or built. Many have experienced significant cost and schedule overruns. A significant factor contributing to such cost and schedule overruns is rework, which arises due to errors, omissions and changes. Such rework arises as there is an underlying pressure to complete the project and commence production as soon as possible. If rework occurs, it is explained away as being an unfortunate event. Surprisingly, cost and schedule overruns are expected; a 5% of CAPEX cost increase due to rework is considered acceptable, if it occurs. If rework is anchored at such a level, then the likelihood for accidents and perhaps even loss of life significantly increases. It is only when a major failure, accident or catastrophe occurs that an investigation reveals design, managerial and organizational flaws have occurred. The determination of rework causal factors provides the foundations for appropriate risk management strategies in future projects to be determined.

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An analysis of the effectiveness of the use of contigency sum in project cost estimation & management in the Ugandan Construction industry

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Abstract:
The Ugandan Economy is one of the fast developing economies on the African continent with the Construction Industry contributing close to 10% of the Gross Domestic Product for the last couple of years. The Volume of construction work has steadily increased over the years due to the increased foreign investment into the Country. However, despite the positive trend, the industry faces a number of challenges one of the major ones being cost overruns on Construction projects. A review of existing literature on the subject revealed that this is majorly due to the ineffectiveness of the Project cost estimation method used in the industry. The study investigated the manner in which contingency sums included in the entire project cost were determined on twenty projects with a contract sum above 1m USD. The study further examined how the cost of those projects was managed during construction revealing the cost overruns for the different elements of the works; assessed the factors that determine the accuracy of the contingency sum included and as such the realistic project cost required for each individual building works. Finally the study proposed a new approach to determining close to accurate contingency sums of the individual construction works elements.

Keywords:
construction, cost, estimation, management, Uganda

1 Introduction

The cost performance of construction projects is a key success criterion for project funding agencies. Projects require budgets to set the sponsor's financial commitment and provide the basis for cost control and measurement of cost performance during the design process as well as during construction. Uganda is one of the African countries that had a very nasty past full of political instability and turmoil. Because of this the country and its infrastructure deteriorated so much till up to 1986. However since that time and for the last more than 20 years the country has experience peace and this over time has won the confidence of investors. With the inflow of investments, the construction industry has seen a great boom that has never been in history. Construction projects of various scales are taking place. However notwithstanding the boom, the Industry faces a several challenges one of which is the fact that most of the projects carried out are finished at a cost between 25-35% of the initial project cost at that start

of the project. This is rather a disturbing phenomenon among the professionals in the industry as well as the Clients.

In Uganda, cost overrun in especially public construction projects has been pointed out for a long time and no consistent and in-depth research has been carried out. Accordingly completion of both private and public construction projects within the pre-set budgets have been challenging issues for the Ugandan construction industry. It should be highlighted that achieving the objectives of a building contract is very important to the satisfaction of the parties involved particularly the Client. In construction projects, plans and cost estimates are usually drawn to ensure that the work is carried out to the desired quality, within agreed contract time and within the contract sum. However, the Ugandan construction industry there are several invariably unforeseen items and events in the execution of a building project such as the unstable dollar to Uganda shilling rate that affects the price of the imported building materials; the rather low level of professionalism and skill among the workers in the industry etc.

In Uganda, while preparing the cost estimate for a project, a contingency sum is included in the cost to cover up for the potential unforeseen circumstances that may lead to increase in the cost of the project. Contingency is usually defined as the budget that is set aside to cope with uncertainties during construction. The main objective of contingency is to prevent a project from experiencing cost overrun. The effectiveness of this contingency is dependent on adequate consideration given to those factors that are responsible for the changes in plan. Any realistic contingency must serve as a basis for decision-making concerning financial viability of the variations.

A key component of a project budget is cost contingency. Project cost contingency has been a part of projects and project management for at least fifty years and probably much longer. Most textbooks on project management and in particular project cost management invariably contain some reference to project cost contingency. Despite the ubiquity of project cost contingency in the theory of project cost management, there has been little empirical research into project practitioners' understanding of the concept, its intended scope, methods of estimating or management. There has been a recent resurgence into researching cost contingency, (e.g. Mak et al 1998, Aibinu & Jagboro 2002, Williams 2003) which may be a reflection of growing interest in project risk management over the past decade and the realisation that cost contingency is in fact an important risk management notion. An appreciation of risk aspect of contingency may encourage greater use of quantitative risk analysis techniques for its estimation.

Contingencies are often calculated as an across-the-board percentage addition on the base estimate, typically derived from intuition, past experience and historical data (Mak et al, 1998). It is considered an arbitrary method of contingency calculation that is difficult for the estimator to justify or defend (Yeo 1990, Newton 1992). Thompson & Perry (1992) claim that all too often risk is either ignored or dealt with in an arbitrary way and Baccarini simply adding a percentage contingency onto the estimated cost of a project is typical. Furthermore, the percentage addition results in a single-figure prediction of estimated cost, which implies a degree of certainty that is not justified (Mak et al 1998). The percentage addition indicates the potential for downside risk and does not indicate any potential for cost saving opportunities and may therefore mask poor project management (Mak et al, 1998). It also does not encourage creativity in estimating practice, promoting a routine and mundane administrative approach requiring little investigation and decision making, which may propagate oversights (Yeo 1990, Mak et al 1998). The traditional allocation of contingency in construction projects using

percentage addition method has been challenged and criticised leading to evolution of analytical and scientific methods.

David Baccarini in his paper Understanding Project Cost Contingency – A survey (Baccarini, 2005) highlighted several shortcomings in the understanding of the concept of project cost contingency that can have significant repercussions for effective project management. He concluded that the lack of sophistication in the estimation of project cost contingency by practitioners is reinforced by poor management practices in term of reviewing the accuracy of contingency and the limited existence of policy and good management practices. Overall, this suggests there is significant room for improvement in the understanding, estimation and management of project cost contingency.

Notwithstanding the inclusion of the contingency on most projects in Uganda, the projects end up with cost overruns. This was the underlying reason why this research was undertaken – to investigate how the project cost estimates are made at the start of the project; how the amount of the contingency sum is established; how the cost is managed during construction and then finally to evaluate the effectiveness of the method used to determine this contingency sum.

On examination of how the cost of those projects was managed in Uganda particularly during the construction period, it was revealed that there are various cost overruns for the different elements of the works that make up the overall construction project. The research revealed the factors that determine the accuracy of the contingency sum included and as such the realistic project cost required for each individual building works. Finally the study proposed a new approach to determining close to accurate contingency sums of the individual construction works elements.

2 Literature Review

Contingency has been defined as: "An amount of money or time (or other resources) added to the base estimated amount to achieve a specific confidence level, or allow for changes that experience shows will likely be required" (AACE 2000: 28)"The amount of money or time needed above the estimate to reduce the risk of overruns of project objectives to a level acceptable to the organization" (PMI 2008: 199). The key attributes of the concept of project cost contingency are: *Reserve* - Cost contingency is a reserve of money (AACE 2000). *Risk* – The need and amount for contingency reflects the existence of risk in projects (Thompson and Perry, 1992). Contingency covers for two categories of risks – known unknowns and unknown unknowns (PMI 2008; Hillson 1999). Contingency caters for events within the defined project scope that are unforeseen (Moselhi 1997; Yeo 1990), unexpected (Mak *et al*, 1998), unidentified (Levine 1995), or undefined (Clark and Lorenzoni, 1985; Thompson and Perry, 1992). *Risk Management* – There is a range of risk management strategies for risk in projects such as risk transfer, risk reduction, and financial treatments for retained risks e.g. contingency (Standards Australia 1999). So contingency is used in conjunction with other risk treatment strategies.

Bello and Odusami, 2007 in their paper *'the Practice of contingency allocation in construction projects in Nigeria'* found the conventional allocation of a lump sum amount and percentage addition to the base estimate to be the methods used by quantity surveyors in estimating contingency on construction contract despite the awareness of the scientific methods by a good number of them. They concluded that the importance

of forecasting an accurate and effective construction contingency is sine qua non to client's satisfaction on the estimated final construction cost and hence, the construction contract delivery. The factors considered in setting an arbitrary contingency should be tailored to the use of scientific methods of contingency estimation; the outcome of such would go a long way in assessing the performance in the construction industry. If percentage addition is to be used; a proper assessment of the project could indicate a prescribed percentage among those developed from scientific methods. The government establishment can also develop a scientific method of estimating contingency that can be used as a benchmark for effective performance of construction contingency, this is the practice in United Kingdom and Hong Kong.

Clark and Lorenzoni, 1985 defined contingency as "a specific provision of money or time in an estimate for undefined items which statistical studies of historical data have shown will likely be required." Therefore, any realistic contingency must serve as a basis for decision making concerning financial viability of the variations, and a baseline for their control (Akinsola, 1996). Touran, 2003b identified project size, type of construction, difference between low bid and owner's estimate among factors that affect project cost overrun. Project size, type of construction, type of client, method of procurement, percentage of design completed before tender, adequacy of information, and number of subcontractors used were identified by Akinsola, *et. al*, 1997.

In estimating for contingency, major project factors or variables considered are: project cost data and duration with their variabilities. It becomes more difficult to determine overall estimate reliability because some sections of a project may be completely defined at the time of estimate, and others only sketchily defined. Contingency estimation has been described as subjective and deterministic based on intuition (Moselhi, 1997; Hogg, 2003 and Baccarini, 2005).

A review of the existing literature on contingency sum estimation for construction projects revealed that there are a number of methods that have been proposed. The methods are primarily traditional algorithmic methods (Moselhi, 1997). Some of the methods are deterministic and others are probabilistic accomplished by either expert opinion or statistical methods.

The Lump sum Amount Allowance: Hogg, 2003 reported 'intuitive perception' as the most adopted method of assessing the amount of contingency whereby the consultant quantity surveyor allows a single figure for risk that reflects the overall perception of the project. Other researchers reported this method but Hogg, 2003 distinguished it from percentage addition in his findings.

Traditional Percentage Addition: This is a subjective method of percentage addition on the base estimate derived from intuition; gut feeling, past experience and historical data. This method has been described as "Crystal ball' (Moselhi, 1997); 'across-the-board' percentage addition (Baccarini, 2004). It has been considered arbitrary (Ahmad, 1992; Thompson and Perry 1992) and criticized by researchers. In fact, it is the criticism of this method that led to different methods and techniques proposed for contingency estimation as this method has several weaknesses (fully described in Thompson & Perry, 1992: Mak *et al.* 1998, Mak and Picken, 2000; Karlsen and Lereim, 2005). Generally, the contingency estimated with this approach ranges from 1 to 5 percent and rarely exceeds ten percent (Moselhi, 1997).

Cost Item Allocation: A contingency percentage is allocated to each cost item (Moselhi, 1997) in the work break down structure (Karlsen and Lereim, 2005) or several work packages (Ahmad, 1992) and the project overall contingency is then estimated as a weighted average. According to Ahmad (1992) each work package can be treated as a risk centre, and the amount of contingency to be allocated to each will be different.

Probabilistic Itemised Allocation: This method is similar to 'cost item allocation' method but it uses Pareto's law – known as the 80/20 rule that is the law of significant few and insignificant many (Moselhi, 1997). For the estimation of contingency, it means that 80% of the risk will be associated with 20% of the cost items and it examines closely each item being considered significantly and allocate for each item a probability value, rather than percentage contingency, for not exceeding its estimated cost. Touran (2003a) also developed a probabilistic model for the calculation of project cost contingency by considering the expected number of changes and the average cost of change orders.

Programme Evaluation Review and Technique (PERT): The method calls for some judgment about the probability density function, which describes each cost item as a random variable taking on values between its estimated lowest and highest costs. Yeo (1990) suggested using formulae similar to PERT according to a 5-95th percentile. Three estimates of cost are needed for each item being considered: lowest cost (optimistic), highest cost (pessimistic) and the most likely cost (modal value). The three estimates of cost can be made base on judgment and experience and or base on data collected from previous project.

PERT with modified variance: This is a direct probabilistic method like PERT but can model any correlation that may exist among the project cost items (Moselhi, 1997). Based on probability distribution used for each cost item, the mean of the project cost is the sum of those calculated for the individual items as in PERT and the variance of the project cost is calculated in a manner different from that used in PERT. Moselhi (1997) reported that this method is accurate and reliable.

Monte Carlo Simulation: The Monte Carlo technique is a process for developing data through the use of random number generator. This technique was developed a number of years ago and has become one of the most popular probabilistic risk analysis techniques (Smith, 1999). It was introduced as an improvement over and as an alternative to PERT (Moselhi, 1997). In this approach, a simulation model is created. The model is basically a cost breakdown structure (Karlsen & Lereim, 2005) or work package (Ahmad, 1992) where each cost item in the structure is a single point estimate.

3 Research Methodology

The research sample selected was guided by typical cases of a population that can provide the requisite data and information among professionals in the construction industry. Purposive sampling was used in selecting projects as the research intended to study only projects with a contract sum above USD 1million and on which the researcher was directly involved on from inception to handover. This was basically to ensure that accurate data is used in the research, as not many consultants in Uganda are willing to release this confidential information to non-project team members. The primary data for this study were obtained through structured questionnaire administered to experienced professional and practising quantity surveyors in majorly

Government/Public and Private consulting firms. This was in the bid to guide the respondents to providing direct answers that can finally explain in detail how the contingency sums are determined and how the cost overruns relate to the contingency sums allowed for on a project. Most of the organisations had projects across the country hence, were representative of, according to Asika (2005), what obtains in the entire population of the study.

Archived data was reviewed on ten projects handled by the author in the last 10 years of practice. These include a wide spectrum ranging from some of the biggest construction projects in the Industry with contract sums amounting to USD 65 million to multi storied commercial facilities. The benefit obtained in use of data where the author was part of the consultancy team was the fact that he saw the project from conception; preparation of the very first preliminary cost estimates, the engineer's estimate at tender and then the final contract sum obtained by competitive tender; involved in the supervision of the construction works and therefore able to track the trend of the estimated costs vis-à-vis the final cost on completion of the project.

The research methodology should clearly discuss the approach and/or the research design, data collection, and data analysis adapted or to be adapted in the research. One of the most important issues to be discussed here is the appropriateness of the selected methodology, i.e. the justification of why this particular methodology (consists of research approaches, tools, and so on), is the most appropriate choice compared to other alternatives. This is the opportunity for the authors to demonstrate their awareness and understanding (appropriate for the level of study) of the research tools commonly used in their field and how this knowledge is used to inform them in constructing a robust methodology to tackle the research problems/questions.

4 Findings and Discussion

The research established that the process of determining the cost of a Project in Uganda is done using a document called Bills of Quantities (BOQ). It is a document generated by the Quantity surveyors (QS) using detailed drawings from the Architects and Structural/civil Engineers showing detailed specifications of the Project in their respective specialties. Works in this document are divided into two major parts – the civil works and the Electrical mechanical (EM) works. The BOQ is made usually of 6 major components i.e. the Item or number or reference of a particular component of the works; the description of the works to be executed; the Unit of measure e.g. m, m2, m3, kg etc; the Quantities as measured by the QS from the drawings; the Rate charged for the execution of one unit of measure; the cost which is the product of the rate and the quantity. In the BOQ all the works to be done on the Project are described in a systematic manner usually in the most likely order they should be logically executed i.e. starting with the foundations etc. It is meant to be a comprehensive document as it is used as a reference for the generation of any payment certificates for the Contractor during the execution stage of the Project.

Another vital component of the BOQ is what is known as the Contingencies. It is meant to cater for any unforeseen changes in the works as it is executed. They are spent only with the prior permission of the Architect. If not spent at the end of the Project this remains the Client's money. This is usually done as a percentage of the total derived cost of works. It is usually in the range of 5-12% of the cost of the Project. The cost of the Project is dependant on the Quantities amounts and their description. It should be

noted that in this method of determining cost the safeguard is in the use of a contingence sum. It is estimated that the contingence sum can be used to cater for any changes and variations in the project. In Uganda determining the amount or percentage required on the Project contingence is through the experience of the QS.

From the extensive literature review and the practical experience of the author, it was revealed that the unforeseen that the contingences are meant to cater for show up in a wide variety of ways and affect different parts of the Project. It is therefore not justified to give a summary contingence percentage on the overall as if all areas of the Project are affected the same way by the changes. Some changes are due to unforeseen site conditions like in Uganda the underground services are difficult to locate as there isn't an up-to-date services layout master plan for the City and yet there have been new lines laid in the last couple of years. This justified the researcher's approach to divide the building into several parts and then study independently the effects on these different parts during the execution of the Project.

The proposal is that the contingency sum of each of the parts should be embedded and made as a percentage of the individual portions and not of the final cost. This will have a cumulative effect on the total amount of contingency available on the Project and also allow for individual use of the said amount during the execution of the Project. It is agreed that different parts are affected but then another question arises affected to what extent so as to deem a high or low percentage of the contingences. The research revealed four major factors that affect the accuracy of the cost of a particular element of the construction works.

The practical work experience of the author revealed four major factors that determine the required contingency sum for particular elements of work of a project. Experience has it that the different works on the Project are designed and their quantities (volumes) can be ascertained with less effort than other works. For instance any works that are under the ground level are deemed to have a high level of uncertainty in defining the works and their quantities involved during the stage of tender especially if no detailed geotechnical investigations are made which the research revealed is the case on most projects in Uganda. This can be explained by the fact that these are specialised services and only few firms provide this service which leads to it being expensive. So the first parameter of measurement is *Level of uncertainty involved* on a particular set of works on the Project. The higher the level of uncertainty, the higher the required contingence percentage.

Research has revealed that one of the major holdbacks on the effectiveness of Tenders in Uganda is a result of incomplete drawings at tender stage. One Architect explained that design is an on-going process and so often continue even up to the execution stage of the Project. Notwithstanding the fact that this is true, not all parts of the building design are left uncompleted at tender stage. Here we derive the second parameter – possibility to have the design and detailing of that portion of the building completed, or in other words *the level of incompleteness of the part* at tender stage. If it is high then it calls for a higher contingency as it is bound to alter the quantities more during construction than other parts of the building.

A construction project is a rather complex assignment which is made of so many varied parts which should be clearly and in detail described to the contractor in order to ensure a clear understanding of the same and therefore give it a viable and corresponding rate while pricing for the works. It can be agreed that not all parts are of the same

complexity. The QS is meant to describe the parts in a clear and usual construction language. Many projects have had court cases due to the misunderstanding and therefore misinterpretations of the specifications of the different parts of the building. So the *level of difficulty to achieve clarity* of the works definition by the Architect and QS will definitely affect contingence sum required for the works.

Contingences are taken to be the safe haven to run to in case of any variations on the Project. Experience testifies that most contingences rarely cope with the level of changes made on a project and are therefore depleted even before the mid of a construction project time. Again it should be remembered that not all parts of the building are susceptible to variations to the same extent, and so it is not justified to have the same percentage of contingence attached to those parts. So the forth parameter is the *probability that a variation will occur to that part* of the building.

The next stage of the research reviewed the cost overruns for the ten projects worked on by the researcher to reveal first the contingency allowed for and second the final cost overrun attained at the end of the project. In Uganda the Building works particularly the new works are usually divided into *Sub-structure works (foundations and all works below the ground level); concrete frame and roofing; External and Internal walling; Openings (windows, doors, curtain walling etc); Finishes (internal & external); Electrical and Mechanical Installations.* Table 1 below shows the results received from the detailed review of the archived information.

Table 1. Cost overruns in percentage of the different building works to the Overall cost overrun (Source: Author's findings)

Project no.	01	02	03	04	05	06	07	08	09	10	AV.
Substructure	6.17	1.05	5.12	1.05	2.05	1.05	1.05	2.05	1.05	0.05	2.069
Frame	12.04	2.15	9.04	2.15	1.04	2.04	0.15	1.04	2.04	1.15	3.284
Walling	1.44	2.55	2.44	2.55	0.55	0.55	0.55	0.55	1.55	0.08	1.281
Openings	10.58	9.55	10.50	6.55	3.45	2.45	7.55	2.45	2.45	1.25	5.678
Finishes	5.67	8.02	12.44	8.66	4.06	3.06	8.11	5.06	2.01	2.22	5.931
Mech./Elect.	9.10	1.68	7.06	7.68	2.11	1.11	4.28	5.11	2.11	1.09	4.133
Cost Overrun, %	45	25	46.6	28.64	13.26	10.26	21.69	16.26	12.21	5.84	22.48

5 Conclusion and Further Research

The results from the table above give ground for a more practical approach to the management of Construction projects cost in Uganda. First analysis is made on all the areas that have HIGH as the rated index. These are the combinations of the type of effect that must have a thorough mechanism for monitoring of the Project Cost. For instance Finishes on the Building should be closely monitored by ensuring the following; The Architect developing a comprehensive schedule of finishes of the building early on in the Project; discuss and agree with the Client on the same so as to bring the effect of the index probability of variation into the range of Medium or even low, so as to save on the 12% contingence included in the Cost.

Because finishes have a high level of complexity and difficulty to describe, with the detailed schedule the QS will find it easier to describe the finishes better for the

contractor. A vital point here is the fact that the materials market for finishes is changing pretty fast, with better sometimes more cost effective in the long run coming onto the market. This leads the Client and even the architect to want to make a variation for the good of the Project. This justifies the 12% contingence sum of the cost of the finishes.

The proposed new method for determining the individual contingency sums of the various elements of the project needs when applied needs to be reviewed in the various circumstances surrounding each individual project. Further research should be made in revealing the most effective ways of managing the contingency included in the project cost.

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Critical-Chain Project Management in Western Australia: Towards Construction Project Duration Reduction

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Abstract:
Given that one in three infrastructure projects in (Western) Australia were completed over-time, project management of the building process requires re-examination; Critical-Chain Project Management (CCPM) is presented as a way to address unsuccessful, over-time delivery of projects for the local construction industry. CCPM is an application of the Theory of Constraints to establish procedures to better manage human behaviour and more efficiently allocate resources required to complete tasks. CCPM is presented as a means to improve upon the Australian construction industry's more commonly used Critical Path Method. The research work described uses a qualitative methodology to assess the extent to which stakeholders in WA might be able to implement this alternative scheduling technique to incorporate risk assessment. Findings are presented which suggest that whilst industry appears resistant overall to the implementation of CCPM, utilisation of the technique may be suitable for disaster-mitigation community-asset-reinstatement.

Keywords:
critical-chain, project-management, civil-engineering/construction, Western-Australia.

1 Introduction

According to the Australian Constructors Association Report entitled 'Scope for Improvement', which surveyed over 200 industry professionals during 2005, one out of every three infrastructure projects in which the survey participants were associated with were completed over time (ACA, 2008). Western Australian (WA) professionals identified significant Liquidated Damages associated with projects conducted in their unique home-state (Western Australia is comparable in size to Western Europe, has a population of 2.3 million, with the world's most isolated mainland city, Perth).

This paper explores the possibility of using a new paradigm of project management, namely Critical Chain Project Management (CCPM), to address the problem of unsuccessful delivery of projects on time within the WA construction industry.

1.1 Critical Path Method (CPM)

Currently within the Australian construction industry Critical Path Method (CPM) is the most frequently used time-scheduling technique and is a mathematically based algorithm for scheduling a set of project activities. A CPM schedule is developed in the form of a graphical model known as a 'network', this network is a visual representation

of activities linked together in a logical sequence to create a map of relationships and dependencies between activities, and identifies the project's critical path/s (Uher, 2003). The project's Critical Path is defined as the longest chain of dependent activities, referred to as critical activities, whereby any delays in these critical activities will delay the entire project's schedule.

1.1.1 Shortcomings of the Critical Path Method

Advocates (Goldratt, 1997) of Critical Chain Project Management (CCPM) attribute a range of project failure rates to CPM's inabilities in dealing with three important factors:

Fundamental Project Uncertainties Causing Delays

Resource Dependencies Between Activities

Human Behavioural Factors

Project uncertainties are accounted for in CPM schedules through the allocation of contingency time to activities' duration estimates, based upon the planner's perception of risk to which the activity is exposed (Uher, 2003). It is recognised by CCPM supporters that planners will estimate according to their worst past experience of that activity type leading to excessive safety time being allocated, which in turn seldom motivates the performance of a respective project team (Goldratt, 1997). In addition it might be argued that the insertion of respective contingency time(s) into each activity's scheduled duration makes it very difficult for the project team to monitor project progress along the schedule. This can be argued to prevent the accurate estimation of a work path or project's expected completion date by the project team, unable to effectively intervene to accelerate progress in order to protect committed completion dates.

Efficient allocation of a project's committed resources is an important aspect of successful project management; however, CPM schedules do not largely require activity resource allocation. Omission of some resource dependencies is likely to result in unexpected delays, as activities await the resources required.

It is common within the WA construction industry for payments to be paid based on the achievement of milestone progress points. This form of progress measurement can be argued to result in an environment of somewhat short sighted project management, where the project team in an effort to appear successful push to achieve these milestone payments at the expense of other works. Although this form of progress measurement is not specifically required by CPM, CPM seldom provides any relevant guidance.

2 Critical Chain Project Management (CCPM)

Critical Chain Project Management (CCPM) is the application of the Theory of Constraints (ToC) to the project environment. CCPM establishes procedures and introduces techniques to plan and manage projects in any industry, attempting to better manage human behaviour and more efficiently allocate resources required to complete tasks. It is a structured way to increase project flexibility, allowing advances in the programme to be capitalised on and providing additional feedback loops for management to base intervention decisions upon.

2.1 Implementation of CCPM in Order to Minimise Project Durations

2.1.1 Cutting Estimated Task Durations

The first stage of CCPM is to address (effectively cut) the safety/contingency time from activity durations estimated within the project schedule. The amount of time to be trimmed from each activity duration estimate should reflect the amount of uncertainty embedded in its tasks. Goldratt argues for significant cuts to activity durations, suggesting in many cases opportunities for the halving of a 'reasonable' task duration estimated by an experienced scheduler using CPM (Goldratt, 1997). This proposed new expected duration is subsequently deemed to reflect the median safety-free duration of works, free of any inbuilt safety time allowing for delays which may occur. However contingency time remains required to deal with uncertainties and delays, in CCPM this time is installed into the programme in the form of buffer periods.

2.1.2 Buffer Period Installation and Management

There are three types' of buffer periods used in CCPM, as outlined below:

Project Buffer: half of the time cut from critical activities are compounded (summed together) and inserted into the schedule at the end of the Critical Chain. Goldratt argues that the estimated activity duration is to be cut by 50% and half of the time which has been removed is placed in the project buffer; meaning that the overall activity duration estimation calculation including safety time is approximately up to 75% of the original projected duration using traditional CPM scheduling methods.

Feeding Buffers: calculated using the same techniques as the Project Buffer above. The difference between Feeding and Project Buffers is that Feeding Buffers contain safety time for each non-critical work path opposed to the Critical Chain, inserted into the project schedule where the non-critical work path feeds into the Critical Chain; as such there is more than one Feeding Buffer within the project schedule, whilst there is only one Project Buffer.

Resource Buffer: unlike the Project and Feeding Buffers, it is not a summation of safety time to account for delays but rather a rouse (wake-up-call) in the form of a notice, given to the relevant subcontractor one week and again one day prior to a particular plant or personnel being required to undertake a critical activity. These Resource Buffers are inserted into the project network in the form of Resource Dependency arrows between activities. A requirement of CCPM project network development is that each activity is allocated the resources required for its completion, allowing resource allocation priorities to be developed.

Monitoring of the Project and Feeding Buffer's consumption is to be done on a regular basis (perhaps even daily) through routinely updating the project schedule, with delays in activity completion to be subtracted from its corresponding buffer. Once delays have been subtracted the buffers so-called Burn Rate requires to be calculated. The Burn Rate is defined as 'the ratio of the percentage of buffer consumed to the percentage of work completed along a particular work path' (Srinivasan, 2007). The Burn Rate acts as a feedback mechanism for the project team; once a work path produces a burn rate ≥ 1, intervention is required from the project team to bring the work-path back on schedule to protect its expected completion date.

2.1.3 Updating Project Schedules

In order for buffers to be managed effectively CCPM advocates a significant increase in project progress reporting. Regular (ideally daily) on-site subcontractor supervisors will be required to submit a 'Subcontractor Daily Progress Report' or SDPR to a contractor representative, to update them on progress made on activities throughout the day and predict expected activity completion dates (Maylor, 2002). Based on the submitted SDPR each activity which is underway should be updated on the working project schedule to reflect the situation on-site. Once each schedule has been adjusted it is to be passed onto the project manager who is tasked to combine all work schedules into a summary schedule showing percentage progression of each work-path. Based on the projected dates, corrective action can be taken by the project management team to protect committed completion dates. CCPM also calls for an increased openness between the contractor and client, brought about by allowing the client access to this working schedule. Therefore once the schedule is updated it needs to be posted on a pre-agreed online forum to which the client and client's representative have access.

2.1.4 Monthly Progress and Cost Reports

Somewhat by definition no matter how quickly you complete non-critical activities the project cannot be completed any sooner than the time it takes to complete those which are critical. Therefore by measuring the progress of a project by its progression along the Critical Chain, a true estimate of progress can be made and payments made accordingly. CCPM calls for progress payments to be paid as a percentage of the total quoted price of the project based on the percentage of the Critical Chain completed (Goldratt, 1997). Therefore the Progress and Cost Report must include a detailed breakdown of Critical Chain activities and the progress that has been completed along it to date. The information required to ensure the accuracy of these monthly reports is to be taken from the updated schedules outlined above.

3 Assessing Opportunities for CCPM in WA

It was considered that enquiries into opportunities for utilisation of CCPM locally were best achieved by the use of the qualitative method of research. This method allowed analysis of the variables related to critical chain project management to be investigated in terms of understanding the circumstances in which study participants address issues in scheduling (Creswell, 2007).

Pilot study data collection occurred in the form of four semi-structured interviews with senior civil engineering project management professionals locally. Interview participants were identified using 'purposeful sampling' with a view for 'maximal variation' (Creswell, 2007). On this basis participants company profiles varied in size, nature (client/consultant/contractor) and sector (public/private). All participants were high-rank personnel with extensive knowledge of scheduling practices.

3.1 Late Project Completion in WA

From the responses given in the structured interviews, problems do exist within the WA construction industry in delivering projects on time. Time-blowouts were recorded on 25-50% of projects within the remit of the sample-group.

3.1.1 Establishing the Negative Financial Impact of Liquidated Damages

Three-quarters of the respondents had encountered the application of very harmful liquidated damages, which resulted in the contractor ultimately losing money on the project in all cases. The high level of harm caused by liquidated damages within the WA construction industry indicates a greater level of uncertainty than was contractually expected from the builder/contractor. CCPM advocates contractors and subcontractors to take on larger liquidated damages contractually, therefore exposing them to more risk, in exchange for larger profit margins. CCPM enables the project team to better understand and deal with delays by providing additional feedback loops, minimising uncertainty and making harmful liquidated damages less likely.

3.1.2 Establishing the Cost Competitiveness within the WA Construction Industry

The structured interviews identified that there is a general trend of cost competitiveness increasingly within the WA construction industry, especially in the lower tier building sector. For larger contracts the sample identified that competition is not placing significant downward pressure on profit margins within Western Australia. Since CCPM calls for large financial incentives for its implementation, large infrastructure projects would be most feasibly able to offer these incentives.

3.1.3 Establishing if the Milestone Progress Payment System is Affecting Negatively Project Durations

All project managers in the sample interviewed identify the practice of pushing for milestone payments at the expense of other works as common within the WA construction industry; however respondents deny doing it personally. This practice increases the risk of delayed works being neglected until they become critical and potentially delaying project completion.

3.1.4 Problems Due to an Increase in Activity Progress Reporting

As identified in the structured interviews, subcontractors within the WA construction industry independently allocate resources to their activities and job sites. This means that daily progress is not necessarily consistent, and generally subcontractors allocate resources only once an activity has become critical. Confirming the CCPM assumption that adding safety time to activity durations does not help in delivering projects, but rather that ‘an activity will expand to fill the time available’ (validating secondary research suggestions identified by Maylor (2002) et al). Without consistent progress or subcontractors being able to accurately predict the finishing dates of activities, the updated schedule will not help in planning future works.

3.1.5 Payment Based upon Critical Chain Progress

It was found that if payments are made based upon the progress along the Critical Path, the cost of works to the contractor will not correspond to the value of work. Meaning in some cases that the contractor will need to pay more than they are expected to earn for the works, especially in a ‘services heavy’ project, these costs could bankrupt smaller contractors. If however finance was obtained by the contractor, all additional costs due to interest owed, would most likely be passed onto the client and result in the cost of the project to increase. It was also confirmed through the structured interviews that contractors aim to make additional funds by remaining cash-positive throughout the project and reinvesting this additional money. It was identified by both Senior Project Managers and Contracts Administrators interviewed, that any cash flow problems experienced by the contractor due to insufficient payments from the client, would result

in delayed or withheld payments to subcontractors and suppliers, which could impact very negatively upon cash-flows or indeed prevent them agreeing to participate in CCPM projects. Another problem related to systems of payment was the ability to incorporate any change in scope or change in Critical Chain/Path (notwithstanding contractual claims mechanisms); argued by the sample as leading to a delay in payments to the contractor which will be passed onto subcontractors and suppliers.

3.1.6 Reduced Activity Duration Estimation

Accurately estimating durations to reflect the safety-free median activity durations was described by sample project managers interviewed as a 'major resourcing issue'. Yet all also recognise that Target Programmes, developed by contractor representatives and used on-site to drive subcontractor performance, estimate 'unrealistic activity durations' which assume 'a best case scenario' (much like the activity durations called for in CCPM); however it was also recognised during the interviews that if CCPM installs larger liquidated damages into subcontracts, the high level of subcontractor interdependence and interfacing will significantly increase the risk to subcontractors, making them less likely to contractually commit to CCPM projects. Further research into the installation of liquidated damages within CCPM contracts is recognised as an area for further research.

3.1.7 An Increase in Staff and Plant Idleness

The structured interviews identified that 'starting non-critical activities earlier than required in order to keep resources onsite and absorb excess capacity' as a common practice in the WA construction industry. Yet CCPM calls for a structured progression through the schedule in an effort to complete works sequentially and prevent multi-tasking. Discipline will be required by the contractor not to push ahead with future works if the required management resources are not available to the contractor on-site, requiring an understanding and belief in the ideals of CCPM brought about through the continual training of the contractor's project team.

3.1.8 Training Required

For a contractor to implement CCPM, significant continual investment will have to be made in training of staff members and auditing procedures. This investment in people poses significant problems due to the relatively high staff turnover experienced in the WA construction industry as identified through the structured interviews. In the Australian construction industry during the year 2002 there was a 13% mobility rate within the industry and 4% exit rate from the industry (CSRM, 2003), where a mobility rate refers to employees leaving one company for another within the construction industry.

3.2 Aspects of CCPM already in use in the WA Construction Industry

3.2.1 Target Programmes

The Project Programme generally will have much contingency time installed into it since programmers often have a less than clear understanding of the project constraints, site conditions, activity methodologies and other details specific to the project being undertaken. Therefore contractors develop their own programmes which take into account many of these previously unknown variables. These more accurate Target Programmes assume a best-case-scenario, as expressed in the structured interviews, meaning contingency time is not installed into the (updated) activity duration estimates.

This means that the Target Programme is the contractor's version of a CCPM programme without the installation of buffers. The purpose of these Target Programmes is to accelerate subcontractor performance by setting 'unrealistic activity durations', therefore subcontractors constantly believe they are running late. However the development of these Target Programmes is individual to each project manager with the time cut dependent on their unique perception and experiences of uncertainty. Instead of buffers being installed and managed in a structured way, contingency time is cut from the schedule and it is hoped that the difference between the Target Programme and Project Programme will account for uncertainties and delays. The problem with this method of management is that the criticality of each delay is not identified by the project team, and thus the effect that each has on the project completion is not fully understood or appreciated by stakeholders.

3.2.2 Subcontractors Committing to Approximate Start Dates

CCPM calls for subcontractors to commence activities directly after the completion of the preceding activity, and as such has been compared to a baton-relay-race (Maylor, 2002). This requires subcontractors to commit to durations for works rather than set dates, and also requires them to commence works upon instruction. The practice of giving subcontractors rough starting dates to begin works is identified through the interviews as common within the WA construction industry; whereby the Project Programme is recognised as guide only and dates are generally confirmed during meetings closer to the commencement date.

4 Conclusions: Opportunities to Reduce project Durations in WA

Given perceived logistical problems with CCPM implementation and the lack of competition within the industry, the investment required to successfully implement CCPM would significantly outway the potential benefits provided by CCPM in securing tenders and increasing profit margins for a construction contractor within the WA construction industry. However partial implementation of CCPM techniques in the development and management of Target Programmes as outlined above will increase the control of these programmes, through providing a framework in which to establish activity durations, monitor progress and manage buffer periods. Additionally in the case that the economic climate within the WA construction industry worsens significantly, CCPM implementation would become more feasible, providing an alternative to the client in a highly competitive environment.

4.1 Clients with Multiple Projects Running Simultaneously

CCPM seeks to provide the client with the up-to-date working schedule as discussed above, which shows the impact of delays in responding to contractor questions on the project's overall duration through a colour coordinated buffer management system. In the case of a client with multiple construction projects running simultaneously, as generally is the case for the government's public works department, this ability of CCPM to give the client an easily recognisable feedback loop in which to prioritise decisions could provide significant benefits in reducing delays experienced by all projects.

4.1.1 Projects with a Known Amount of Resources

Inconsistent resource allocation, as is argued generally by respondents to be the case within the WA construction industry, means regular monitoring of progress is unlikely

to give an accurate feedback mechanism to judge progress and estimate completion dates. Monitoring, ideally daily, might be argued to elicit pre-emptive action on behalf of the project management team, potentially causing delays and straining relations between the two parties. Therefore projects with a known amount of resources, such as infrastructure projects or on building contracts where no sections of work are subcontracted, would be two project types most able feasibly to utilise CCPM monitoring and buffer management techniques.

4.1.2 Projects with Relatively Large Liquidated Damages

The changes necessary for a contractor to undertake /implement CCPM, requires a lot of time, investment and understanding to be successful. In order to make this large level of investment feasible, sufficient financial incentive needs to be provided contractually by the client based upon the real cost to the client whilst the infrastructure is not operational. Therefore projects with relatively large liquidated damages are best suited to CCPM, as they are better able to provide the large financial incentives and bonuses required to make CCPM implementation financially viable.

4.2 Industry Conditions Suited to CCPM Implementation

4.2.1 High Level of Competition

By implementing CCPM and advertising its potential benefits in reducing project completion durations, contractors offer an alternative to the client, with an estimated project completion date significantly shorter than that offered by traditional CPM. It might be argued that this shorter duration is likely to be balanced by a somewhat higher project price. In the case of a significant increase in industry competition for projects, (private sector market-troughs perhaps) this alternative scheduling tool and the investment required for it, might prove viable for consideration/implementation.

4.2.2 Emergency Relief

In an emergency situation shortening project durations becomes the primary project success criteria in order to minimise impact by restoring vital infrastructure. It can also be assumed that the maximum amount of resources available will be utilised, therefore the resource pool is known. Both these conditions make emergency relief construction works (and perhaps more pertinently, the somewhat longer-term re-establishment of essential residential and community amenities) well suited perhaps to CCPM techniques (notwithstanding the requirement to understand/apply the underlying ethos). Higher contractor profit margins might realistically perhaps be balanced with political and humanitarian incentives in delivering and completing projects as quickly as possible. It might be argued that any organisation predisposed to, and experienced in, emergency relief construction works could potentially benefit most from the implementation and offer of works scheduled by CCPM.

5 Recommendations

Full implementation of the Critical Chain Project Management scheduling tool is not recommended generally for the currently buoyant WA construction and civil engineering industry; however, it can be argued that Target Programmes used onsite might indeed benefit from development and management according to CCPM principals. Development of such Target Programmes, including activity duration estimations and resource dependencies in accordance with CCPM techniques, whilst

requiring additional reporting of progress through Subcontractor regular/Daily Progress Reports and complementary contractor schedule management, can be argued as being potentially advantageous; programme scheduling might be addressed explicitly, towards mutual benefit, within local standard forms of construction contract, such as clause 32 of Australian Standards (AS) 4000. Similarly opportunities may exist for stakeholders associated with disaster mitigation and related community re-establishment projects to gain from an implementation of CCPM techniques (and its incorporation into selection criteria for awarding such re-construction contracts), to address/reduce project duration/delivery times.

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Benefitting from Employee Ideas Through Suggestion Systems: Challenges for Middle-East Construction Organisations

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Abstract:
Suggestion systems have been used by organisations for centuries to elicit employee ideas and improve organisational performance. They have started gaining popularity in the middle-east in the last decade. This paper presents an analysis of different challenges associated with implementing suggestion systems in the Middle-east construction sector. Among the major issues highlighted that affect the implementation are high upfront cost and lack of lifecycle costing models, varying educational levels of employees, high employee turnover, different expectations for rewards and need for detailed feedback.

Keywords:
suggestion systems, idea management, and innovation

1 1 Introduction

Competition in today's business environment is so fierce that companies are recognizing innovations and creativity by its workers as an important element in sustaining competitive advantages. By having more innovations companies can find new ways to optimize how work is done and reduce cost and can bring new products to market and more profit to the shareholders. Many organizations have means to collect workers ideas from the classical suggestion box to state-of-the-art IT systems. Nevertheless, organizations (and suggestion systems) can be different but a common issue effecting suggestion systems is how to make them work effectively. This paper elaborates on the idea of employee suggestion system and discusses some major challenges in implementing them in construction organisations in the middle-east.

2 Background

Creativity is a fundamental human capability found to some extent in everyone (Fairbank and Williams, 2001). However, in a civilized society, people themselves need to volunteer ideas, it cannot be forced out of them in distress (Pluskowski, 2002). Suggestion systems primarily consist of administrative procedures and infrastructure for collecting, judging and compensating ideas, which are conceived by employees of the organization (Van Dijk and Van Den Ende, 2002). In addition, suggestion systems have

the capability of being all inclusive by being able to focus on capturing ideas from all workers, working in a range of professions (Fairbank and Williams, 2001).

Suggestion systems are not new at all. In 1721 Yoshimune Tokugawa, the 8th Shogun, placed a box called "Meyasubako" at the entrance of the Edo Castle for written suggestions from his subjects. Although the mechanism and associated rewards of this suggestion system are not known, it is one of the earliest ever known suggestion systems. The first industrial suggestion system known to us is the one established by William Denny in his shipyard in Glasgow in the year 1880 (Dickinson, 1932). Research in the area of suggestion systems is also not new, as one of the references found in the review of literature is Dickinson, which was published as far back as 1932. People have analyzed different aspects of suggestion systems, their success factors and barriers. We have come a long way from the days of suggestion boxes to sophisticated computer-based suggestion systems. Nevertheless, irrespective of the difference in types, and technological complexities of suggestion systems, one common issue affecting them is how to make them work effectively. However, for these suggestion systems to work effectively, they should attract sufficient numbers of suggestions. Research indicates that several suggestion systems fail to attract sufficient participation (Fairbank and Williams, 2001; Dijk and Ende, 2002; and Turrell, 2002).

The following section presents the review of literature in the area of suggestion system lifecycle and the drivers for suggestion systems. It is followed by a section on challenges faced by companies in the middle-east in implementing suggestion systems and is followed by a section on conclusions.

3 3 Literature Review

3.1 3.1 Suggestion System Life Cycle

Frese et al (1999) have highlighted three process variables that are deemed to be important while making a suggestion system work. The first one is the process of having ideas. The second one is a mechanism and associated administrative processes for submission of ideas. The third one is the feedback and associated reward in order to encourage high quality ideas to be submitted. As Grant and Ashford (2008) suggest "The key criterion for identifying proactive behavior is not whether it is in-role or extra-role, but rather whether the employee anticipates, plans for, and attempts to create a future outcome that has an impact on the self or environment". This impact they are referring to could be the impact on the work environment in terms of the value that is generated or it could be the impact on the job prospect and the associated reward and recognition for himself/herself. Suggestion systems establish formal procedures to actively solicit voluntary value added ideas from employees (Verworn, 2009). This process promotes continuous improvement, and enables the whole workforce to develop ideas instead of relying on a handful of specialists (Fairbank et al, 2003; Verworn, 2009). Suggestion system exploits the reservoir of ideas in employees that would otherwise remain dormant in the absence of this system. These ideas that the employees come up with could be either a recombination of existing materials or an introduction of new materials to the organization (Baer et al, 2003). There are three important elements of suggestion systems as specified by Robinson and Schroeder (2004); the first one is the actual submission of suggestions and ideas by the employees. The second major element is the process of evaluating the suggestion for the value they generate, the process followed and the amount of transparency. The third major element is the

evaluation of reward and communication of the feedback. For the whole suggestion system to be successful, it is important that all three of these elements be analyzed.

The process of submission of suggestion encompasses the publicity and solicitation process for ideas, making them document and submit it, and also helping them make a case for the amount of value added by the implementation of the idea. So it all starts with the promotion of employee innovation. The innovation here is more of interactive process perspective, (Edwards, 2000) where we are consider innovation activities as an interaction between individual determinants and organizational characteristics (Lee et al, 2006). Therefore, in order to generate valuable ideas from individuals it is important that organisations form a support system that encourages employee innovation and submission of more suggestions (Recht and Wilderom, 1998). It is also important in the case of suggestion system to consider attribution theory. Attribution theory states that

"a person who perceives the cause of success for a task to be out of his/her control may lose motivation to perform the task" (Hultgren, 2008). Through soliciting these suggestions, the point of attribution theory is reinforced and employees feel that their suggestions contribute to the success of their organisations which is a big boost to their confidence and sense of being.

The second major element in a suggestion system lifecycle is the process followed. Hultgren (2008) lists some key variables that affect the overall success of the suggestion systems and most of them are related to this part of the cycle. The variables are: simplicity of submission, evaluation and reward system, evaluation bias/unbias-ness, feedback quality and promptness, ability to monitor progress, rapid evaluation and a safe environment that does not penalize the employee for rejected suggestions.

The third element of a suggestion system is the reward and feedback. The rewards of suggestion system and the perceived value could be both financial and non-financial. Imai (1986) established almost two and a half decades ago that there is a debate of culture when it comes what works in terms of value and reward. American suggestion systems were very financially-driven, they stressed on economic benefits and provided monetary rewards; whereas the Japanese stressed the morale-boosting benefits of positive employee participation (Recht and Wildrom, 2008). The impact of financial regard and they being not one of the key drivers was further highlighted by Robinson and Schroeder (2004). However, what is important is to have some sort of reward mechanism that is transparent and acts as motivator. The reward could be merely recognition (Robinson and Schroeder, 2004).

3.2 Suggestion System Drivers

Creativity is basic human capability (Fairbank and Williams, 2001), However, ideas cannot be forced out of people, they need to be volunteered (Pluskowski, 2002). Employee Suggestion System which can be defined as administrative procedure for collection, judging and compensating ideas, which are conceived by employees of the organization (Van Dijk and Van Den Ende, 2002). In addition, suggestion systems are systematic and should focuses on capturing ideas from all workers, not just ideas from identified few smart workers (Fairbank and Williams, 2001). An average benefit of 13 $ for every 1 $ spent on the system administration (including rewards) was identified (Shair, 1993). Also it is estimated that net savings of over 7000 $ are collected on average from every idea (Verespej, 1992). Suggestion systems were used since the sixteenth century in the British navy to stimulate workers to provide their ideas (Turrell,

2002). Since that date the concept of suggestion systems has matured toward what is called idea management. Idea management is concerned with collecting "focused" business ideas, developing them and measuring performance (Turrell, 2002).

Many studies that evaluated the success of suggestion systems revealed that encouraging workers to share their ideas through the suggestion system was a common difficulty. Fairbank and Williams (2001) noted that motivating participation is common weakness in suggestion systems. In addition, a Research Study conducted with 50 companies in the UK between 1996 and 1998 found that the majority of programs failed to meet initial expectations (Turrell, 2002).

A large amount of literature is available on the role of work environments to encourage and enhance creativity, the aim here is to try to link this general literature to how organizational support can help workers use suggestion systems more often. As the subject of environment support is very wide, focus will be on the role of supervisors and colleagues to enhance system usability because of their importance. It is well established that management interest in employee suggestion system is very important in its success (Farnham, 1994). However, ability to recognize and exploit creativity is a primary challenge confronting today's managers (Hamel 2000). In addition, having senior management chair evaluation committees can comfort workers that evaluation is going to be fair (Fairbank and Williams, 2001).

One of the most famous studies on the field of creativity, which is often cited in research relating to the subject, is that done by Harvard Business School professor Teresa M. Amabile where for over 30 years she was mainly focused on the role of work environment on creativity. Her work, without going into much details, support our model in that both supervisor and work group support are very important factors for workers creativity (Amabile et al 1996). Many other researchers also identified that organizational climate has much effect on innovation where supervisors are key players in it (Abbey and Dickson, 1983). The evidence of the importance of supervisors (and management) support is explained by Cherry Hudson (2004) when he said "Programs lacking good management support will exist, but will not thrive". Supervisors must realize that they can create a work climate where it acts as a source of pressure for directing workers toward using the suggestion system (Pritchard and Karasick, 1973). Supervisors through their hierarchical rank in companies can orient workers toward creativity and using suggestion systems. Supervisors have many means to influence workers like frequently reminding them in group meetings and recognizing those who submit ideas. Supervisors should also try to establish good relationships with their subordinates as Basu and Green (1997) suggest that a positive leader-member relationship enhances exchange and *innovative* behavior. Negative attitudes and prejudices towards workers can severely reduce system usage (Wilms et al. 1994). Frese, et al (1999) Suggest that supervisors can encourage participation by removing hindrance and encouraging participation. Supervisors can control many hindrances because in many suggestion systems they have considerable power as they act as an initial filter for ideas and can influence the committee decision of accepting it. As mentioned above, it can be summarized that supervisors can enhance system usability because they can encourage the worker to hand in suggestions (Oldham and Cummings, 1996). A life example of the positive role of work environment on increasing participation is found in many Japanese work environments, where environment is a key element as to why some Japanese suggestion systems have much higher participation rate than the American ones. In many Japanese systems a sense of belonging and

shared fate fosters employee commitment; consequently, they are willing to interchange knowledge without restrictions (Recht and Wilderom, 1998).

Support of colleagues and work group is also an important factor in increasing system usability. Rogers (1954) suggested that the cohesiveness of a work group determines the degree to which individuals believe that they can introduce ideas without personal censure. Others have suggested that collaborative effort among peers is crucial to idea generation (Amabile et al, 1996). Participation can increase because workers can compete on who raises more suggestions. In addition, work mates can help new comers and first time users to use the suggestion system. Also discussions of ideas can take place where premature ideas can be enhanced and workers can be encouraged to submit their ideas. Also by collaboration workers are more exposed to creative ideas, which can lead to "set workers mind" to think creative (Amabile, et al, 1996).

There is not much literature that focused on the suggestion system ease of use. No researchers advocate the use of IT based systems to make suggestion systems easy (Turrell, 2002; van Dijk and Van den Ende, 2002). However, IT systems do have limitations particularly at the first stage when entering data is required. Not everybody is comfortable in using an IT application especially older people. Also accessibility is important where the system should be made available for all workers including contractors and even visitors. Accessibility can be enhanced by distributing suggestion forms in strategic locations around an organizational location like the employees cafeteria. Having the forms displayed in, holders can actually stimulate workers "and remind" them to generate ideas. If an IT suggestion system is used, workstations can also be distributed to allow workers with no computers to participate (and can be made easy like the informational touch screen PCs found at airports). Accessibility can also cover how easy it is to hand in a suggestion where a requirement of attendance in person can hinder participation and the ability to send suggestions by mail should be available.

Rewards to increase participation has been and still is a key element in suggestion systems. The majority of research on the subject supports that financial prizes are not very important (when compared to intrinsic motivators) in improving participation in suggestion systems (Fairbank and Williams, 2000). Motivation can be separated into extrinsic rewards like bonuses and gifts or intrinsic motivations which arise from performing the task itself. Intrinsic motivation is the drive to perform a task for its own sake rather than for any external reward received in exchange for performing the. Frese et al, (1999) found in their experiments that the motive to get a reward was only slightly related to submitting ideas and suggested that companies should not attempt to increase participation in suggestion systems by paying more money. Also, comparing large and small companies, Carrier (1998) found that even that incentives are 10 times higher in large companies; the results are not better than small companies. In addition, while in the US the average payment awarded through suggestion systems was US $ 602; in Japan it was only a mere US$ 2.20 (Recht and Wilderom, 1998). This huge difference in prize amount did not translate into a higher suggestion participation in the US companies which received around 1% of the number received by Japanese companies (Van Dijk and van den Ende, 2002). Convincing evidence shows that the reliance on extrinsic motivation limits participation to typically 10-15 percent of the employees, as opposed to 70-80 percent when no reward systems is used, or when recognition is kept to a symbolic level. (Stenmark, 2000). Another disadvantage of financial reward is that it makes people focus on the financial compensation rather than on being truly creative,

and it also makes people more reluctant to share ideas or seeds for ideas with others (Stenmark, 2000).

Rewards must be scrutinized to ensure that they promote extrinsic motivation without extinguishing intrinsic motivation (Fairbank, 2003). Stopping extrinsic motivators like money prizes can lead to user dissatisfaction. Fairbank , (2003) explains that while intrinsic motivation elicits and promotes the generation of creative ideas, it may be much less effective than extrinsic motivation at encouraging employees to go to the effort to actually submit their ideas. It should be noted that rewards will only motivate behavior if the rewards are valued by workers. Different prizes can be offered so that workers select prizes that suit them best. Rewards can be even used to foster collective ideas where a reward can be spent on the group for a joint activity (Recht and Wilderom, 1998).

An important element in the success of suggestion systems is to give timely and detailed feedback to workers on their suggestions. To improve participation, the organizational culture must offer a safe environment in asking for feedback to avoid sense of failure (Fairbank and Williams, 2001). If feedback is not received, workers will not know if their suggestions were accepted or just ignored. Long waiting causes frustration and can reduce usability because when time passes, the worker's enthusiasm for the suggestion will drop and he / she might not participate again. Turrell (2002) identifies that many companies have a backlog of suggestions of more than a year and suggests using a web-based system to collect ideas and speed the process of feedback. Responding to suggestions will be difficult if the company does not align its policies and mission statement with encouraging creativity because of the time needed to be devoted for providing feedback. Linking feedback to intrinsic motivation, Hackman and Oldham (1976) suggested that workers would look do for doing activities that provide feedback. In addition, jobs that provide feedback can promote creativity (Fairbank et al, 2003). Thus, if the feedback of the system is structured effectively (like publishing good feedback or putting them on a special certificate) usability will be increased because workers can attain satisfaction from the feedback and the way it was administered.

If negative feedback should be given (i.e. idea can not be implemented), careful management is essential (Fairbank et al, 2003). If feedback is viewed as criticism, it can reduce creativity, but if it is given as information, it can be used to improve the quality of the creative output (Amabile et al, 1996). The speed of feedback can be improved by using a web-based system where feedback can be viewed immediately after it is posted. A web-based system can also help tracking the suggestion and also post suggestion and feedback online which can increase usability and group participation. Also fast feedback can improve perceptions of management support (Axtell, 2000) and workers will believe that the organization treats suggestions adequately and fairly (Frese, 1999).

To provide prompt and reasonable feedback suggestions evaluation should be done by a committee with different disciplines (Fairbank and Williams, 2001). The committee members have the duty to be transparent and provide clear feedback on suggestions, which can remove the mystery surrounding the process and might reduce the perception that the process is political (Fairbank et al, 2003). If the members of the committee are not selected carefully, some good ideas may be prematurely rejected due to the

committee's limited cognitive capacity, the proposal's poor communication skills, bad timing, or being proposed in the wrong context (Stenmark, 2000).

Scope defines what kind of ideas an organization is seeking from its workers. Ideas can be either big or small and participation can be open to all workers and contractors or just restricted to R & D divisions. Van Dijk and van den Ende (2002) define the scope as the net that the company throws to collect ideas. Having a big net by widening the scope will happen only with small ideas (Stenmark, 2000; Turrell, 2002). Robinson and Schroeder (2004) are big promoters of small ideas and they claim that it is impossible to achieve excellence without the ability to pay attention to details which come with small ideas. Also small ideas are important in suggestion systems because they are usually situation-specific and can not be copied by competitors, so they improve competitive advantage more than big ideas which can be easily identified and copied (Robinson and Schroeder, 2004). Small ideas can accumulate overtime and open the door for big ideas especially if they were open for discussion, where they can trigger other workers to build on them to achieve even better improvements. Widening, the scope to include small ideas can improve (and increase) usability because logically, on average, people have more small ideas than big ones and thus the flow of ideas to the system should be more. By encouraging small ideas the suggestion system make advertisement for itself similar to a department store doing discounts, where the price limit is set lower and thus more people are able to buy (participate). On the other hand, if the suggestion system scope only focuses on radical and big ideas, many people will be excluded especially blue-collars. This is not suggesting that blue-collars can not have radical ideas but, for example, if a chemical plant wants only improvement in the chemical process, many people would be excluded instantly like HR, finance and many laborers because the area requires specific academic background plus experience. A well documented evidence of the role of small ideas to enhance system participation is in the performance of many Japanese suggestion systems which emphasize small ideas compared to the US companies which look for big and radical ideas (Recht and Wilderom, 1998).

Another support for small ideas comes from Axtell, et al (2000) who studied the contribution of shop floor suggestion systems for workers and suggests that lower level employees are much more likely to be able to contribute in this domain (i.e. small ideas) than to come up with radical new ideas. The more responsible the workers feel about their work, the more they take of charge of change (Axtell, et al, 2000). Responsibility can be linked to small ideas because the majority of workers in any company have specific jobs and don't often look at the larger company picture like managers. This suggests that the workers feel more responsible about their specific areas and usually small ideas are the only ideas that cover that area.

Van Dijk and Van Den Ende (2002) suggest that high accessibility and a broad scope will cause a sudden and sharp increase in the number of suggestions that will have negative feedback. Aas the number increases, the feedback will be slower. They recommend having dedicated workers to avoid this negative relationship.

Small ideas can affect another element in our usability model which is the satisfactory experience. Small ideas are most likely to be implemented fast, and so workers can see their ideas in reality which will encourage them to generate even more ideas because they can witness the system working and their confidence in the system increases.

4 Challenges Faced By Middle-East Construction Organisations

There are several challenges faced by construction organisations in the Middle-east in implementing these suggestion systems. The first one is the amount of resources needed to develop and administer the system. In order to operationalise an effective suggestion system, it is important to have dedicated people, systems and processes in place. It can be argued that the return from a suggestion system will pay for itself in the long run, but still there is an upfront cost associated with starting the system and it may take a few years to start delivering results. Since a majority of construction companies operating in the region are SMEs, it is difficult for them to justify the initial cost and start a suggestion system. Lack of accurate lifecycle costing models also is a problem in making a case to implement a suggestion system.

The second problem is the educational level of workforce. Most of the construction labourers are from the Indian subcontinent, who do not know how to read or write. This creates a problem because someone actually has to sit with them and write down their ideas on a piece of paper or feed it into a computer system. With limited education, it is entirely possible that these individuals might think they have a good idea but since they have a limited outlook on operations of the company, they might not be able to make a business case to support their ideas. Their ideas might be too crude and a significant refinement and investment of resources might be needed to make a case. On the other hand the same company might also have highly educated employees involved in design, engineering and project management who would be more articulate in expressing their ideas. These employees would be very comfortable with computers and would be easily able to express their ideas in an IT- based system. Therefore, a company will have to create multiple channels for entry of the data that can accommodate both the workers on construction sites and their more educated colleagues. This will again result in a higher cost for the system.

Another issue is the high turnover of employees. Most of the companies in the middle-east face the problem of high turnover. Most employees do not last long enough in a company to actually settle down and think of creative ways to improve their jobs. But it is possible that the high turnover of employees can be reduced if employees feel that their ideas are being used in the organisation and they are a more integral part of the success of the organisation. This can be done by implementing suggestion system. High turnover also means that employees bring ideas from other organisations into their new organisations. These ideas about different ways of operating can actually be used by their new organisation to develop new capabilities and enhance efficiency. So suggestion systems can actually provide a forum to bring external ideas into the organisation and explore new ways of doing work for the organisation.

One more significant issues is the reward system and mechanisms. A discussion on extrinsic and intrinsic motivational factors has been presented earlier. In the case of middle-east construction organisations, both of them are important. Most of the laborers in middle-east construction are paid very low wages, and therefore for them extrinsic reward in the form of cash would be highly motivating. However, cash rewards are usually based on the proportion of benefit delivered by the idea. The ability to measure long term financial benefit for project based organisations is difficult. One mechanism could be just a fixed reward for good ideas irrespective of the returns. For people in the middle and senior management intrinsic rewards might be more motivating. Recognition would be a better reward. Therefore, the suggestion system needs to have multiple types of reward mechanisms for ideas depending on the type of employees.

One issue that has been mentioned in the literature review is feedback. The feedback cannot just be an "accept or reject" process. It needs to recognise that the idea evaluation and feedback is an iterative process. The first idea might not be implementable, but a second or third step refinement might result in a much better and implementable idea. This would mean that the idea evaluation process is comprehensive and provides detailed feedback on how improvements can be achieved either for that idea or in future ideas. This again implies a wider involvement of people from different departments in order to comprehensively analyze and assess ideas which translates into higher resource commitments by the organisation.

5 Conclusions

This paper discussed suggestion systems, their life-cycle and the major drivers that lead to their success. This chapter also highlighted some of the major issues with implementing suggestion systems by construction organisations in the middle-east. The first issue was the resource commitment in starting and managing a suggestion system effectively. Lack of accurate lifecycle costing models and a higher upfront cost is definitely big barriers for organisations who want to implement suggestion system. The second issue was the educational level of employees. In most construction organisations there are laborers who are not educated and who cannot even read or write, and then there are people in management positions who are quite dextrous in using all kinds of computer systems. The suggestion system needs to provide appropriate mechanisms to elicit and gather ideas from both types of employees. This would mean someone actually going to construction sites and sitting down with employees who have ideas, noting them down and submitting on their behalf. For more educated employees there needs to be an easy to use computer based system that they can use to submit the idea. This multi-channel system will also translate into a higher cost for the companies.

Construction organisations in the middle-east also have a high employee turnover. This means that employees don't work with an organisation long enough to actually proactively start engaging in process improvement. On the other hand, this can also be viewed as an opportunity to elicit ideas that they have brought into the organisation from outside.

Reward systems and differences in expectations between management level employees and laborers have been regarded as another significant issue that needs to be addressed by organisations implementing suggestion systems. The reward has to be extrinsic for site labours and intrinsic for management level employees. This dual reward system is needed for successful implementation of the suggestion system. The last issue that was discussed was the need for detailed feedback. The system should help the employees improve their ideas and work with them to make sure that good ideas can be implemented.

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Using a Process Framework for Large Developments

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Abstract:
The possible translation of large mixed-use precinct delivery processes and their assessment into a conjectural integrated management, planning and design framework is a major goal. Due in part to the improvements sought in the ecological performance of the Development Industry. If these are to be achieved process based outcomes in particular are crucial to the Industry given its fragmented structure. The framework needs to help clients, stakeholders and professional advisors particularly managers achieve a range of integrating objectives linked to increasing pressures not least those arising from sustainability demands. With an optimum integrative delivery framework a more rigorous and innovative route map based on whole systems, approach results better places developers and managers when determining how best to delivery project goals, aims and objectives within a sustainable development agenda. This will aid in achieving reductions in pre planning timescales and give greater certainty in actual performance delivery and outcomes. The paper provides an overview of a contextual framework that evolved out of the interrogation and evaluation of the process and outcomes of several large mixed-use precinct case studies. Crucially its engagement aligned with developments that were undertaking a sustainable development assessment of their planning, design and operational management outcomes by an internationally recognised independent assessment process.

Keywords:
assessment, certification, framework, integration and process,

1 Introduction

The translation of mixed-use precinct delivery processes and assessments into a conjectural integrated management, planning and design framework is a major goal. If improvement in ecological performance outcomes is to be achieved an integrative process is crucial to the Development Industry given its fragmented structure. The framework needs to help clients, stakeholders and professional advisors particularly managers achieve a range of coalesced objectives (Emmitt, 2010) linked to increasing pressures not least those arising from sustainability demands. By building this optimum delivery framework a more rigorous and innovative development route map based on a 'Whole Systems Approach' (Stasinopoulis, et al., 2009) for mixed use precincts can be proffered. This should better place developers and their process managers when determining how best to deliver a project's own goals, aims and objectives within a sustainable development agenda. It will aid in achieving reductions in pre planning timescales and give greater certainty in actual performance delivery and outcomes.

It is a prime consideration that the principles of sustainability allow early identification of opportunities and constraints. Clearly statutory authorities require land and property

developers to address the issue of (and ensure) the protection of social, economic and ecological environments when submitting supporting material for development applications. How and in what form they do this is paramount. The notion that meaningful assessment undertaken at an early stage minimises the risks associated with inadequate consideration of social, economic and environmental values is crucial. It also provides the possibility of ensuring sustainable development outcomes whilst still achieving particularised project objectives.

Any framework must be applicable, comprehensive and independent regarding the whole of a project delivery process. Without this, it will not be effective in assuring compliance with local and international legislative requirements and called for corporate social responsibility imperatives. If these factors alone were not meet, it would be unable to provide independent conformity via auditing and certification of sustainability and associated environmental risk mitigation for all stakeholders. Such failure will also mean that those opportunities such as the saving of costs by expediting planning approvals and embedding cost effective green design criteria in the projects would be lost as well. This is because when seeking to achieve ongoing uniformity and consistency of environmental and broader sustainability criteria for the whole of a project (from inception and design through to building delivery, operation and maintenance) the process is highly dependent on establishing objectives early particularly regarding planning and legislative obligations. Accordingly, such a framework needs to identify the encompassing criteria into an ongoing precinct project and its interrelated phases. This incorporating of principles however cannot simply limit itself to the development specifications and details of design, construction and operational aspects. It will crucially be required to determine the impacts of a project over in many cases considerable timescales.2.

2 Review of Mixed Use Development – A pragmatic and positive solution

Increasingly as noted by Moore (2010) the Development Industry has responded to long held concerns over the shortage of developable land supply and growing disquiets regarding the degradation of the built and natural environment (ODPM, 2001, Brikeland, 2008) with medium to large mixed-use developments. They are also a commonly accepted means of accommodating the beneficial objectives linked to the rising discipline of urban design (Carmona, 2004). The resultant and diverse projects are an increasingly important and popular (Rabianski Et al, 2009) feature of the Industry's response when considering the continuing growth of challenging political and economic conditions that have always commonly attached themselves (Coupland, 1997, Wheeler, 2004) and now sustainability pressures to increasingly complex development circumstances.

Yudelson (2008) suggests that medium to large mixed-use precincts will continue to grow in importance, primarily because cities are actively encouraging such developments and assisting private developers with planning and zoning decisions, incentive programs, and in some cases the assembling of land (NAHB, 2008). A USA Industry survey cited by Yudelson (2008) noted that amongst large national development organizations that these types of projects accounted for some 25% of members' activity with some 35% stating that these types of mixed-use schemes accounted for more than half their business. It is likely that these figures are repeated elsewhere i.e. Australia and the UK where, as with the USA land prices have steadily

risen along with a growing wish to integrate the key roles of homes, work, and leisure activity into lifestyle choices.

Of note is that this form of undertaking has long been a largely pragmatic land management (Barton, Davis and Guise, 1995) and functional planning response (Hoppenblower and Louw, 2005). They have become predominant in the real estate landscape (Rabianski, 2009) and are increasingly popular where localized pressures require comprehensive resolution (Nguo and Armitage, 2008). The range of related issues they seek to resolve include population growth, declining economic performance linked to regeneration of inner city, industrial areas and brownfield sites. A further manifestation is in areas where developers are creating opportunities for themselves (BCO, 2005) through promotion of professed environmental, social and economic gains linked to new precincts or extensions of existing townships. Of crucial importance is the argument that mixed-use precincts offer an ideal opportunity for achieving sustainability and meaningful ecological improvements given the scale of development and land areas normally involved (Hyde, Ed., 2007). These factors along with extensive built environments, associated infrastructure and wide social and economic activity can create positive development outcomes despite the somewhat complex and dynamic relationships and considerable timescales involved. Conversely it is a paradox that research from the UK (Williams and Dair, 2007) and Australia (Moore, Ed. 2009) suggests that large scale precincts appear to fall short of a fuller implementation of sustainable environmental, social and economic best practice or better.

These increasingly seen projects offer enormous opportunities in searching for improvements in the ecological performance of not only the development itself but also the related development and construction industries. This is due in part to the scale of such schemes, which may incorporate a wide range of facility i.e. residential, retail, education, commercial, travel and tourism facilities, transport, roads, footpaths, cycleways and structural landscape infrastructure. The potential pursued emanates from the ‘economies of scale’ and the ability to achieve meaningful win-win outcomes. This provides opportunities to explore innovative alternatives regarding management, design, technology and demand and supply services (Koebel Et al, 2004). These inevitably master-planned undertakings afford, particularly where residential tenure is a main element, the prospect of richly textured areas and environments comprising a mix of provision, uses and activities (Carmona, Et al., 2010).

2.1 Closely Aligned Processes and Considerations

Closely aligned to these project features are sustainability benchmarking and performance assessment. These increasingly involve independent third party certifications of the development’s planning, design and operational management processes. This reflects an implicit awareness of the key roles they have to play in resolving, or at least mitigating, many of the conflicts that mixed-use developments may generate. Governments and a growing number of developer organisations have regulations and policies in place to tackle universal themes such as water and energy conservation, waste reduction, social inclusion and equitable economic outcomes. Some go further and seek to assess impacts and outcomes in terms of total ecological success. They have considered it crucial where predicted and/or actual performance assessment feature in a precinct development processes to translate this necessity into an integrated management, planning and design process based framework (Moore, 2010). This is due to the problematical question of how to deliver sustainable development agendas consistently on what are complex procedural undertakings. Of equal importance is what

the framework looks like and what models and tools to employ within its boundaries when recognizing sustainability as a dynamic progression or journey.

Another framework consideration involves the need to identify fully the critical activity of managing the total development process. In doing this it should help the Development Industry, its clients, stakeholders and many professional advisers particularly the Development Manager, achieve goals brought on by ever increasing 'sustainability' demands and actual delivery pressure (Moore, 2010). The significance of these propositions flows from growing calls for developers, who ever they are, to reflect greater degrees of 'sustainability' (Brikeland, 2008) and the related and highly desirable 'Quality of Life' (Moore, 2006) in their developments. Crucially the associated agendas of these primary areas are recognized by many national and local governments (and importantly existing and new communities impacted on or created by development) as being crucial to their long-term implementation success.

The creation of a program framework that seeks to reconcile all the possibilities and encourages equitable resolution of the inherent conflicts of development is an advancement of existing processes. Viewed in essence as a means by which it becomes easier to recognize how the planning, construction and operable life of any precinct will have environmental, social and economic consequences. These complex and interrelated outcomes will inevitably place demands on natural capital (Hudson, 2005) and as such it is important that the resultant impacts are either fully mitigated or at least kept to a minimum (Bokalders and Block, 2010).

However, mitigation is only likely to come about if there is a willingness to undertake innovative, responsible and committed approaches on developments. As such, the framework approach will require a multi disciplined and highly directed assemblage of actors and processes. This objective if achieved will secure the engagement of those able to provide the skills, tools and solutions needed in the securing of sustainable futures for developments (Battle and MaCarthy, 2001).

3 Primary Questions, Research Methodology and Major Areas of Interest

3.1 A Primary Question

In responding to this search for an innovative approach the resultant enquiry sought to consider whether the delivery processes involved (including ecological assessment) on large mixed-use precincts would benefit from an integrated management, planning and design process based framework. The aim is to help the Development Industry, its clients, stakeholders and its many professional advisers particularly the Development Manager, achieve goals brought on by ever increasing 'sustainability' demands and actual delivery pressures. Of particular interest is would the framework manage a perceived gap currently found at the crucial pre development point of delivery at the level of precincts.

In doing so, it may be able to surmount the many economic, social and technical barriers that presently prevent the Industry delivering sustainable development projects as a norm rather than the exception (Keobal Et al., 2004, Wales and Mead, 2006, SGSR, 2009). There is also the possibility that use could gain the sought after recognition and possible reward for achieving best practice by those involved in pursuing innovative development processes when seeking to deliver enhancing ecological performance

agendas. In responding to the resulting questions, a crucial methodology employed was the engagement of the framework with actual primary and comparative case studies (Moore Ed., 2009).

3.2 Case Studies

Research involved the interrogation (Swanborn, 2010, Thomas, 2011) of several large mixed-use precinct case studies from Australia, the UK and the USA. The primary case studies where all master planned development undertakings of a similar scale and mix. They reflected the total development process at various stages of their evolutionary cycle. The schemes chosen (including the comparative ones) also engendered large multi-disciplined teams lead by a client based project manager. Whilst there is significant difference between location, geographical variance and actual stage in the delivery process, this did not impede the gathering of information and data. Quantitative and qualitative methodologies (Walliman, 2011) collected key area performance and sector benchmarking indicator data (Bell and Morse, 2010). This aided in assessing (Kelly, 2004) the ecological sensitivity and management of the precincts planning, design and actual construction. Information gathered also helped evaluate the ongoing operation some of the precincts in terms of their performance regarding environmental, social and economic outcomes. The findings when matched with a number of similar comparative case studies (Moore, Ed, 2009, Nichols and Laros, 2010) show that developers are responding to the now established demand (Pitts, 2004, Williams, 2009) that they plan, design and manage precinct infrastructure provision in a sustainable manner.

Crucially many of the developments studied measured their immediate and broader impacts and eventual total performance outcomes. This reflected awareness by these developers and their teams that by describing and monitoring a range of situations better assessment of available management options were possible. Crucially this provides a means to evaluate the outcomes of actions taken. Also of significance is that all the major parties involved in the processes of the primary case studies recognized and acknowledged that with the ensuing data, critical decisions made regarding sustainability had some certainty of success. Of importance is their concurrent recognition that when challenging business as usual process norms entailing broad ecological agendas there are considerable resource inputs. Additionally the primary case studies along with others confirm that in specific locations the implementation of innovative delivery strategies is fundamental. They also confirm the critical need for ongoing involvement between initial development progressions and associated long-term operational management practices adopted by facility managers.

Recognized are the limitations and implications of single case study research however as noted these case studies are part of a number of related parallel investigations into the management, planning and design and operational processes of precinct development. The ensuing analysis of these actual case studies provides insights into their conception, evolution, construction and eventually management. The case studies utilized serve as a broad evidentiary base (Kathan, 2008) to compare the outcomes noted later. The use of multiple case studies as noted by Hines (2007) generates a cross case analysis which is both descriptive and covers explanatory topics.

This option recognizes that whilst each of these developments has its own context and perspective the numbers studied accommodate and overcome the uniqueness and artificial conditions surrounding comparative case studies (Jensen and Rodgers, 2001).

Crucially they are able to provide a means to access highly pertinent information and understanding of real life phenomenon (Yin, 2003 and Lamnek, 2005)). The outcomes recorded promote constructive observations and support the actual implementation of viable processes better formulated to aid future developments. The originality and value of this offers a unique analysis of the correlations between desired development outcomes through increased cooperation, and actual process behaviour in terms of planning, design, construction and operational procedures.

Review of processes and extensive documentation, analysis of the information and data collected from members of their development teams, participation in team meetings and a large number of site visits and interviews with key stakeholders were the range of sources utilized and interrogated. This unlocked an array of crucial insights into the goals, aims and objectives of the parties involved and of the developments themselves. Also exploited was material originating from a large number of similar undertakings selected from related international sources. The comparative case study approach element identified an extensive number of crucial demand variances regarding location factors such as culture, economic and environmental capabilities. The framework needs to accommodate this feature.

A major area of interest was the use, particularly timing, of third party assessment and certification models and tools employed on many new developments to assess the sustainability and ecological performance outcomes of the resultant planning, design and operational management of precincts. The extensive technical reports flowing from these accreditation bodies provide considerable insights into the delivery of sustainable development. Consideration of the multifaceted principles of sustainability and sustainable development in the early phases of a proposal allows for swift identification of substantial opportunities and constraints (Yudelson, 2009).

Concurrently most statutory authorities will require land developers to address and ensure protection of social, economic and ecological environments when providing supporting material for development applications. Assessment undertaken at an early stage minimizes the risks associated with inadequate considerations of environmental values and provides an opportunity to ensure sustainability outcomes while still achieving project objectives. The increasing difficulty for developers is the ability to predict the potential outcomes of a project and to identify the opportunities for incorporating sustainable planning and design, construction and operational aspects in a way that reduces impacts. Guidance from certification bodies that provide benchmarking and assessment is a growing feature. Some of these organisations have created guidelines and checklists that include sector indicators to help tackle development issues faced by developers (at the master planning and early development delivery phase) who wish to raise their ecological performance and profile. The adoption of these tools also offers potential rewards and recognition not least of which, may include early authority approval, a result of the confidence that some assessment agencies place in these independent certification bodies. Crucial to project success is their accommodation in the framework.

Of importance regarding the use of possible outcomes and findings from the preceding is how best to deliver sustainable development agendas on these precincts. The contextual framework provides the necessary process based program and overall inputs to result in a consistent means to delivery sustainability and the highly prized ‘Quality of Life’. Concurrently the significant matter of what measures are required to overcome the many barriers particularly the high degree of fragmentation that besets the

Development Industry and the allied Construction Industry should also manifests itself when using the framework.

3.3 Contextual Issues

The first consideration was to seek to identify those matters affecting the efficiency of the Development Industry regarding the delivery of sustainable development and 'Quality of Life' on precincts. There is a significant gap in the delivery processes at the mixed-use precinct level. This gap is a result of the highly fragmented nature of the Development Industry and related Construction Industry. This fragmentation is a result of ongoing traditional responsibility transfer, investment inertia, developer priority, statutory inflexibility and professional inimitability (Egan, 1998: Marsh, 1997 and Myers, 2011). These and other factors conspire in preventing the Development Industry in particular to overcome major barriers regarding its crucial role in responding to growing environmental, social and economic agendas flowing from ever increasing government and community demands. Resolution of this malaise is critical to the achievement of sustainable development and ultimately improved 'Quality of Life' for all stakeholders involved with or affected by a project. There is a substantial industry responsibility and imperative in seeking answers to the vexed questions surrounding the failure to resolve its shortcomings.

A major objective of the research has been to seek to resolve the issue of integration of the many parts and participants in the process of delivery. Determination is paramount due to the increasing numbers of actors and their influences on the process. Of significance will be if the integrating program based framework created offers high performance outcomes on this type of development. Equally, can it also secure measurable improvements in the management of the total development process? Linked to these two outcomes would be the gains seen in high quality urban planning and design, improved infrastructure and individual building performance particularly post construction and most crucial of all occupation and community evolution.

The contextual settings of development and its management, urban planning and design, architecture, sustainability, sustainable development and 'Quality of Life' are critical elements in this process. Of critical importance are the relationships and impacts these have with and on a developer and a development manager. An initial point contemplated regards the skills set and continuing professional progression needed by these two central figures. Further reference to the need for ecological and Triple Bottom Line assessment and reporting is also crucial. To meet this need the case studies show an increasing range of third party models and tools employed on them and aimed at delivering improved sustainability outcomes. Evidence of the effectiveness of these aids and their acceptance and proficiency manifested itself from several workshops held as part of the research program. However many attendees appear to hold some reservations regarding support of the models and tools in overcoming the known deficiencies of the current system (Moore Ed. 2009).

3.4 The Search for Definition

To achieve the stated goals and objectives of delivering mixed-use precincts as described earlier there needs to be a coherent transformation of the many resultant definitions into measurable framework success. In this lies a major problem. Observations show that an extensive range of interpretations existed regarding what is a precinct. The result of there being no workable definition and/or understanding of how to integrate it into a precinct delivery process is critical for the primary participants i.e.

the Developer and Development Manager when undertaking such developments. These parties normally engage with the total delivery process of schemes and therefore normally accept the prime responsibility for achieving success. The measure of this success will need to be a reflection of what it is that they are creating hence the need for definition clarity. To resolve the issue it is felt that there are two basic considerations needing resolution when giving regard to the meaning and contexts of precincts. Firstly, the importance of determining what constitutes a precinct. Secondly, what are the main characteristics that need addressing within the debate regarding sustainable development? From the answers the creation of precinct sustainability agendas and 'Quality Of Life' plans will flow.

The US Green Building Council (USGBC, 2007) identifies that whilst no strict definition exists for what comprises a precinct there is research on the topic. They note that *'in simplistic terms, a precinct or neighborhood is an area of dwellings and/or work places and their immediate environment that residents and/or employees identify within terms of social and economic attitudes, lifestyles, and institutions'*. In seeking to offer some further clarity they cited some time ago the Charter of the Congress for the New Urbanism (1996) which rather simplistically defined a neighborhood and therefore for the purposes here a precinct as being a place that is compact, pedestrian friendly, and mixed-use. These rather limited concepts when expanded on by Dover and King (in Doug Farr's Sustainable Urbanism, 2007) define a precinct as the basic increment of town planning. This observation allows the use of the idea that a single precinct can stand alone or together as two or more interconnected precincts, that will not be limited in common sharing of specialized areas, hubs or main streets of a town or possibly a region. This last point is important because the case studies show that some precincts can be of such a scale that they rival small villages and towns in terms of population and facilities. In some urban extensions, they can enlarge existing communities or engulf them to such an extent that they in essence become the new community (Moore, Ed. 2009).

The search for definition is critical given that currently most refer only to a political or legal boundary. These whilst important regarding the administrative operation of localized facilities and services are less than adequate regarding its true nature or complexity. In addition, the limitation of this defining will not offer a means by which integration of a precinct into a broader area, regional or national context can take place. Without broader designation and matched characterization, it is likely that attempts to coordinate actions towards greater efficiency in resource usage for example will not take place. The outcome of which is likely to be continuing tensions between national goals, community expectations and development industry delivery. The definition is also crucial regarding the ultimate delivery of sustainability and 'Quality of Life'. Determining what a precinct is should provide clearer understanding of the agendas needed to deliver these two key elements of sustainable development.

3.5 Principles and New Approaches

It is recognized that the Developer and the Development Manager will need guidance in creating the conditions within which a precinct may flourish and become a great place to live, work and grow. In considering how best to deliver the critical features of a truly sustainable community the evolving framework advocates the use of guidelines and checklists. These tools are practical applications for trying to implement multifaceted aspects of the complex relationships between physical and holistic concepts many of which are untested at present.

It is contended that ‘decision making for sustainable development in the built environment requires new approaches that are able to integrate and synthesise on all the dimensions of an urban system (or a building) and different points of view, in a holistic manner' (Brandon and Lombardi, p.75 2005, citing Mitchell, 1999 and Deakin, et al. 2001). This accords well with the view that currently other than ecological problems i.e. environmental impacts there is only limited integration or focus on the wide number of connected development factors. The narrowness of this approach consistently seen in statutory requirements has lead to the relegation of equally important dynamics such as social, economic and cultural issues to the periphery of decision making by developers in particular. A further consequence has been the lack of contemporary analytical tools development aimed at handling such areas more rigorously. Brandon and Lombardi (2005, citing survey’s by Deakin between 2001and 2003) note that only life cycle assessment is being used to augment environmental capacity with consideration of equity, public participation and futurity. Even on the case studies, very little evidence existed of systematic usage of pre-development tools other than those required for EIA requirements.

The failure of even established tools to penetrate the Industry is primarily due to many of them not truly reflecting or being able to respond to the growing complexity of institutional structures and a range of stakeholder interests commonly seen on many developments. Most of the analysis models employed in strategic planning are only useful for systematic and analytical evaluation of alternative courses of action. Some advocate that to overcome this failure Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) need linking into a Life Service Model (Bell, 1998). Whilst this may seem simply and a primary requirement for developers few have the expertise to use these evidence hungry tools correctly at the initial stages of a development where there is the greatest uncertainty.

Consequently, the case studies show that many developers are more likely to use internally created tools aimed at specific organisational needs and reflecting in-house skills. The issue here is their efficacy when compared with third party models. It is highly unlikely that any useful company tools that prove efficient will become commercially available to others. This is understandable given the already suggested complexity and limitations of assessments methodologies such as Life Cycle Cost Analysis (Rebutter and Hunker, 2003). There is also likely to be a reluctance to release what may be methodology that provides market advantage to competitors. This aspect of project reality is fundamental because to be effective the analyses must be carried-out early. This presents an issue for the Industry and the resultant framework regarding how early and at what stage of the development process are they most effective. Many schemes have complex time issues for example some projects are responses to existing planning determinations facilitated by highly regulated policies and strategies. These may force the developers onto an already established and structured pathway that is less open to change and innovation.

Irrespective all precinct schemes have to respond to market driven vagaries that are extremely time sensitive and very difficult to impact assess. Predictability therefore is a constant problem given the timescales that are involved and the highly volatile nature of financial markets and consumer sentiments. To accommodate these tensions many tools adopt a primary objective of choosing the best alternatives to the employment of scarce resources. They follow such a course of action because they need to review the entire life of the project and not some arbitrary time span. However, they all find difficulty in determining the correct course of action to undertake. This is because firstly there is

likely no single defining course when viewed against the known difficulty of determining development programs. Secondly, existing tools do not reflect all the issues or possibilities prevalent in development. With such lack of definition and without an available all encompassing model accurate assessment and performance prediction remains elusive.

There is an absolute pre-requisite for constant review and long-term commitment by the parties. Without this there is little guarantee of success. When considering the preceding a common technical problem arises regarding the effective use of these models and the ensuing information. To have an unfettered confidence in decisions flowing from the findings there can be no omission or misinterpretation of data. Any analysis must take place in a systematic structure using estimating techniques that are not prone to being wrong or misused. There is a heavy reliance on a concentration of correct and significant facts and meaningful assessments of uncertainty. Crucially there is also an imperative that constant checking takes place that they do not estimate the wrong items and they use correct and consistent escalation data. It is more than a truism to contend that these features do not feature consistently in the Development Industry. Therefore, the framework would need to be robust enough to accommodate the variation in the Industry's developers and their management capabilities. It must also provide a means by which limited resources do not mean responses that are not fully coherent with the challenges of integration of a wide range of agendas one being sustainability.

4 Findings and the Framework

4.1 Needs and a Theoretical base

There was no intention in the research for fully tackling the theoretical base for such a framework. This is because several works have comprehensively provided outlines that offered a sound base and pragmatic approach to formulating the nature and content of the conjectural proposal. Brandon and Lombardi (2005) use a holistic and integrating 'modality' based mechanism and framework structure. This approach helps to underpin a decision making process aimed at bringing together the diversity of interests involved in sustainable development. It also provides the means to overcome other major problems such as lack of language commonality and systematic methodology in the approaches of the many actors and disciplines already identified. Their propositions are an outcome of using the fundamental but according to Nijkamp (2005) somewhat neglected scholarly work of the Dutch philosopher Dooyeweerd (1968 and 1979). The resultant theory has been adapted into a proffered holistic approach that provides a basis for understanding complex dynamic realities. It employs the fifteen modalities of Dooyeweerd so that they may be seen as irreducible aspects or dimensions that altogether make up a holistic pattern where a list of dimensions can be used to *'understand the functioning of a complex system or entity such as the built environment or local community'* (Brandon and Lombardi, 2005 p.78) hence its appropriateness.

Brandon and Lombardi (2005) maintain that by using Dooyeweerd philosophical basis it helps to understand the complex trade-offs in sustainability. It also goes some why in coping with the multidimensionality of evaluating new possibilities for future sustainability in the built environment. The 'modalities' have been adapted by them to reflect the built environment into fifteen descriptions which they suggest will help decision makers classify and quantify sustainable development issues. These classifications supported by scientific criteria and a number of questions will aid and guide the user in handling the evaluation of a planning and design proposal. They

should be able to facilitate collaborations aid consultation and improve communication between the parties involved.

The adapted modalities are an overview for sustainable development decision making. They represent the beginnings of criteria requiring consideration at the start of the development process. In support of 'modalities' work by Thorburn, Jakku and Webster (CSIRO, 2003) who have investigated the use of decision support systems (DSS) was used. Their work has been to search for the means by which scientific knowledge incorporation can be in a form that industry stakeholders are able to use in assisting their management decisions. This closing of the loop in particular by designers is a means to enhance processes and possible offer more innovative ways of increasing design reliability along with reducing ecological footprints (Vallero and Brasier, 2008). The search prompted by the need to understand the growing number of complex interactions that now exist between a range of environmental, social and economic factors (Thorburn, Jakku and Webster, 2003). A complexity clearly mirrored in medium to large mixed-use precincts and the development processes employed.

4.2 Into a Project Management Process

It is pertinent to develop a specific development framework process using familiar development, project and operational management techniques given the inconsistencies in the Industry's skills base. This reasoning also responds to the fact that most developers and many of the stakeholders involved desire the management and completion of projects in a timely and cost effective fashion. This means that the framework needs to reflect at least in the short-term existing developer and consultant abilities and resources with additional expertise coming from external or internal third party sources. This has profound implications for the objectives and methodology resulting from this viewpoint.

The benefits that derive from a 'total lifecycle' view starting from initial planning through operation and disposal of a facility are highly relevant to decision making. As the case studies show many promoters are now concerned with a project from the cradle to the grave. This involvement requires proficiency or at least understanding of a much broader range of activities. Many not normally encountered by single-phase organizations such as architects and constructors. It also means that certain costs, i.e. construction will represent only a small portion of the overall life cycle costs of a development. Accordingly optimizing performance at one stage of the process may not be beneficial overall if additional costs or delays occur elsewhere in the total process. For example, saving money on the design process will be a false economy if the result is excess construction and operational costs.

Fragmentation of development and project management among different specialists is common and may be necessary though is best avoided. This is due in part to the disadvantage caused by the challenges of integrating specific disciplines into the various parts of a process (Vallero and Brasier, 2008). Good communication and coordination among the participants becomes even more essential in accomplishing the overall goals of the development were specialism diversity is prevalent. It is here that the integration of the process and the flows of information become crucial. New information technologies can be instrumental in this process, especially the Internet and specialized Extranets.

Productivity improvements are always of importance and value if they provide improved results. As a result, introducing new management approaches, design tools, materials and automated construction processes is desirable as long as they are cost effective and consistent with desired performance outcomes. Quality of work irrespective of whether related to design, physical or operational performance is critically important to the success of a development due to it being the Developer and stakeholders that live with the result. This in essence gives to motivation for adopting the focus on developers and their development manager. The concentration of attention is because cost effectiveness of total facility development falls on these two rather than the competitive provision of single services by the other various participants to the process.

However while the framework is primarily targeting development management it is not solely intended for the Developer and their direct representatives. By understanding the entire process, all participants can respond more effectively to the Developer and other critical stakeholder's needs in their own work, in marketing their services, and in communicating with other participants. In addition, the specific techniques and tools discussed in context of this framework (such as social and economic evaluation, management information systems, benchmarking and certification) readily apply to any portion of the process. Because of the concentration on the effective management of the entire development, a number of novel organizational approaches and techniques become of interest. Primarily the incentive is to replace confrontation and adversarial relationships with a spirit of joint endeavor, partnership and accomplishment. For example, the appropriate means to evaluate risks and the appropriate participants to assume the unavoidable risks associated with constructed facilities.

Scheduling, communication of data and quality assurance have particular significance from the viewpoint of an owner, but not necessarily for individual participants. The use of computer-based technology and automation also provides opportunities for increased productivity in the process. Presenting such modern management options in a unified fashion should be a major objective. This unification viewpoint of the entire process of project management differs from other views regarding the subject. Most treat special areas or problems, such as cost estimating, from the viewpoint of the particular participants such as construction managers or contractors.

This once again reflects the fragmentation of the construction process amongst different organizations and professionals. Even within a single profession such as Civil Engineering, there are quite distinct groups of specialists in planning, design, management, construction and other sub-specialties. Fragmentation of interest and attention also exists in nearly all educational programs. While specialty knowledge may be essential to accomplish particular tasks, participants in the process should also understand the context and role of their special tasks.

4.3 The Conjectural Framework and Realms of Influence

The framework seeks to provide a means for achieving what some (Newman and Jennings, 2008) describe as long term visioning based on sustainability, intergenerational environmental, social, economic and political equity whilst respecting the drivers of individuality. Interestingly whilst this convergence view of Newman and Jennings (2008) is for a city, it translates readily into the starting point for the conjectural framework. Its focus with appropriate amendments provides a catalyst from which to launch the drawing together of the dispirit parts of the process that is

development. Holding a long-term vision is the starting point for positive changes that leads to sustainability. The vision must reflect the distinctive nature and character of the place. It should also express the shared aspirations of all who are seeking to make the development more sustainable. These aspirations need matching by an addressing of equity giving equal access to both natural and manmade resources. This sharing must also bring with it responsibilities regarding resource preservation for future generations.

Therefore, a sustainability vision must offer an opportunity to align and motivate a range of development participants around common purposes, which offer a basis for developing a meaningful strategy linked to action plans and the processes needed to achieve such a vision. For a precinct to be truly successful, its developer and development champion must operate within a prescribed but flexible framework. Figure 1 provides a proposed conjectural framework that is seeking to define for developers and their advisors the total process, critical influences, crucial phases, likely direct management actions needed and timings for the use of models and tools involved in the creation of a precinct. The framework is an aid in the achievement of sustainability goals. It offers a picture of the elements necessary to meet regulatory requirements, provide realistic outcome predictions modeling and identifies the use of independent third party assessment and certification. A further aspect is the continuing flexibility and adaptation reflected in the open and overlapping systems nature of the process, phases and management linkages. It identifies crucial matters that encompass a whole systems view of a precinct development that there are considerable opportunities to integrate a range of input tools. Of particular interest will be those that have evolved to deal with the operational and community phases. It is this phase that is most impacted upon by the aim of improving 'Quality of Life'.

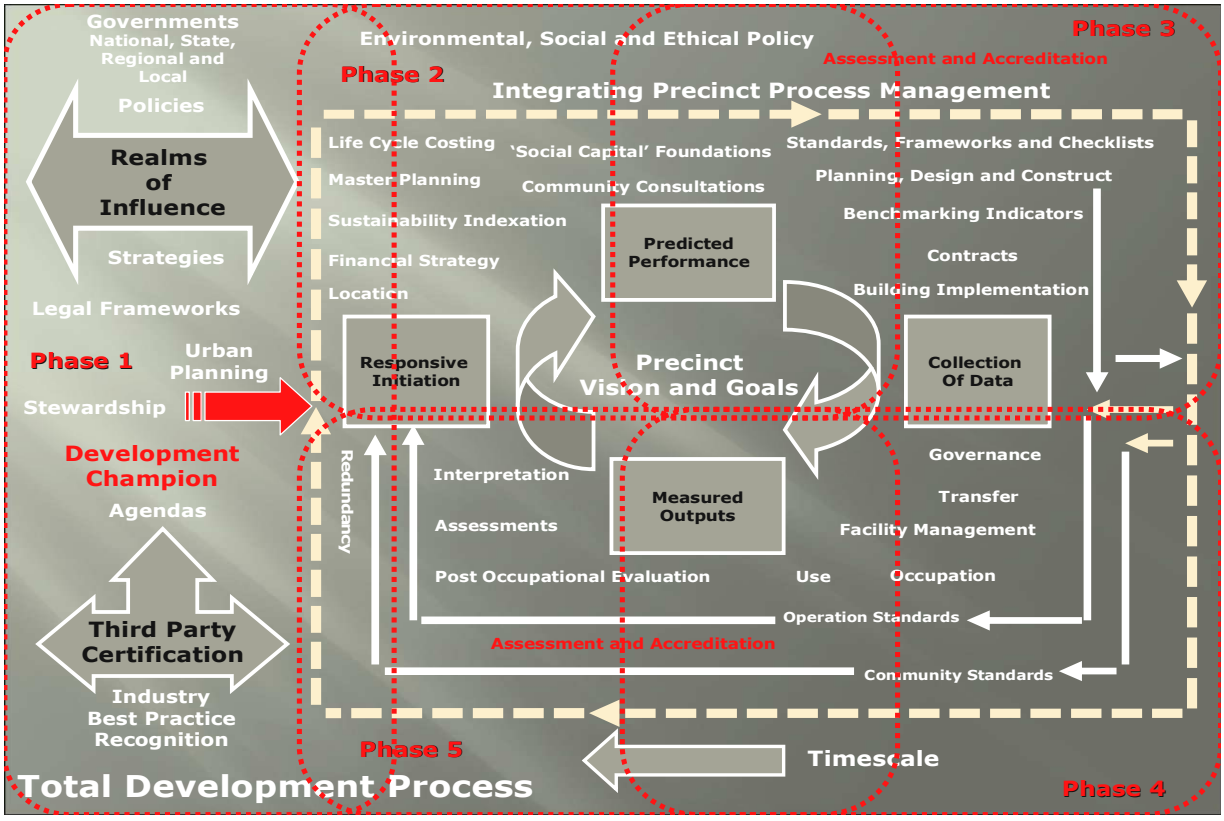

Figure 1: A Conjectural Framework for Delivery of a Mixed Use Precinct

The framework vision and its structure however will need to reflect and respond to the reality of a development process. The direction a project takes will be subject to a considerable range of pressures. In seeking to establish sufficient understanding of these there is a critical need within the framework to determine what are the 'Realms of Influence' that exert authority and in some cases control the responses of the development if not challenged. These influences best determined by an early analysis of factors. These refer to the nature, type of timing of what may be positive manipulations of inputs. Others it is possible to contend are unnecessary burdens or at worst are barriers to the delivery of a sustainable development.

A further framework consideration regards the fact that whilst considerable effort has gone into achieving and, measuring project success against time, budget and deliverables many have failed in the attempt. Major causes of this failure, are noted by Henrie and Sousa-Poza (2005) who cite several sources (Meadows, 1996, Ollila, 2002, Faulconbridge and Ryan, 2002 Kerzner, 1998 and Cleland and Ireland 2002 respectively). These include poor requirements definition, Selection of the wrong person as project manager, misused management techniques and inadequately applied project management principles and processes. Henrie and Sousa-Poza (2005) contend that there is a common theme to all project management successes or failures, which revolves around the people involved. This notion and the preceding stated reasons for failure supports firstly an argument for clearly defining the vision (or requirements) of the Precinct. Second is the importance of selecting the right Project Leader or Champion to mange the total process. Thirdly, management of the wide range of inputs and outputs that make up this complex system will be dependent on the correct choice of techniques and tools. Lastly but as critical will be the application of sound management principles at appropriate times commensurate with the needs of the process. All these factors will need to be present in the framework structure with support at each phase as to what mechanisms are required to be in place to ensure success. Importantly the factors relate strongly to the common issue surrounding all projects, which is the influence of cultures. Already noted are the professional barriers brought on by educational and practice imperatives. Institutional factors are more opaque but are still the result of 'people' either individuals or collective groupings. The issue primarily involves astute awareness. It is also fundamental for all to be fully aware of what culture dominates the undertaking. This awareness requires equally matching with an appreciation of how many cultures a development team may need to accommodate.

Recognition is a crucial factor in the encouragement or mitigation of positive and negative impacts respectively. Undertaking this analysis is a primary function of project leadership. Therefore early selection of the correct key person or organization (who has been termed 'Development Champion') for the framework stewardship role is essential. On filling the position, interpretation of the influences should take place immediately. This early interventionist framework approach attempts to more accurately predict potential outcomes of the influences on the project. It seeks to determine without bias as to what are likely consequences when responding to or challenging them. It is important that the analysis is done within the contexts of all phases of the process giving due regard to timescales.

5 Ongoing Work and Conclusion

The proposed conjectural framework representation is by nature broad based and requires to be further developed. The continuing evolution is considering each phase to

show more succinctly critical influences and possible processes, models and tools that when used achieve the outcomes proffered earlier. There is already interrogation of the five phases identified on the primary case studies and some comparative ones. This distinguishing at each phase of particular parties, their roles and inputs is essential. Of these, the most influential regarding the process itself group into several major factions. The most obvious are the regulatory bodies, the Developer and his team, the Community and third party external organizations. The ongoing phase charting of the total development process uses these groupings as the basis to determine what designated role and influence each has in the process.

The primary case studies reflect strongly the use of predictive modeling linked with third party certification bodies. They in the main were targeting environmental, social and economic commitments as the crucial dimensions of improved ecological performance. Early indications are that others have utilized tools noted on the primary studies, in the development process stakeholders. Many of those found and incorporated into the evolving framework become potential tools that a developer may wish to engage by negotiation with for example a local planning authority.

An early introduction of these tools may provide the non-aligned professional guidance needed regarding process development linked to sustainable development. Additionally it may also introduce into the regulatory system the idea of benchmarking and assessment transparency regarding predicted ecological performance and in particular 'Quality of Life'. Other tools used in delivering particular aspects of a development are noted. Whilst more specific in role i.e. value engineering, these tools suggest the willingness of some developers to use a wide range of aids. Comment is required on the efficacy of these more specialized tools. This may point to the reasons for their limited penetration of the total development process. Crucially all the models and tools identified so far are able to single out opportunities for incorporating sustainable planning, design, construction and operational factors into a project.

The charting seeks to identify crucial areas where the Developer and managers require strategies for responding to and influencing possible outcomes. As noted earlier the functional quality of any model or tool and their efficiency when employed is paramount. The framework will not be commenting upon particular ones currently in use. This is because currently charting aims are more to do with identifying particular types and were they should engage with the process. However if a common and proven model or tool is available it will be identified for reasons of clarity. This clarity is prudent because there is a significant range of models and tools currently being researched (and in some cases used) to meet the sustainability challenge. Brandon and Lombardi (2005 p.123 citing Deakin, 2002) identified '*at least 61 methods available for evaluating the planning, design, construction and operation of the sustainable urban development processes.* Crucially they restrained their chart to only showing the most commonly used ones. Whilst the charting attempts to provide some form of hierarchy of models and tools readily available at the development activity level there are already noticeable gaps particularly in preliminary site selection analysis. Also in, attempting to offer a listing it is important to recognise that some of the new (and even the more established) models and tools employed by the development industry are not universally available. Further, the charting will reflect the Industry practice of in-house tools use a feature clearly seen on all the case studies. Wide variants of similar tasked tools (albeit individually constructed or commercially available though modified) exist in a large number of developer organizations. This aspect is important because the conjectural

framework is not about excluding any particular tool. However whilst each has its own merits because of limited industry exposure, there has been no rigorous testing.

The ongoing research seeks to translate all the preceding input (and more) found into the broad conjectural process based performance framework with discrete phases that integrate crucial concepts along with pragmatic models and tools. The primary aim is to offer the route map toward the destination of sustainable development and improved 'Quality of Life'. It seeks a theoretical but highly practical basis on which to formulate the framework, mapping the sustainability journey through the interlocking phases of total development. Of note, are the crucial references identified from case study examples and extra inputs as to what aspects are fundamental to successful outcomes. However for the framework to be successfully applied other factors will be needed. It is but a part of a broader missive one that will require further inputs from those involved in the Development Industry.

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Client satisfaction with contractor work performance in Lagos state, Nigeria

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Abstract:
The client's satisfaction of construction project is not always at the forefront of contractor's interest especially in the quest for more project and profit therefore undermining the client reason for the project which in turn creates a wide deviation from what the client expects thus contributing to the client not been satisfied in the performance of the project. This is an important challenge towards the contractor's performance and successful projects delivery. The primary objective of this paper is to identify the current levels of client satisfaction in Lagos state and to examine the important criteria for assessing contractor's performance. An opinion based questionnaire of fifty in number were distributed randomly to the respondents, 36 were retrieved and used for the analysis. It implies a descriptive research survey and the population entails clients which include public and private clients and his representative in an on-going and completed projects. The data collected were analyzed using descriptive and average index. The study shows that Clients in Lagos state, Nigeria, are slightly satisfied with contractor work performance having expressed satisfaction with only five (5) out of the forty five (45) important contractor work performance criteria surveyed .The top priorities of clients for contractor work performance in Lagos state, given in order of importance include: adequacy of as-built (finished product), quality of workmanship and identification/ correction of deficient work in a timely manner. In conclusion clients are satisfied with quality of overall service, Organization of current documents and records and agreement about changes of contractors' work performance in Lagos state.

Keywords:
client, contractor work, performance, project success, satisfaction

1 Introduction

Satisfaction can be defined as a person's feeling of pleasure or disappointment resulting from comparing the perceived performance of a product in relation to expectations. If performance matches the expectations, the customer is satisfied. If performance exceeds expectations, the customer is highly satisfied or delighted. If performance falls short of expectations, the customer is dissatisfied (Comite europeen des responsables de la

cartographie officielle (CERCO) working group on quality 2000; Kotler 2000).Satisfaction will occur when a client's needs are matched with an organisation's product or service (Besterfield *et al*, 1995).Previous definitions of customer/client satisfaction have referred to it as a buyer's cognitive state of being (Howard and Sheth, 1969) an evaluation or judgement of an experience (LaBarbera and Mazursky, 1983; Cadotte *et al*.,1987); a summary attribute phenomenon coexisting with other consumption emotions (Oliver, 1992); an evaluation summary psychological state emotion (Oliver, 1981); an outcome an emotional response (Halstead et al., 1994); an evaluative response (Day, 1984; Tse and Wilton, 1988) and a response pertaining to a particular focus determined at a particular time (Giese and Cote, 2002).Products and service have attributes which affect customer satisfaction; attributes such as performance attributes, threshold attributes and excitement attributes (Besterfield *et al* 1995).In the construction industry, there is an absence of a generally acceptable operational definition and measure of customer satisfaction (Torbica and Stroh, 1999), but, however, it has been defined as the extent to which a physical facility (product) and a construction process (service) meet and/or exceed a customer's expectations (Karna, 2009) i.e. how well a contractor meets the client's expectations (Karna *et al.,* 2004; Yang and Peng 2006); or the satisfaction with the constructed facility, the contracting facility and the contracting service (Yasamis *et al*.,2002).Performance measurements and criteria used for determining project success initially have relied upon the traditional factors of time, quality, cost (Pinto and Rouhiainen, 2001; Jafaar *et al*., 2006; Karna, 2009) and safety, but recently subjective measures such as client satisfaction have been included as a criterion for measuring performance (Chan and Chan 2004; Center for construction Innovation, 2004) even as time, cost and quality have been deemed as insufficient (Toor and Ogunlana, 2009).Client satisfaction with contractor work performance is however a subjective assessment (Masrom and Skitmore, 2010; Cheng *et al*, 2006) influenced by individual perception, orientation / experience and expectations of the client, which will differ for different individual clients, but nevertheless remains an indication of the success of delivery or the ability to execute and complete a project within the required expectations of the client (Construction Industry Development Board (CIDB) construction industry indicators summary results, 2009).

According to Soetanto *et al* (2001), satisfactory performance of project participants is a must for a harmonious working relationship and assessing client satisfaction will help to provide information for participants to help improve their performance.

Few construction firms in Lagos state carry out a process of self audit geared at improving performance and client satisfaction, but the greater focus has been on profit and more projects. A wide deviation from what the client expects in terms of actual cost, schedule control and quality of completed work is what obtains today and this constitutes an important challenge to successful project delivery and contractor work performance in the construction industry. The satisfaction of the clients who drive construction projects are often side lined in this drive for profit by construction firms, who do not seek to understand and focus on the individual needs of clients or who do not have an understanding that different clients will have different needs when defining client-contractor relationships. According to Pratt (2004), the construction industry is not known for focusing on customers'/end users' needs. Disputes and litigations and delay in payment are some of the negative results that arise from this practice. This research intends to examine the level of client satisfaction with contractor work performance and to identify the important criteria for assessing contractor's work performance in Lagos state.

2 Client expectation factors and contractor performance

Karna (2004) explained that a customer's expectations in construction are a function of several factors: the customer's past or direct experiences with the contractor and similar contractors, word-of-mouth information about the contractor, and the customer's personal needs. In addition, a customer's expectations are affected by a contractor's marketing activities and image, and the customer's own investment in the project and the relationship. The customers' expectations play an important role in the evaluation of contractor's performance. According to Kärnä (2009), at the project level, the customer assesses the contractors' performance in relation to three comparisons, all of which impact customer satisfaction as shown in fig 1. They are:

1. Comparison – between the quality of the building, the customer's expectations and the adjusted goals for the building.

2. Comparison – between the quality of the construction process and the experiences, which have emerged during the process.

3. Comparison – between the customer's expectations and experiences.

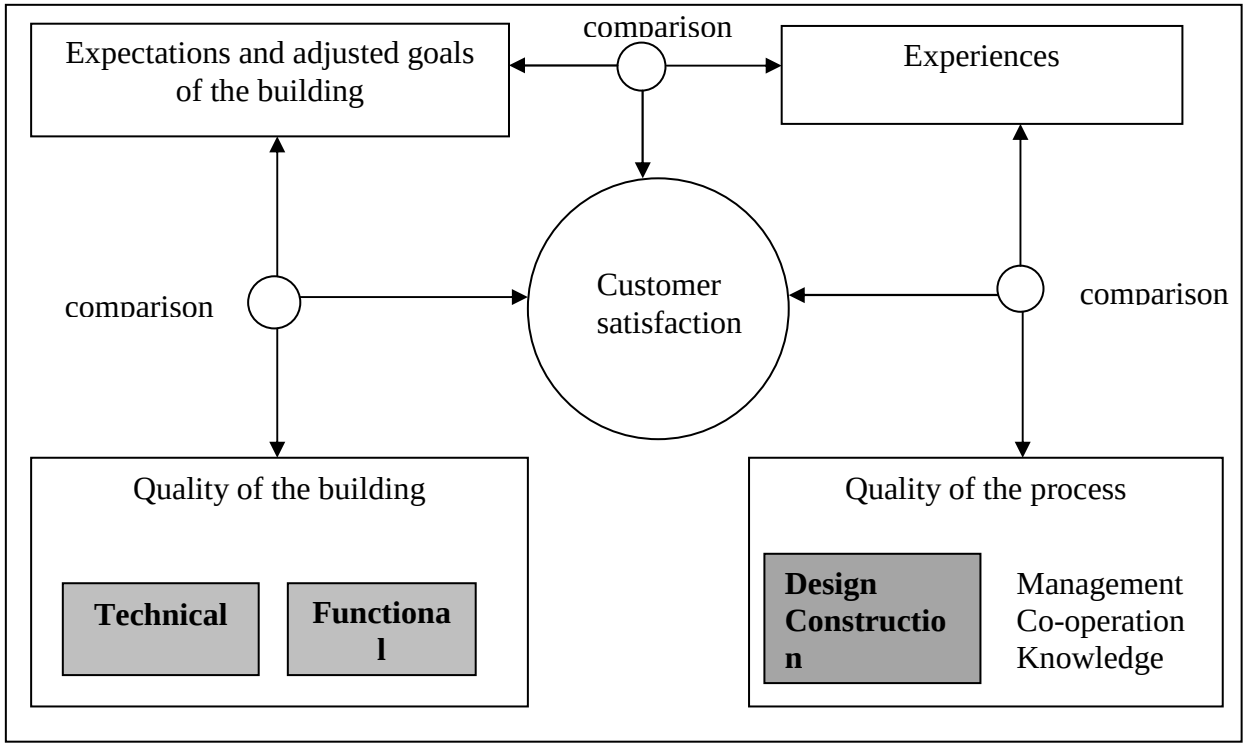

Fig 1: Interrelationships between customer satisfaction and quality at project level (Karna, 2009)

According to Blumenthall *et al.* (2000), clients of the construction industry want their projects delivered: on time, on budget, free from defects, efficiently, safely and by profitable companies.

Regular clients expect continuous improvement from their construction team to achieve year-on-year reductions in project times and cost. And according to Latham (1994) the owner's wish will normally include: value for money, pleasing to look at, free from defects on completion, delivered on time, fit for the purpose, supported by worthwhile guarantees, and reasonable running costs and satisfactory durability.

The client's needs can be given as satisfaction of function, achievement of economy, control of programme time and creation of aesthetics conditions(Turner,1995).Needs such as timeliness of completion, aesthetics, cost of the project and safety of production are part of project schemes and should be satisfied by building teams (Alinaitwe 2008). Bowen,*et al*, (1997) and the study by Kometa, *et al* (1994) as cited in Alinaitwe (2008), construction industry clients are largely misunderstood, dissatisfied and critical of the performance of their consultants and contractors. Client satisfaction can be achieved by getting client constructional needs translated into a design which specifies technical characteristics, performance criteria and quality standards and enabling the project completed within time, cost and quality standard.

3 Research methodology

A descriptive research survey was used for the study. The population consists of both public and private client of recently commissioned and ongoing projects who are randomly selected. Convenience sampling technique method was used. A total of fifty (50) self administered questionnaires were randomly distributed and thirty-six were retrieved and used for the analysis for this study. Statistical packages for social sciences (SPSS) were used for analyzing the data collected using descriptive and average index rating to calculate the level of importance. The formulae is shown below

Importance index calculation:

Where:

$$\frac{5n_1+4n_2+3n_3+2n_4+1n_5}{n_1+n_2+n_3+n_4+n_5}$$

n_1= Very important; n_2=Important; n_3= Neutral; n_4=slightly important; n_5= Not important;

The extent of the range as used in the importance index analysis rating scale was calculated given that the difference between the lower and upper ends of the five point scale =4.00, from 5.00 – 1.00 and that since there are five points thereon, 4.00 was divided by 5 which gives 0.8, which determines the extent of each range and hence the importance index analysis rating scale is as given in Table 1

Table 1: Importance index analysis rating scale

Range	Category
>4.20 ≤ 5.00	Very important
>3.40 ≤ 4.20	Important
>2.60 ≤ 3.40	Neutral
>1.80 ≤ 2.60	Slightly important
>1.00 ≤ 1.80	Not important

Satisfaction index was calculated from:

$$\frac{7n_1+6n_2+5n_3+4n_4+3n_5+2n_6+1n_7}{n_1+n_2+n_3+n_4+n_5+n_6+n_{7\,1573}}$$

Where: n_1= Very satisfied; n_2=Satisfied; n_3=Slightly satisfied; n_4=Neutral; n_5= Slightly dissatisfied; n_6= Dissatisfied; n_7= Very dissatisfied.

The extent of the range as used in the satisfaction index analysis rating scale was calculated given that the difference between the lower and upper ends of the seven point scale =6.00, from 7.00 – 1.00 and since there are seven points therein, 6.00 was divided by 7 which gives 0.86, which determines the extent of each range and hence the importance index analysis rating scale is as given in table 2

Table 2: Satisfaction index analysis rating scale

Range	Category
$>6.16 \leq 7.00$	Very satisfied
$>5.30 \leq 6.16$	Satisfied
$>4.44 \leq 5.30$	Slightly satisfied
$>3.58 \leq 4.44$	Undecided
$>2.72 \leq 3.58$	Slightly dissatisfied
$>1.86 \leq 2.72$	Dissatisfied
$>1.00 \leq 1.86$	Very dissatisfied

4 Findings and Discussion

4.1 Analysis of general information

Table 3 shows that the profession of architect (frequency of 14 or 38.9%) was the largest amongst respondents surveyed (others refer to respondents who are not professionals of the construction industry but who nevertheless engage in construction activities as either project coordinators, financiers etc). As shown by the table under the **role** played by respondents, the role of client's representative featured highest with a frequency of 15 (41.7%)**.** Under **organization**, respondents from public/government bodies formed the largest number of clients surveyed with a frequency of 15 (41.7%). The large number of public infrastructure projects being handled by contractors at both local and state government level and the position of government as a regulatory body make this population a significant one. Repeat/continuing clients under **frequency of construction activities** had the highest proportion of the respondents' evaluated (frequency of 27 or 75%) and the satisfaction of this group is a major factor in determining client satisfaction owing to their wealth of experience. Respondents who were involved in building construction projects formed the largest percentage in project category as shown by Table, with a percentage of 63.9% and a frequency of 23. Under **contract sum,** respondents involved in projects with a contract sum higher than N10,000,000 (greater than USD 66,666) have a greater population and this goes to show that the survey will adequately cover the major and well established contractors in Lagos state.

Table 3:Analysis of general information

Respondent's general information	frequency	percentage(%)
Profession		
Architect	14	38.9
Builder	7	19.4
Quantity surveyor	2	5.6
Civil engineer	1	2.8
Others	12	33.3
Total	36	100
Role		
Client/owner	8	22.2
Project manager	13	36.1
Representative	15	41.7
Total	36	100
Organisation		
Private company	10	27.8
Public/government bodies	15	41.7
Private individual	8	22.2
Total	33	100
Frequency of construction activities		
One-off	9	25.0
Repeat/continuing	27	75.0
Total	36	100
Project category		
Building	23	63.9
Civil engineering	13	36.1
Total	36	100\

Analysis of general information

General information	frequency	percentage(%)
Contract sum		
#1000000-#10000000	4	11.1
Above #10000000	32	88.9
Total	36	100

4.2 Important contractor work performance assessment criteria and client priorities

Table 4 shows clients response to the importance of the surveyed contractor work performance criteria. Clients were neutral or undecided on three (3) out of the forty eight (48) surveyed contractor work performance criteria given as: conducting regular meetings to explain safety programme (mean, 3.33), discussing safety at owner-contractor meetings (mean, 3.31) and correction of noted deficiencies in safety programme (mean, 3.39). Thirty one (31) contractor work performance criteria were seen as important as shown in table 4 while the mainly fourteen (14) contractor work performance criteria had a response of very important. Fourteen (14) contractor work performance criteria were seen as very important .Table 4 also shows the ranking of surveyed contractor work performance criteria and topmost in order of importance include: adequacy of as-builts (finished product) (mean, 4.61), quality of workmanship (mean, 4.56) and identification/ correction of deficient work in a timely manner (mean, 4.50)

Table 4: Clients' response on importance of contractor work performance criteria.
VI=Very Important; I=Important; N=Neutral; SI=Slightly Important; NI=Not Important. R*=Level of Importance; R**= Ranking

S/N	Contractor work performance criteria	Frequency 5	4	3	2	1	AI	R*	R**
	Adequacy of the initial schedule for the work	13	18	0	5	0	4.08	I	20
	Adherence to approved schedule	11	21	1	3	0	4.11	I	18
	Resolution of delays	15	13	2	0	0	3.69	I	37
	Completion of punch list items	13	20	2	1	0	4.25	VI	12
	Furnishing of updated and revised project schedules on a timely basis	11	15	1	9	0	3.78	I	34
	Warranty response	13	19	3	1	0	4.22	VI	13
	Degree of completion at handover inspection	16	17	2	1	0	4.33	VI	6
	Adhering to budget	15	17	4	0	0	4.31	VI	8
	Providing cost control suggestions with respect to manpower reduction	12	9	10	4	1	3.75	I	35
	Providing cost control suggestions with respect to reducing material costs	5	19	2	7	3	3.44	I	45
	Providing cost control suggestions with respect to reducing production costs	3	24	4	2	3	3.61	I	41
	Effectiveness of job-site supervision	6	22	4	4	0	3.83	I	31
	Compliance with laws and regulations	8	14	5	9	0	3.58	I	42
	Professional conduct/ courtesy of personnel	9	17	6	4	0	3.86	I	29
	Review/resolution of subcontractor's issues	2	22	9	3	0	3.64	I	40
	Implementation of subcontracting plan	6	18	11	1	0	3.81	I	33
	Information flow on site	13	18	3	1	1	4.14	I	16
	Providing required manpower for supervision	6	27	2	1	0	4.06	I	22
	Providing well organized mobile offices to the site	8	19	5	4	0	3.86	I	29
	Organization of current documents and records	10	22	3	1	0	4.14	I	16

Table 4(continued): Clients response on importance of contractor work performance criteria
VI=Very Important; I=Important; N=Neutral; SI=Slightly Important; NI=Not Important. R*=Level of Importance; R**= Ranking

S/N	Contractor work performance criteria	Frequency 5	4	3	2	1	AI	R*	R**
	Agreement about changes	16	14	4	2	0	4.22	VI	13
	Skill of contractor's work supervisors	4	20	9	3	0	3.69	I	37
	Skill of contractor's workers	8	21	6	1	0	4.00	I	26
	Commitment of contractor's employees to set goals	3	26	5	2	0	3.83	I	31
	Providing the required quality and quantity of equipment.	15	9	9	3	0	4.00	I	26
	Making sure that equipment and facilities are well maintained.	6	17	5	8	0	3.58	I	42
	Providing a clear safety programme	6	17	4	9	0	3.56	I	44
	Discussing safety at owner-contractor meetings.	9	9	5	10	3	3.31	N	48
	Following of health and safety guidelines	2	26	4	4	0	3.72	I	36
	Worker attire (Safety shoes, gloves and hard hats, etc.)	11	18	5	2	0	4.06	I	22
	Conducting regular meetings to explain safety programme	8	13	5	3	7	3.33	N	47
	Correction of noted deficiencies in safety programme.	6	14	6	8	2	3.39	N	46
	Cleanliness and order on site	5	19	8	4	0	3.69	I	37
	Management of environmental issues and related know-how on site	11	15	7	3	0	3.94	I	28
	Quality of workmanship	21	14	1	0	0	4.56	VI	2
	Adequacy of the construction quality control plan	14	20	2	0	0	4.33	VI	6
	Implementation of the construction quality control plan	17	18	1	0	0	4.44	VI	4
	Quality of quality control documentation	12	23	1	0	0	4.31	VI	8

Table 4 (continued): Clients response on importance of contractor work performance criteria
VI=Very Important; I=Important; N=Neutral; SI=Slightly Important; NI=Not Important. R*=Level of Importance; R**= Ranking

S/N	Contractor work performance criteria	Frequency 5	4	3	2	1	AI	R*	R**
	Storage of materials	10	20	5	1	0	4.08	I	20
	Adequacy of materials	13	15	4	4	0	4.03	I	24
	Adequacy of submittals	8	23	3	2	0	4.03	I	24
	Adequacy of quality control testing	14	16	5	1	0	4.19	I	15
	Use of specified materials	16	15	4	1	0	4.28	VI	11
	Adequacy of as-builts (finished product).	22	14	0	0	0	4.61	VI	1
	Level of defects at handover	6	29	0	1	0	4.11	I	18
	No of defects at handover	12	23	1	0	0	4.31	VI	8
	Identification/ correction of deficient work in a timely manner	20	14	2	0	0	4.50	VI	3
	Quality of overall service	18	17	0	1	0	4.44	VI	4

4.3 Client satisfaction with contractor work performance

Table 5 shows the response of clients as to the satisfaction level with the important contractor work performance criteria or factors. Clients according to Table 5 were slightly satisfied with forty (40) of the forty five (45) important contractor work performance criteria.However clients expressed satisfaction with only five (5) contractor work performance assessment criteria which are given as: quality of overall service (mean, 5.44); adequacy of as-builts (finished product) (mean, 5.47); quality of workmanship (mean, 5.33); agreement about changes (mean, 5.33); organization of current documents and records (mean, 5.36). The overall satisfaction level which gives the current state of client satisfaction with contractor work performance in Lagos state according to Table 5 is a rating of “slightly satisfied (overall mean, 5.05).

Table 5: Average index for satisfaction level of client with important client specified contractor work performance criteria in Lagos state

Contractor work performance criteria	Frequency							Total= FreqxWi	Average Index
	7	6	5	4	3	2	1		
1. Adequacy of the initial schedule for the work	3	10	15	2	6	0	0	182	5.06
2. Adherence to approved schedule	7	6	16	4	3	0	0	190	5.28
3. Resolution of delays	3	7	15	6	5	0	0	177	4.92
4. Completion of punch list items	2	10	10	7	5	2	0	171	4.75
5. Furnishing of updated and revised project schedules on a timely basis	1	8	13	11	3	0	0	173	4.81
6. Warranty response	3	8	14	3	7	1	0	174	4.83
7. Degree of completion at handover inspection	2	13	11	5	5	0	0	182	5.06
8. Adhering to budget	2	13	11	5	3	2	0	180	5.00
9. Providing cost control suggestions with respect to manpower reduction	2	8	9	10	5	2	0	166	4.61
11. Providing cost control suggestions with respect to reducing production costs	2	5	17	7	5	0	0	172	4.78
12. Effectiveness of job-site supervision	3	7	22	3	1	0	0	188	5.22
13. Compliance with laws and regulations	0	12	14	9	1	0	0	181	5.03
14. Professional conduct/ courtesy of personnel	3	11	16	4	2	0	0	189	5.25
15. Review/resolution of subcontractor's issues	3	7	13	10	3	0	0	177	4.92
16. Implementation of subcontracting plan	1	14	12	8	1	0	0	186	5.17
17. Information flow on site	4	10	15	6	0	1	0	189	5.25
18. Provdng required manpower for supervision	1	5	25	3	2	0	0	180	5.00
19. Providing well organized	2	5	25	4	0	0	0	185	5.14
20. Organization of current documents and records.	4	11	17	2	2	0	0	193	5.36
21. Agreement about changes	2	17	10	5	2	0	0	192	5.33
22. Skill of contractor’s work supervisors	3	14	8	9	2	0	0	187	5.19
23. Skill of contractor’s workers	2	10	17	5	2	0	0	185	5.14
24. Commitment of contractor’s employees to set goals	1	15	11	7	2	0	0	186	5.17
25. Providing the required quality and quantity of equipment.	0	9	15	10	2	0	0	175	4.86
26. Making sure that equipment and facilities are well maintained.	1	5	19	8	3	0	0	173	4.81
27. Providing a clear safety programme	3	3	17	9	1	0	0	163	4.53
29. Following of health and safety guidelines	3	7	15	6	2	3	0	174	4.83
30. Worker attire (Safety shoes, gloves and hard hats, etc.)	0	16	10	5	4	1	0	180	5.00
33. Cleanliness and order on site	1	15	9	7	4	0	0	182	5.06

34. Management of environmental issues and related know-how on site	3	7	13	9	4	0	0	176	4.89
35. Quality of workmanship	2	11	20	3	0	0	0	192	5.33
36. Adequacy of the construction quality control plan	2	9	21	1	3	0	0	186	5.17
37. Implementation of the construction quality control plan	1	7	21	5	2	0	0	180	5.00
38. Quality of quality control documentation	2	7	18	7	2	0	0	180	5.00
39. Storage of materials	1	9	15	9	1	0	0	175	4.86
40. Adequacy of materials	2	10	12	8	4	0	0	178	4.94
41. Adequacy of submittals	4	10	15	3	4	0	0	187	5.19
42. Adequacy of quality control testing	3	11	11	8	2	1	0	182	5.06
43. Use of specified materials	3	8	20	4	1	0	0	188	5.22
44. Adequacy of as-builts (finished product).	2	16	15	3	0	0	0	197	5.47
45. Level of defects at handover	1	4	25	4	2	0	0	178	4.94

5 Discussion of findings

The results indicate that clients of the construction industry in Lagos state, Nigeria are slightly satisfied with contractor work performance having indicated to a very large extent, slight satisfaction with important contractor work performance assessment criteria surveyed and to a very minimal extent in comparison, expressed satisfaction with the important contractor work performance assessment criteria surveyed. Forty (40) of the forty five (45) important contractor work performance assessment criteria had a response of slightly satisfied and only five (5) had a response of satisfaction

Clients identified forty five (45) out of the forty eight (48) surveyed contractor work performance assessment criteria as being of importance to them and also to varying degrees of importance and the topmost ranked three (3) priorities of clients for contractor work performance in Lagos state, given in order of importance are: adequacy of as-builts (finished product), quality of workmanship, and identification/ correction of deficient work in a timely manner.

6 Conclusions

There is a need by contractors in Lagos state to improve on all the aspects of contractor work performance as identified in this research in order to ensure greater levels of client satisfaction. A slightly satisfied client can easily become a dissatisfied client and this could lead to great implications for future patronage in terms of repeat business, client loyalty, referrals, image and hence economic growth of construction firms and this improvement can be done by meeting client expectations in all the aspects surveyed with a particular focus on delivering clients' top priorities identified in this study and given in order of importance to include: Ensuring adequacy of as-builts (finished product); Ensuring good quality of workmanship; and Identifying and correcting deficient work in a timely manner.

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Controlling the Risk of Construction Delay in the Middle East: State-of-the-Art Review

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Abstract:
The construction business has been at serious risks to the recent global economic recession. In the Middle East, the investments in this business have reached US$1.8 trillion in 2008, which is forming about 25% of the construction volume worldwide. The financial crisis in the late 2008 has braked up the economic development in many infrastructure sectors. Consequently, the investors unable to keep their confidence in the construction business. The delay in the construction projects is one of the highest risks versus the project success criteria. The three traditional elements of time, cost, and quality are not sufficient since the construction projects are more complex by a change of business environment. The objective underpins this research is to conduct a literature review to identify additional effective measures for controlling the potential delay risks to maximize the opportunity of success in construction projects. Thirty-six scholarly research studies published between 2000 and 2011 have been surveyed to identify related measures for delay control (MDC). The literature survey revealed that 60% of the studies are related to decision-making, performance, risk management variations, and poor management knowledge of stakeholders, whereas 20% are in the Middle East. 25% of the studies are related to lacking of financial risk by stakeholders, which represent 14% in the Middle East. The knowledge gap has been identified in project performance, stakeholders' management, and risk management as significant measures of success criteria in controlling project delay.

Keywords:
measures of delay control, risk management, project management, stakeholders, Middle East

1 Introduction

Construction delay is ubiquitous in the Middle East construction business, as well as considered as one of the highest risks to the project success. This phenomenon is largely owing to its overlapping with the roles and interests of the project stakeholders in a multicultural society. The stakeholders have long been involving in the construction projects as either individuals or organisations; moreover, their interests might be affected positively or negatively according to the success or failure of the project completion. (PMI, 1996). Mitchell et al (1997) argued that a project manager should have to understand the characteristics of the power and authority of the stakeholders that largely affect the project environment and outcomes. Therefore, it would be significant to carry out the identification and management of the stakeholders throughout the running project since their nature and numbers could vary with the life-cycle of the project (Moodley, 2002).

Accordingly, the stakeholders should update their respective commitments and satisfaction, and hence the project success.

Risk management is the most crucial practice in the management of any project to warrant its successful completion. Royer (2000) expressed the importance of risk management experience, as "*Experience in the risk management must be of critical concern to the project managers and the like in the project network since ill-managed risks are one of the primary causes of project failure"*. Unfortunately, many project stakeholders and contributors have not realized yet the need for risk assessment knowledge, which is a key element in the risk-management process; whereas some of them believe that, the risk identification comes by trial and error experience. However, the trivial risk knowledge is usually cascading as a common term among the construction community of the stakeholders.

Artto et al (2008) defined risk from project management perspective as "An uncertain event or condition (favourable or unfavourable) that results from the network form of work, having an impact that contradicts expectations. An event is at least partially related to other actors in a network". Referring to this definition, four risk-source categories have been identified based on the project sub-contractors' interrelations with i- other sub-contractors, ii- clients, iii- external competitors, and iv- non-business actors such as municipality and other area authority (Artto et al, 2008). On the other hand, lack of professional managerial knowledge and skills might cause unavoidable risk management failure (Klemetti, 2006). The risk of construction project cancellation and delay in the Middle East, particularly in Dubai has evoked many worries on the investors to go further in construction business (Wilson, 2010).

Project delays would be a major negative impact on the stakeholders whose economic activities have been overwhelmed. In the Middle East, the situation is notably dissatisfied. The stakeholders are being criticised as they are not dynamically and coherently of delay control, which requires an important approach to the project success. The risks of the project delays have been investigated in many Middle Eastern countries such as Jordan (Odeh and Battaineh, 2002; Sweis et al, 2008), Kuwait (Koukshi et al., 2004; 2005), Saudi Arabia (Assaf and Al-Hejji, 2006), the UAE (Faridi and El-Sayegh, 2006; Motaleb and Kishk, 2010), Oman (Al-Nuaimi et al. 2010), and Iran (Khoshgoftar et al., 2010). These studies focused entirely on the delay causes and effects rather than on the control aspects. On the other hand, the recent global financial crisis has braked up the construction boom leading to postpone and cancellation of running construction projects. This financial situation created a great dilemma of project delay and shortage in cash liquidity leading the stakeholders to delay the payments to the developers of the real estates (Khamis and Senhadji, 2010).

The key objective of the delay control management is to minimise the risk versus maximise the opportunities of successful completion of a project. If the target of success is going to be maintained by the stakeholders' management and satisfaction, it would be interesting enough for those responsible in formulating projects, as well as for those who initiating projects for the first time. In this study, a number of significant measures for delay control (MDC) were picked out from thirty-six scholarly studies published between 2000 and 2011, with special concern on those studies treated the effects of the recent global financial crisis on the situation of construction projects. We hope that this study to encourage further comprehensive research in the future. The paper is organised as following: Section.2 discusses the stakeholders' management and satisfaction beyond the traditional criteria. Section.3 outlines the adopted research methodology, which is

seeking to improve the stakeholders' management in a positive way, as well as to identify a number of measures for delay control (MDC) to bridge the knowledge gap in the traditional criteria of time, cost and quality. Section.4 discusses the findings to provide a constructive conclusion and recommendation for further related studies in Section.5. A list of the cited references is appeared in Section.6.

2 Beyond the Traditional Criteria and Stakeholders Satisfaction

Although a widely accepted of the traditional criteria on project success the last couple of decades, the construction project management is slowly departing from the traditional criteria (time, cost and quality) measures to a rather effective measures, since criticisms on the traditional criteria and featured by the heterogeneous, while the criteria meeting resources constrains, the components of time, cost and quality are one thing, and to meet specifications is another (Shenhar et al., 1997). Alarcon et al. al (1998) criticised the criteria as well as not appropriate for long term improvement and arrive too late to correct actions to justifying the ability of effective quality. In addition, no longer can project success be restricted by the traditional criteria only (Low and Chuan, 2006); it is lacked of efficiency when Dweiri (2006) looked crucially at the basic criteria as internal measures of project management efficiency.

It is noted to approaching the efficiency, the projects should be measured by the degree of managing risks, since the stakeholders conflicting interests has different views in project success perception and satisfaction (Bryde and Brown, 2005), considering the state of the stakeholders and their degree of influence in the project. Besides, the significant knowledge in which area the stakeholders are willing to accept risks, this could help the risk response strategy (Mulcahy, 2005), as well as managing and register, risks in an innovated framework will help a continuous building of stakeholders' knowledge (William, 2008).

2.1 Significance of MDC and Project Success

The most important outcome that should be observed on the success criteria of the project is the degree of influential variables that related to the performance, decision-making and variations by stakeholders. Performance mainly stands as a motivated measure into the traditional components, cost benefits saving (Beathamet al., 2004), early completion (Chan and Chan, 2004), improve quality (Ling et al., 2009) when conflicts are often due to stakeholders dissatisfaction of poor quality of work.

According to the changing of buildings functions and demands, the performance is one of the most important in project management and should be tailored and innovated for every project (Toor and Ogunlana, 2010). The satisfaction of project performance is a strategic stance in a world of hyper-competition, this has been considered since construction projects suffer from delay and budget overrun. Moreover, powerful of construction organization should compete to win the market place and create values for their stakeholders (Shenhar, 2004). Studies should be concentrated in more depth of stakeholders' performance, management and perception of risk assessment. Landin (2000) considered to gain long-term of construction project performance, the stakeholders' satisfaction is crucial. As well as effective communications management (Bakens et.al, 2005 and Young, 2006).

Empowerment of stakeholders' decision- making was encouraged previously in different environment in project management, but it is limited under project

management authority. It is more valuable for stakeholders to set their goals and keep inventories, such managerial function and plan innovation come from motivated stakeholders or teams that impact on the decision-making effectiveness. Moreover, affect completing projects on time, budget and within specifications (Barber and Warn, 2005). A significant historical information and knowledge has been used to improve decision-making and the outcome of project control (Albinoet, al., 2002) as well.

Variations/change orders have enhanced projects delays by clients, contractors or other stakeholders that emerged for number of reasons such as user change orders in Jordan (Al-Momani, 2000), excusable delay by clients and consultants (Memon, 2004), excessive client change orders in UAE (Motaleb and Kishk, 2010), change orders in Oman by the client and consultants (Alnuaimi et al. 2010), the most effect are the schedule delay, stakeholders conflicts and cost overrun. Some efforts by Arain (2005) have secured the base of knowledge management during the earlier stages of a project life cycle, mean that the greatest requirement for effective variations management.

In addition, the financial measure as a loss of potential revenue, it can be contributed by any of stakeholders, clients (Al-Khalil and Al-Ghafly, 1999; Assaf and Al-Hejji, 2006). The client‘s payment delay, contractor poor cash flow (Ahmed 2003, Harris and McCaffer, 2003, Construction Industry Working Group on Payment, 2007). As well as bankers, quantity surveyors, architects, consultants and other constructions parties may affect direct or indirect in the process of payment claim, the invalid contractor’s claim, certification delay by consultants, poor work valuation and insufficient documents as well as involving too many stakeholders for honour certification process and heavy works on consultant to work on evaluations. Besides, influences of financial crisis (2008-2010) on the Middle East. Constraints of the cash flow that led to delay of payments (Arabic institutions for strategic researches, 2009).

Inflations, and financial market instability lead to cash flow issues (Ahmed, 2003), lack of funding programmes (Adul-Rahman, 2006). That is what happened in the Middle East where the financial resources are affected by the recent Global financial crisis, difficulties to get and approve loans (Khamis and Senhadji, 2010). Similarly, the impact of crisis on the GCC real estate markets, stakeholders (developers) in financial bodies are among the largest openly scheduled companies in Arab markets, and both were adversely affected by the recession. In addition, increasing of real estate prices in the Middle East had ended by 2008 and the average inflation has estimated to decline from 10.8% in 2008 to 3.7% in 2009 (Habibi, 2009). In turn, speculations decreased in mortgage payment, and as a result, many banks came under financial distress.

3 Research Methodology

A literature review has been undertaken for identifying the gaps in delay control and project success. Thirty-six published research studies have been surveyed, which appeared in scholarly and refereed journals in construction projects areas. Some non-conventional documents have also been surveyed such as dissertations, technical reports, working papers, as well as from authenticated websites as listed in Table.1. Excel spread sheet was used to analysing the data observed.

Table (1) Measures for delay control (MDC)

No	Studies/Country (Region)	MDC Tools	Research method	Causes and effects of delay	Impact on stakeholders

1	Ng, et. al ,2000/ Hong Kong (Asia)	A Conceptual Case-Based Decision Model for Construction Delays Mitigation (Group 1)	Quantitative	Slow-decision by contractor	increase knowledge-good for inexperience planner-
2	Odeh and Battaineh, 2002/Jordan (Middle East)	Contract performance development (Group 1&2)	Quantitative (Questionnaire)	Owner interference, inadequate contractor, financial , labour productivity slow decision-making	minimize owner interference , labor and finance
3	Aibinu and Jagboro, 2002/Nigeria (Africa)	Acceleration of site activities,&contingency allowance(Group3)	Quantitative (questionnaire)	Client related delay	Eliminate time overrun-
4	Shenhar et al., 2002 (N/A)	Risk Identification ,probabilistic risk &trade off (Group 1)	Quantitative (100 projects)	Time overrun,	Improve Risk management
5	Fernie et al, 2003	Knowledge sharing (Group1)	Quantative (observations)	Knowledge problematic	Leason learned
6	Nguyen, 2004/Vietnam (Asia)	Comfort, competence and Commitments (COMs)(Group 1)	Quantitative (questionnaire)	Complexity of projects (many factors)	Improve knowledge in project handling-
7	Lee et al., Aug. 2005 (N/A)	Dynamic Planning and control management(DPM) for Project change management(Group 1)	Exploratory (case study)	Concurrent design changes and their subsequent impacts on project performance	Cost and schedule control-
8	Lee et al., Nov. 2005/ (USA)	Converted Lost productivity into Delay duration (Group3)	Quantitative (case study)	Lost productivity	Settlement of schedule delay -
9	Arain, 2005/Singapore (Asia)	Knowledge-based decision support system (KBDSS)(Group1)	Quantitative (questionnaire, depth interview)	Owner and contractor related project variations	Control variation orders and improve decision-making
10	Oliveros, 2005 (N/A)	Fuzzy logic model (Group3)	Quantitative (empirical)	time overrun	Updating project schedule
11	Koushki, 2005/Kuwiat (Middle East)	Adequate funds, good allocation of time and money, competent consultants and contractors (Group1&2)	Quantitative ((personal interviews)	Time delay and cost overrun	Minimize time and cost overrun
12	Wang and Haung, 2006 /China	Relation/ Guanxi criterion(Group 1)	Quantitative (questionnaire)	Poor stakeholders performance	Maximize Owner and organisation performance
13	Shahalizadeh and Farhadyar ,2006/Iran(Middle	Knowledge management (Group1)	Quantitative (questionnaire)	Waste Time and cost	Lesson learnt

	East)				

Table (1) Continue Measures for Delay Control (MDC)

No	Studies/Country (Region)	MDC Tools	Research method	Causes and effects of delay	Impact on stakeholders
14	Abdul-Rahman et. al. (2006)/Malaysia (Asia)	Effective management method(Group1)	Quantitative	Uncertainty and more variables	Reduce diversions/variations
15	Zaneldin, 2006/UAE (Middle East)	The Negotiation used to resolve construction claims(Group 1).	Quantitative(124 claims)	Excessive client orders	Avoiding disputes, good knowledge from past projects; cooperation by risk philosophy between the client and the contractor
16	Arditi and Pattanakitchamroon, 2006/N/A	Selection of proper delay analysis method (Group3)	Exploratory (20 researches from literature)	Time overrun	Availability of scheduling data-
17	Oladapo,2007 N/A	Variations management (Group1)	Quantitative (questionnaire and 30buildings)	Time and cost overrun	managing variations
18	Zeng et. al., 2007	Fuzzy reasoning techniques of Risk assessment (Group1)	Exploratory	Uncertainty	risk assessment
19	Abdul-Rahman, et. al (2008)/ Malaysia(Asia)	Conceptual delay mitigation model using a project learning approach in practice (Group1)	Exploratory (literature, developed model, case studies, questionnaire)	Poor project knowledge	Improve knowledge, positive schedule and performance
20	Luu et al., 2008 (N/A)	Bayesian belief networks (Group2)	Quantitative (questionnaire, expert interviews, case studies)	Financial difficulties by owner & contractor,& shortage of materials	Financial and time development for stakeholders
21	Abdul-Rahman et al. 2009/Malaysis (Asia)	Well managed cash flow by banks(Group2)	Quantitative	Financial related factor by Client	Prompt payment practice
22	Tumi et al., 2009/Lybia (Africa)	Risk Management (Group1)	Quantitative (Questionnaire)	Ineffective coordination and communication	Performance knowledge-
23	Mulcahy, 2009	Corrective action (Group3)	Exploratory from Field experience	Activity longer estimation	project close to schedule
24	Motaleb, 2009/UAE (Middle East)	Collaboration, Management and Control Solution (CMCS) (Group1)	Quantitative (Questionnaire)	Lack of Risk management	Improve Risk knowledge
25	Motaleb and Kishk, 2009/UAE (Middle East)	Client and project team training (Group1)	Quantitative (Questionnaire)	Excessive client orders	Improve client decision making and reduce variations

26	Said, 2009/Saudi Arabia (Middle east)	Corrective action optimisation (Group1)	Exploratory (Literature, case studies)	Rework that caused time and cost overrun	Control Performance

Table (1) Continue Measures for delay control (MDC)

No	Studies/Country (Region)	MDC Tools	Research method	Causes and effects of delay	Impact on stakeholders
27	Thanh and Dapice , 2010	Controlling and Preventing delay of Sub-Project- (Group 3)	Exploratory (case studies)	Poor planning and controlling, poor finance contractor competence	Time delay overcome and efficiency during construction
28	Preston M., 2010/Gulf (Middle east)	Liquidated damages for delay (Group 1&2)	Exploratory (literature)	Financial (2010 gulf Recession)	Adjust the contractor finance risk and performance obligations
29	Omran et.al., 2010/Malaysia	Working drawing stage solve problem (Group 1)	Quantitative (questionnaire)	Contractor related factor and Owner's slow decision making	Preconstruction knowledge
30	Olawale and Sun,2010/ UK	Preventive, predictive, corrective and organizational measures (Group 1&3)	Exploratory (face-to-face interviews)	Design changes inaccurate time duration, subcontractor inadequate performance.	Improve the effectiveness of project control (Cost and time control)
31	Manase, 2010/UK	The Private Finance Initiative (PFI) procurement (Group 1&2)	Expolarotary (literature review)	Financial related crisis 2009	Client positioning in term of risk allocation
32	Hasna A. and Raza S., 2010/GCC (Middle east)	Project Portfolio Management (PPM) (Group 2)	Exploratory	Financial problems uncontrolled budget	Good knowledge of financial resources
33	Arditi et al., 2010	Lesson learned system (Group 1)	Exploratory –data base	Design related problems	Avoiding the same mistakes in the past projects-improve knowledge
34	Brendel et al., 2010/UAE (Middle East)	Set up qualified civil rights for contractors to assured payment for work (Group 1&2)	Exploratory (literature)	Financial Contractor - related	knowledge to civil code, and code provisions
35	Al Tmeemy et al., 2010	Project management , product & market success measures (Group 1)	Quantitative (postal &e-mail survey)	Failure in (cost, time and quality)	Long-term project success
36	Abdul-Rahaman et al., 2011	Cash flow management (Group 2)	Quantitative (interviews)	Financial client-related	Prompt payments by client

4 Findings and Discussion

Typical results of the study are summarised in Table.1. It can be seen that the MDC was 3% in 2000, 8% in 2002 paced back in 2003 and 2004 by 3%. In 2005-2006, measures have improved by 14% and 16% respectively; and decreased again by 6% in 2007, and 3% in 2008. Effort of attractive studies was clearly improved in 2009 and 2010, by 19% to31%, respectively, as illustrated in Figure.1:

The MDC has been grouped; Group 1 includes decision-making, performance, variations and risk management, Group 2 for the financial risks and Group 3 for the traditional measures, time, cost and quality.

About 60% studies (2000-2011) are related to stakeholders' management and knowledge in variations, decision-making, but very limited in risk management and performance issues (Group1), 30% was pointed out in (2008-2011).

Group 2 is about 25% related to financial risk; one-fifth in (2008-2011) was coincided by financial crisis, which is not satisfied by this phenomenon.

The rest of 15% implicates the third group that related to the traditional criteria (time, cost, quality).

Geographically, it is noticed that in Figure.2:

About 60% studies have been focused on the level of stakeholders' management (Group1) in Global including the Middle East, 25% in the Middle East.

25% are indicated measures related to Group2. Financial risk in Global including the Middle East experienced about 14% exclusively in the Middle East, and15% for the traditional measures in Global.

As a result:

The highest rank of MDC issues of construction project are related to stakeholders' lack of management and knowledge in risk management, performance, variations and decision-making, ordered from higher to lower priority followed by the financial risk, as illustrated in Figure.2.

In general, top gap of knowledge in risk management and performance has showed that the stakeholders have to think beyond the traditional measures particularly in the Middle East region. The research suggests that Fig.3 should be considered as a new model of MDC and project success. There are three levels at which the MDC should be looked at: Issues related to the stakeholders management in more depth of knowledge for satisfaction and conforms to approve success in traditional criteria (time, cost and quality). It is a possibly questionable when the project is assigned to be successful, it does offer i- stakeholders satisfaction, ii- quality of performance, and iii- advanced knowledge in risk assessment and management. Similarly, it is unlikely to control the project delay if the stakeholders' management is not ensured in the traditional criteria. On the other hand, the mind-set of the performance management should be transformed from the functional to strategy focused, and this should be improved by governmental organisations such as Municipalities.

From the authors' point of view, additional measures may formulate a good dependency of relationship and interaction; predict changes in early stages can minimize the disruptive/risk effects. Moreover, save time for risk assessment to be identified from the source, it helps the project team in decision-making and consequently develops the project performance. Consequently as a result, conforms to stakeholders' expectations.

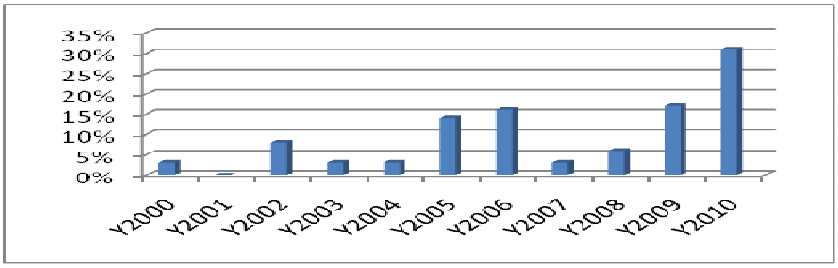

Figure (1): Measures for delay control (MDC) (2000-2010)

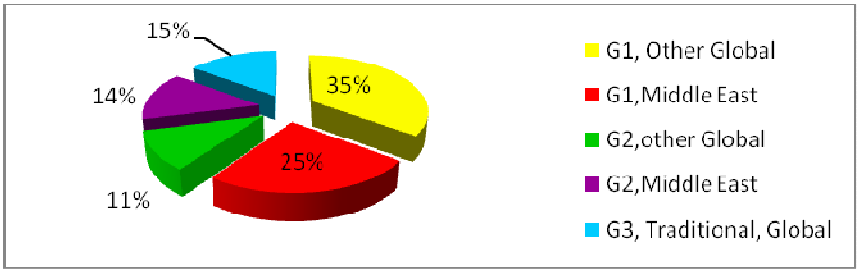

Figure (2): Measures for Delay Control (MDC) in the Middle East &others in Global

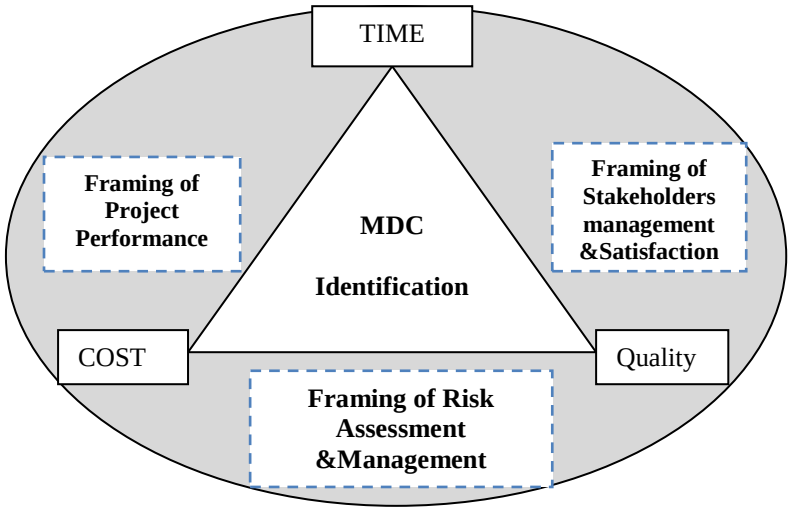

Figure (3): The Proposed Future Model for MDC and Project Success

5 Conclusions and Further Research

A critical literature review has been carried out to identify gaps in handling construction delays. The research gaps are identified as:

The risk management factors that might affect the success of stakeholder management have not fully developed yet. Most of the studies were focused largely on the stakeholders' management concerning control risk of delays. However, a few studies were dealt with the stakeholders' perception of risk assessment as a source that generates possible events and responses, and the principals of delay control in risk management measure.

A range of practical approaches such as in- depth investigation and integration has to be used for the quality of project performance but has not yet fully considered.

A framework was proposed for structuring effective measures for delay control by conducting effective risk management, stakeholder management and project performance gap of knowledge. The findings provide empirical evidence on the context-specific feature of construction delay in the Middle East, particularly in the value of project nature and objectives. These findings help to take the scope of the research one step up along the pathway towards understanding of project success process in different environment although limitations in past studies implicate improper validation of delay control measures.

This study reflects the general view, but needs in-depth investigation in the primary stage. In future, similar studies could be conducted in other regions to validate and compare with the preliminary finding in this paper.

A conducting research of a PhD is on progress to managing the risk of construction projects delays effectively in the United Arab Emirates.

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Are Relational Contracting Principles Applicable to Public Construction Projects?

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Abstract:
The need for relational contracting in the construction industry is high because of the barriers arising from its highly fragmented nature. While relational contracting principles are less difficult to apply in private sector projects, it is not known if public sector projects can enjoy the full benefits of relational contracting. This paper aims to provide answers to this question. Difficulties of implementing relational contracting principles in public construction projects were firstly discussed. A theoretical framework including a basic model, an integrated stakeholder network, and three categories of measurement items were then identified. Although the theoretical framework and accompanying hypotheses are still required to be tested by a following survey, the proposed findings would guide the application of relational contracting in public projects, thus contributing to better relationships in the construction contracting environment, and thereby boosting project outcomes.

Keywords:
relational contract, public construction project, network embeddedness, relationship

1 Introduction

The relationships between contracting parties in a construction project include formal liaisons and relational links. Formal contracts set out the rights, responsibilities and liabilities of the parties. But in a formal contract, contracting parties act in an atomized manner, looking out for their own interests (Williamson, 1975). Formal contracts do not support contractual incentives or flexibilities that are required in ever-changing construction scenarios, and in the face of uncertainty and complexity (Rahman and Kumaraswamy, 2002). Barriers also arise from the highly fragmented industry and business nature, where there is dichotomy between design and construction. This lack of integration gives rise to adversarial relationships. The need for relational contracting in the construction industry is hence high.

Relational contracting principles may be mobilized to offer contractual incentives/flexibilities, improve relationships among contracting parties, and lubricate any transactional frictions. Relational contracting is based on recognition of mutual benefits and win-win scenarios through more cooperative relationships between contracting parties, and underpins various approaches, such as partnering, alliance, joint venturing, long term contracting, joint risk sharing mechanisms and other collaborative working arrangements (Rahman and Kumaraswamy, 2004a). Relational contracting allows mutual future planning and considers contracts to be relationships among the parties, in the process of projecting exchange into the future (Macneil, 1974).

While relational contracting principles are less difficult to apply in private sector projects (Kumaraswamy, 2010), it is not known if public sector projects can enjoy the full benefits of relational contracting. This is because public clients are not in a position to offer any future relationships, since most projects must be procured through competitive bidding (Rahman and Kumaraswamy, 2004b). Public clients also cannot be seen to have a 'hand-in-glove' relationship with other contracting parties from the private sector, since this may imply cronyism. The possible side-effects of closer relationships include perceived break-down of carefully crafted contractual checks and balances, and dangers of sliding from partnering-type collaboration to corruption (Rahman and Kumaraswamy, 2004a).

According to a survey by Construction Institute of ASCE, it was found that cost estimating is usually a much bigger problem in public construction than in private construction (Minchin et al., 2010). The problem is that the lack of possible relational contracting approaches in public projects may have contributed to projects being completed above budget, behind schedule and to unacceptable level of quality. Yet, public projects are highly visible, and need to achieve the basic triple project goals because tax payers' money is involved. The knowledge gap in how public projects can capitalize upon and adopt relational contract principles is therefore seen. This paper directly address this issue by drawing heavily on 'network' considerations in developing a conceptual framework for managing transactions in public sector construction projects.

2 Features of Public Construction Projects

Clients in public construction projects could be differentiated into clients who have a regular requirement for construction work and infrequent purchase clients. There are usually two ways to develop public projects. The first way such as in Beijing is that the client departments, who want to build their own office building for example, engage consultants and contractors to develop, design and construct the building by themselves. In this scenario, the client departments could be defined as "one-off" clients. They may be "on-off" clients who periodically build a new building. One-off or on-off clients would neither need nor be able to be experts in construction project management and develop future relationships with contractors and consultants. Another common way like in Hong Kong is that the client departments request the relevant work departments to design, call for tenders from private contractors to construct or to design and build the facility. In this case, the work departments could be defined as "ongoing" clients, who have the construction project experience and will have future projects to be constructed. They may have less difficulty to offer future relationships with private contractors. Relational approaches may hence be possible with a long-term relationship founded on regular spending process (Tookey et al., 2001).

Unlike private organizations, government organizations are strictly constrained by many rules and regulations. Even those public organizations that genuinely wish to change are often restricted by standing orders, public accountability and probity constraints (Palaneeswaran and Kumaraswamy, 2000; Chan et al., 2001; Minchin et al., 2010). These preset regulations restrict public officials in some activities and perpetuate a behavior pattern that militates against any kind of trusting relationships with other contracting parties. This pattern pushes both parties back toward a traditionally adversarial approach (Rahman and Kumaraswamy, 2004b). For instance, the public sector has more stringent procedures to follow whenever variations or deviations from contracts occur (Chan et al., 2008).

Organizational boundaries within government departments are typically rigid and impermeable. The departments have well-defined jurisdictions, responsibilities, and a hierarchy of authority. This traditional bureaucratic system of organizing must be overcome to allow public organizations to be partnered effectively (Crowley and Karim, 1995). There is also a lack of communication among such clients. Common knowledge sharing platforms (both internal and external) in public organizations are rare (Palaneeswaran and Kumaraswamy, 2000). This is especially critical in China as the lack of appropriate mechanisms to inspire the different government departments to communicate actively has reduced the efficiency of project approval (Tai et al., 2009).

Public sector is also burdened by a tedious stepwise decision-making system that often slows project delivery. Hence transforming industry enthusiasm into action for relational contracting in the case of public sector clients is not as easy as with private sector clients (Rahman and Kumaraswamy, 2004a).

The private companies had closer relationships with their suppliers than public clients. The public sector was not active to participate in appointing their own suppliers and left this entirely to the contractor, while by contrast, the private companies played a part in the appointment of their suppliers (Gibb and Isack, 2001). This could be explained by the organizational culture of public bodies. Public organizations are usually restrained by an inertia that may arise from beliefs such as ‘that is not our responsibility’ (Palaneeswaran and Kumaraswamy, 2000).

The bid behavior in public construction projects is usually under stricter legal regulations. Taking Hong Kong for example, competitive bidding is always required in a public project, while negotiation is more commonly adopted in the private sector (Rahman and Kumaraswamy, 2004b). In theory, some common key procurement principles for public construction projects are public accountability, value for money, transparency (open, equitable and fair competition), propriety/integrity/probity, and confidentiality. Objectives considered in public sector construction contractor selections include proper delivery of good products and/services, minimization of risks and maximization of value for money (Palaneeswaran et al., 2003). However, in practice, public owners usually continue to select the same procurement route as they are in the habit of. They do not consider what procurement route suits each project best, and therefore they do not select the route according to best practice (Lædre et al., 2006). Furthermore, public clients are also restrained by beliefs like ‘there is no need to change current approaches/practices that are good enough (or even better than others)’, or a ‘not invented here’ syndrome (Palaneeswaran and Kumaraswamy, 2000). This limitation usually means that a well-performing contractor may not improve its chances of winning the next contract, even with the same public client (Weston and Gibson, 1993).

To sum up, the issues discussed above may be considered as difficulties to successful implementation of relational contracting in public construction projects as presented in Figure 1.

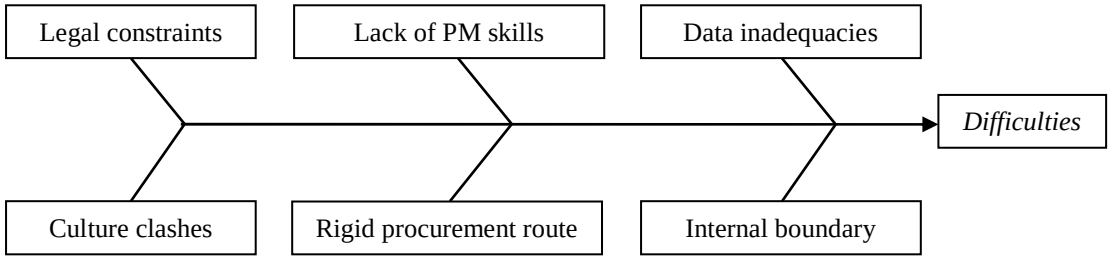

Figure 1: Difficulties of implementing relational contracting in public construction projects

3 In Search of a Paradigm

3.1 Pragmatic Paradigm in Practice

Following the increasing complexities of construction projects, there has been a range of initiatives across many countries to introduce an intensive self-examination and widely publicized reform agenda to the construction process in order to improve performance. Initiatives towards deeper collaboration have played a central role in complex projects, such as the UK "Continuous Improvement" programme (Kumaraswamy et al., 2010) and Australia Alliance Contracting (Clifton et al., 2004). However, there have been improvements, yet these seem not to have been continuous (Anvuur et al., 2011). Taking the UK 'Continuous Improvement' programme as example, the 30 percent overall project savings targeted by Egan (1998) have yet to materialize and initiatives have tended to be project-specific (Smyth, 2010). Therefore, this again reinforces the importance of this research.

3.2 Theoretical Underpinning

There are some companies in the construction industry that attempt to maximize their economic profit. They may be keen in participating in public construction projects with the intention of increasing the revenue. They usually prefer to adopt formal contracts, which contain fairly explicit stipulations of proscribed and prescribed behaviors. Contracting parties in a formal contract are adversarial in nature. This type of organizational strategy choice is therefore governed by rational choice theory (Becker, 1976). The basic idea behind rational choice theory is that people do their best under prevailing circumstances (Green and Shapiro, 1996). It therefore usually represents preferences with a utility function and seeks for the utility maximization. Rational choice theory presumes that the individual decision maker's interest is known and that he/she pursues his/her interests rationally (Becker, 1976). Williamson (1975) stated that in a relatively pure market, parties engage in transactions with minimum interdependence and little expectation for future interaction. The market is operated by 'economic men' who exhibit self-interested behavior, are rational, and are affected minimally by social relations. These 'economic men' make rational choices in transactions involving formal contracts. They rely on institutional arrangement to guard against trouble, select who to transact with based on pure economic motives, ignoring the identity of and past relationships with the individual actor.

However, risk in a construction project is inherent and difficult to deal with. It is difficult for the partners to completely predict the potential problems and outcomes, and have all essential information. The basic assumptions of expected utility maximization under conditions of uncertainty are especially problematic (Machina, 1987). Contracting parties may also be mutually suspicious of each other as each pursues its profit maximization goal. Instead, Granovetter (1985) argued that most behaviors are closely embedded in networks of social relations. Non-rational behavior will be thereafter quite sensible when situational constrains, especially those of embeddedness, are fully appreciated. It is then noted that the decision making aims not only at economic goals but also at sociability, approval, status and power, which however are rarely seen as rational by economists (Hirschman, 1977). In other words, the objective of the behaviors is therefore not only to maximize utility but also to take into account other social goals (Granovetter, 1985).

Jones et al. (1997) proposed that four conditions promote embeddedness among parties: demand uncertainty with stable supply, complex tasks under time pressure, customized exchanges high in human asset specificity, and frequent exchanges among parties embedded in the network. Construction projects are always characterized by high risks, complex tasks, tight schedule, and long period. It is understandable that participators in the contractual structure of a construction project are usually closely embedded in a social network of relations. There is hence a possible governance mechanism among construction firms and the government embedded in a network.

The Relational Contract Theory was originally developed by Macneil (1974, 1978, 1980, 1983). The theory states that informal agreements and unwritten codes of conduct exist among contracting partners, and these are sustained by the value of future relationships (Macneil, 1978). It allows mutual future planning and considers contracts to be relationships among the parties, in the process of projecting exchange into the future (Macneil, 1974). Macneil (1983) summarized ten common contract behavior norms: (1) role integrity; (2) reciprocity; (3) implementation of planning; (4) effectuation of consent; (5) flexibility; (6) contractual solidarity; (7) the restitution, reliance and expectation interests; (8) creation and restraint of power; (9) proprietary of means; and (10) harmonization of the social matrix. Norms applicable to the ends of the relational/discrete behaviors are not simple mirror images. It is worth noting that contractual relationship is not absolutely relational or completely discrete, but exists on a spectrum, which ranges from relational to discrete. Moving a contractual spectrum ranging from relational to discrete does not just give greater or less emphasis to some of the norms, but also transform them (Macneil, 1983; Blois, 2002). The five norms of enhanced importance in ongoing contractual relations are role integrity, preservation of the relation, harmonization of relational conflict, propriety of means, and supracontract norms.

4 Relational Contracting Framework for Managing Public Projects

Two arguments can be drawn from the foregoing discussion. Firstly, public bodies should be differentiated from private companies due to the identified issues presented in Figure 1. Secondly, the two variations in strategic focus will reflect the variations in contracting pattern, i.e. pursuing economic profit only leading to formal contracts and pursuing the balance of economic and social goals leading to relational contracts.

4.1 Network Considerations

In light of the first argument, Figure 2 therefore illustrates how typically multifarious stakeholders in a public construction project need to be integrated. The client body/department/organisation that commissions the built facility and other relevant functional departments like financial department, legislative department, and consulting department are considered in one network; while private contractor, sub-contractors, consultants and suppliers would form another network.

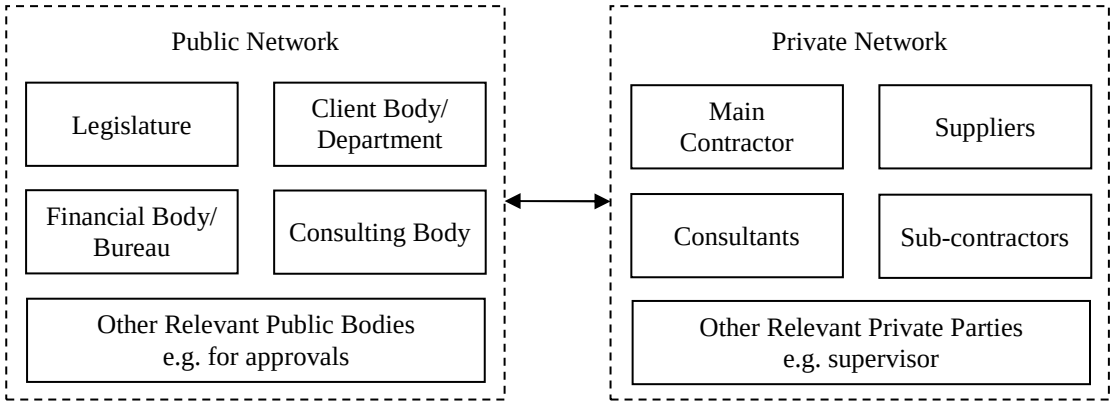

Figure 2: Integrated stakeholders in public construction projects

It is more appropriate to develop two separate networks so that the client department could avoid providing a mistaken impression of having a "hand-in-glove" relationship with private companies. In cities with adequate public accountability and transparency, the difference between relational contracting behaviors and cronyism/corruption is obvious. However, in those cities where public accountability and transparency are not apparent, resistance from the public to adopt relational contracting principles may be encountered.

In addition, one-off or on-off client departments are considered to have less project management knowledge and experience. They therefore need help of other members in the public network, especially the consulting department, to learn about the capability and past performance of bidders in order to choose a reputed contractor. Taking Hong Kong for example, a qualification certificate system is usually adopted in public construction projects such as the List of Approved Contractors for Public Works and the List of Approved Suppliers of Materials and Specialist Contractors for Public Works. In Singapore, the Building and Construction Authority also has a system to register contractors to undertake public works. This is in addition to licensing contractors to undertake large and complex projects. Given the rich project experience of on-going client departments, they can procure the project via competitive bidding and choose any appropriate private partner so as to introduce competition and prevent the "egg-chicken" problem (i.e. a new contractor needs to complete more projects to be reputed but needs to be reputed first to win a contract).

4.2 Basic Model

Based on the second argument, it is expected that the strategic focus will reflect the organizational governance and hence the project performance. Here organizational strategy refers to an attempt for pursuing solely economic goal or a balance between economic and social goals. Pursuing economic profit only (that is interpreted by rational choice theory) would lead to formal contracts, while pursuing the balance of economic

and social goals (that is interpreted by network embeddedness theory) would lead to relational contracts.

In addition, existing literature suggests a positive relationship between organizational culture and project performance (Denison, 1990; Zheng et al., 2010). Organizational culture refers to shared assumptions, values, and norms (Schein, 1985), which are held consistently and enable the organization to have the ability to alter behavior, structures, and systems in order to survive in the wake of environmental changes (Denison and Mishra, 1995). This study focuses on a narrower concept of organizational culture on relationship.

To summarize, Figure 3 presents the basic model. To limit the scope of this research, organizational strategy and culture are both studied from the issue of relationship only.

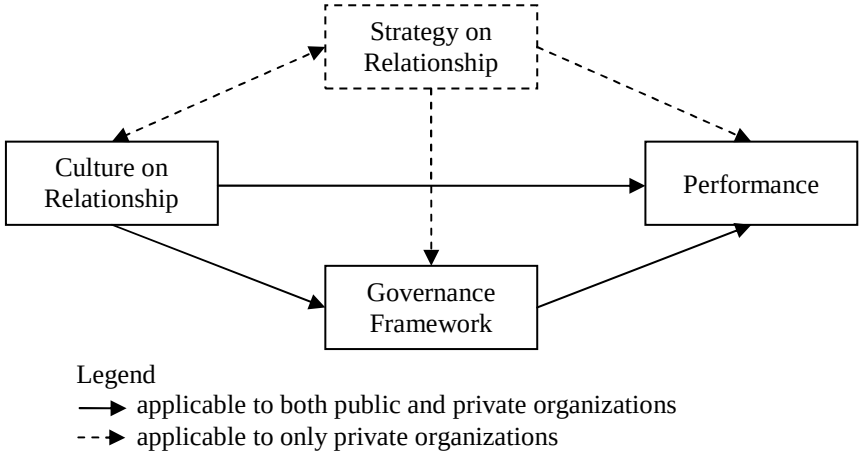

Figure 3: Basic theoretical model

It is worth noting that the objective of public clients in public projects is always not to pursue a maximum economic profit, but instead a maximum value for money towards a balance of multi dimensions. Therefore, “Strategy on relationship” is not a variable to public clients and hence is presented in dashed lines, which means it is only a variable to private construction organizations. More specifically, it is envisaged that:

Hypothesis 1: Private organizations supplying goods/services in public projects that strive towards a relational contracting strategy will achieve better performance than those that pursue economic profit only.

Hypothesis 2: Construction organizations that hold a culture more towards relational contracting behavior will achieve better performance than those that hold a less relational culture.

In the proposed basic model, variables “Strategy on Relationship” and “Culture on Relationship” are both at organizational level, which are in need of a long period to establish. “Governance Framework” is a project-based variable, which includes many other specific constructs like trust and communication and will be further explained in the following section.

4.3 Relational Governance Constructs

To develop a relational governance framework, a literature review is required to identify the elements and success factors of relational contracting approaches, which will be integrated to form relational governance constructs together with the five contract norms of relational contract theory (i.e. role integrity, preservation of the relation, harmonization of relational conflict, propriety of means, and supracontract norms). Based on the (precedent and subsequent) relationships among constructs, a preliminary governance framework could be thereafter derived.

Measure items relating to success factors and elements of relational contracting approach were identified and presented in Table 1. It is worth noting that these items are divided into three categories, i.e. practices by each contracting party, practices between two of contracting parties, and practices among contracting parties. This means of classification provides the possibility to evaluate the practices by different parties and to develop the public and private networks if necessary.

Table 1: Measure items under three categories

Category	Measure Items
Practices by each contracting party	Level of innovation/creativity
	Commitment of resources to the project
	Effort in implementing relational contracting practices
	Acceptance of relational contracting practices
	Culture fit to relational contracting practices
	Financial capacity
	Flexibility when situations change
	Knowledge level about project processes
	Long term commitment level to other parties
	Previous experience in relational contracting approaches
	Readiness to compromise on unclear issues
	Reputation in the industry
	Specific inputs on construction methods, materials, etc before they are formally appointed
	Team working attitude
	Top management support for relational contracting practices
	Attitude to continuous improvement
Practices between two of contracting parties	Familiarity/previous relationships
	Mutual trust
	Mutual understanding
	Open and effective communication
	Level of inter-personal relations/cultural harmony (individual level)
	Sharing of project information
	Ongoing social relationship (eg. “guanxi”, social ties and kinship outside of this project)
	Level of reciprocation/face-saving gesture
Practices among contracting parties	Clarity of division of responsibilities among contracting parties
	Acceptance of performance appraisal mechanism for the project
	Alignment of objectives of different contracting parties
	Collective/combined responsibility by a pre-selected group comprising one person from each major party
	Joint coordination and monitoring plans among contracting parties
	Clearly defined equitable risk sharing arrangement among contracting parties
	Flexible/adjustable contracts to address uncertainties

Category	Measure Items
	Commitment level of contracting parties to joint problem solving
	Presence of conducive learning climate/environment
	Acceptance of dispute resolution mechanism for the project
	Clarity of contract conditions (eg. scope of contract, duties & responsibilities)
	Real gain-share/pain-share among contracting parties
	Effectiveness of team building events used in the project

A questionnaire survey will be conducted, as the second stage of this research, to request public clients, private consultants and contractors to rate the extent to which each of the measure items in Table 1 were present, observed, practiced or emphasized in a past project. Respondents will be request to answer the questions based on one specific completed public construction project which they have been involved in. The questionnaire will include three main parts: i.e. background of the selected project, extent of the activities in the selected project, drivers and obstacles in the selected projects.

The respondents will also be requested to evaluate the performance of the project. The data collected will be analyzed to test the basic model, to identify relational contracting constructs with strong impact on the project outcomes, and then to develop the preliminary governance framework. Following the questionnaire survey, the research will validate the theoretical framework and elaborate on the findings by conducting case studies.

The survey will be conducted in the following cities: Singapore, Beijing, Hong Kong and Sydney. As the funding comes from MOE, Singapore is the natural choice to study. Singapore developers, contractors and consultants are predominantly Chinese by race. How Singapore-Chinese carry out relational transactions will be investigated. To move the study beyond Chinese Singaporeans so that the findings have more international application, this study proposes to investigate how indigenous China-Chinese undertake relational transactions. The research will focus on the capital city, Beijing (as it has a significant number of completed public projects after the recent Olympics). Recognizing that Beijing is not truly representative of China, Hong Kong is chosen to contrast contract practices in the capital and a SAR. To check whether the findings are unique to Chinese when compared to western practices, study will be conducted in Sydney to contrast the findings obtained from Singapore and China. Sydney is chosen because it adopts western project management practices. In addition, more Singapore firms are likely to benefit from an Australian finding as they may also export their services to Australia, and less likely to export their services to UK and US.

5 Concluding Remarks

It is found that contractual relationship is not absolutely relational or completely discrete, but exists on a spectrum, which ranges from relational to discrete. The search for a pragmatic paradigm such as project alliance framework in Australia (which although didn't bring in continuous improvements yet) indicates that relational contracting principles are also applicable to public construction projects. There is hence

a possible governance mechanism among construction firms and the government in a public construction project. A theoretical framework including a basic model, an integrated stakeholder network, and three categories of measurement items were identified in this paper. The framework will be subsequently tested by the fieldwork using a structured questionnaire survey to ascertain its relevance to boost public construction project outcomes.

6 Acknowledgements

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Mechanisms to improve cooperation in energy renovation of social housing

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Abstract:
Social housing organisations have a privileged position to implement changes on the quality of the housing stock, as they are the owners of a large stock of dwellings. In recent years energy efficiency has become one of the main focuses of their renovation processes. However, the financial capacity of these entities is rather small and limits considerably their opportunities to improve the quality of their housing stock. Moreover, as they offer a public or semi-public service, commonly they have to work with strict regulations.

The current energy renovation processes of social housing organizations from four European countries have been analysed: Belgium (Walloon region), France, the Netherlands and United Kingdom. From this qualitative analysis several problem areas have been identified: strategy, work organization, design decisions, tendering and contracting, knowledge and influence on tenants behaviour.

Moreover, possible alternatives have been proposed aiming to increase the energy performance by improving the coordination and cooperation of the different actors involved in the process. As for example: the use of energy consumption parameters to define the renovation strategy, the involvement of construction and maintenance companies during design phase or the use of selection and award criteria in tendering procedures.

This analysis is the first step of a long-term project. Part of the alternatives highlighted in the paper will be implemented by different housing associations in their renovation processes on the next years.

Keywords:
energy renovation, integrated design, social housing, public procurement, supply chain integration

1 Introduction

In recent years energy efficiency in the built environment has become one of the main focuses of European policies (Uihlein and Eder, 2009). In order to achieve broad energy savings in the existing housing stock social housing organisations (SHOs) have a privileged position, as they are the owners of a large housing stock. However, the financial capacity of these entities is rather small and, as they offer a public or semi-public service, they are commonly under a strict regulation. Public procurement rules

and traditional working methods limit the opportunities to find innovative solutions with the participation of the different actors present in the renovation process.

An integrated design approach seeking for the improvement of communication, coordination and cooperation among the different actors can offer alternatives to the current energy renovation processes.

1.1 Research question

This paper aims to propose alternatives for the current energy renovation processes in social housing. The research question is: How can SHOs improve the energy efficiency of their renovated dwellings and how can they reduce conflicts among actors involved in the renovation processes?

Next the research method is described, followed by the characterization of social housing energy renovation and its processes, the definition of the existing problem areas, the presentation of possible alternatives and conclusions.

2 Research method

Energy renovation is considered to be renovation works resulting in a significant improvement of the energy performance of the building and an extension of the service life of the building. In order to characterize renovation processes, to identify the problem areas and to propose alternatives, SHOs from four European countries: Belgium (Walloon region), France, the Netherlands and United Kingdom have been analysed. The SHOs voluntarily participate in two different research projects.

A total of 33 semi-structured in-depth interviews were carried out among employees of four SHOs participating in an European research project called 'Shelter[1]' and other actors involved in their renovation processes (e.g. architects, construction companies, maintenance companies). These SHOs are: Walloon Housing Association for Belgium, Logirep and Dynacité for France and Black Country Housing Group for United Kingdom.

For the Netherlands results were used from in-depth interviews and workshops held within the research project 'Supply-chain integration in housing renovation[2]'. In this project seven dyads consisting of a SHO and a construction company share knowledge and experiences that they obtain while carrying out a renovation project with an integrated supply chain.

Part of the alternatives proposed in this paper will be tested on the on-going pilots for both research projects.

3 General characteristics of social housing renovation

Dwelling renovation in social housing is shaped by national social housing policies, energy regulations and market regulations. The characteristics of these three elements per country are presented in this chapter.

[1] Shelter. http://www.shelterproject-iee.eu Intelligent Energy Europe project.
[2] In Dutch: Ketenintegratie bij woningrenovatie, a project initiated by the Lectoraat Vernieuwend Vastgoedbeheer, University of Applied Sciences Utrecht.

3.1 Social housing renovation policies

Among the four analysed countries, two different main goals in the national social housing renovation policies have been identified. Belgium (Walloon Region) and United Kingdom focus on improving health and safety in social housing while France and the Netherlands have in recent years specified their focus on reducing CO_2 emissions. Commonly, the first approach has an effect on energy efficiency too; however, there is not such a specific energetic target as in the second approach. In all cases the renovation policy is being promoted with a different type of funding programs. See Table 1.

Table 1. Main national social housing renovation policies and implementation tools.

Country	**Main goal of national social housing renovation policy**	**Implementation**
Belgium (Walloon Region)	Improve health and safety	Exceptional Investment Program
France	Reduce CO_2 emissions	Law Grenelle
Netherlands	Reduce CO_2 emissions	Covenant Energy Saving
United Kingdom	Improve health and safety	Decent Homes Standard

In Belgium (Walloon Region) there is an Exceptional Investment Program for renovation purposes that is managed by the Walloon Social Housing Society, umbrella organization for the Walloon SHOs and depending on the Walloon government. The program is subsidizing the renovation of 33% of the social housing stock of Wallonia (Schutter and Mureau, 2009).

In France the generalist environmental Law Grenelle to reduce CO_2 emissions is being implemented by different plans. In the Building Plan the social housing sector has funding incentives through eco-loans. The *Caisses de Dépôts* offers them loans at low interest rates for renovation projects aiming to improve energy efficiency of dwelling rated D or lower by French energy certification standards (Plan Bâtiment Grenelle, 2010).

In the Netherlands SHOs federation Aedes, tenant federation Woonbond, and the national government have signed an Energy Saving Covenant (VROM, 2008) for the housing sector. The covenant has no legal status but defines the common agreement for achieving a certain goal; in this case upgrading the energy performance of all social dwellings to reach energy label B or at least to improve their performance in order to raise the energy label by two degrees.

In 2000 the UK government defined the Decent Home Standard and a Decent Home Program to achieve this standard in all UK social housing stock by 2010. In 2010 10% of the stock was not yet at the standard level. Nevertheless, there has been a large improvement in the health and safety parameters. The program had a Housing Revenue Account managed by the local authorities that offered subsidies for this purpose. At present, UK is defining the goals of a new social housing renovation policy (House of Commons, 2010).

3.2 Energy regulations

The Energy Performance of Buildings Directive, EPBD, has been introduced in all European countries (EPBD CA, 2011). In the four analysed countries it is now mandatory to obtain an energy certificate for the dwelling in case it is being sold or

rented. Therefore, it is not necessary for SHOs to obtain the energy certificate of all their properties. However, as the national policy of certain countries has related the available funding to achieving a certain energy label, the SHOs of these countries have certified the whole stock in order to make energy performance one of the decision fields within their strategic asset management. See Table 2. Among the analysed countries this approach is the case of France and the Netherlands. Belgium (Walloon Region) is already in the process of applying a similar approach (SWL, 2010).

Table 2. Introduction of EPBD score of dwellings in SHOs property register

Belgium (Walloon Region)	France	Netherlands	United Kingdom
Planed to start general implementation next year	Generally implemented	Generally implemented	Not implemented

3.3 Market regulations

SHOs have a different entity status in the European Union that can be categorized mainly in two types: public entities or private non-profit entities. In France and the UK both types of entity exist, whereas in Wallonia all SHOs are public and the Netherlands all SHOs are private non-profit organisations. See Table 3.

European public tendering rules for services (also including design) and works apply to public and private SHOs that use public funds: Belgium, France and United Kingdom. Moreover, national public procurement rules apply under the European thresholds for public entities in Belgium and France (Global Legal Group, 2011). In the Netherlands SHOs are not classified as bodies governed by public law, therefore public procurement rules do not apply to them (Jong and Carnier, 2011). The differences in implementation of public procurement rules and the limitation that they cause to the entities subject to them are currently under discussion at the European Commission (European Commission, 2011).

Table 3. Types of SHOs and Public Procurement Rules applied to SHOs

	Belgium (Walloon Region)	France	Netherlands	United Kingdom
Types of SHOs	Public	Public Private (Non -profit)	Private (Non -profit)	Public Private (Non -profit)
Public Procurement Regulation	EU PPR + Belgium PPR for all SHOs	EU PPR + French PPR for public SHOs	Not applied to SHOs	EU PPR

The fundamental principle of public procurement rules is that the contracts with a budget higher than a defined threshold must be opened up to a nation-wide or EU-wide tender. The conditions of the tender must be published in official EU or national media, depending if national or EU tendering rules apply (Grelier, 2009; Thiel, 2010). The process must assure the equality of treatment among all the candidates.

SHOs can organize an open or restricted procedure. In an open procedure the candidates apply directly with an offer. In restricted procedures the candidates are pre-selected by certain selection criteria related to economic and financial standing and technical or professional certificates. Public procurement rules offer other kinds of procedures, but these are not applied to renovation projects in social housing.

In the case of restricted procedures it is possible to define a framework agreement that allows using the same pre-selection of companies for certain type of contracts for a

maximum of four years. In all restricted procedure a minimum number of companies must be pre-selected (Office of Government Commerce, 2008).

The contract can be awarded to the "lowest price" or to the "most economically advantageous offer". In order to define the "most economically advantageous offer" a set of criteria needs to be defined beforehand by the SHOs. These award criteria can take into account among other parameters total cost of ownership, delivery date, running costs, cost effectiveness, technical merit, sustainable solutions and after sales-service (Global Legal Group, 2011).

4 Current energy renovation processes

In order to improve the dwellings to current standards, several elements of the dwelling could be replaced; e.g. kitchen, bathroom or the electrical installation. Among the works performed some effect the energy consumption; e.g. insulation of walls and roof, double-glazing of windows, introduction of assisted ventilation, new heating system and, less applied, installation of renewable energy systems.

The SHOs in this research adopt two main types of renovation processes: major renovation and planned maintenance.

4.1 Major renovation

Considering the renovation process from inception until exploitation it can be divided in four phases: planning, design, construction and maintenance. See Figure 1. During this process seven main types of actors are present:

- Tenants
- Social Housing Organisation
- Investors: Bank, Municipality, Regional Government, National Government, Energy Companies.
- Designers: Architects, Engineers, Consultants.
- Construction companies (including installation companies)
- Maintenance companies
- Manufacturers

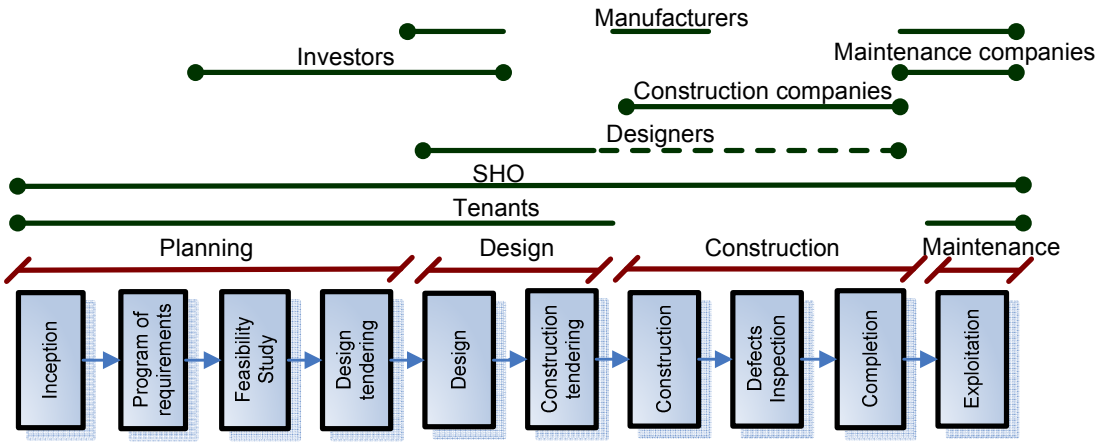

Figure 1. Major renovation process; phases and actors present in every phase.

Major renovation takes place mainly in empty properties, and the tenants have commonly a minor possibility to participate in the design decisions. In effect, only the

SHOs and the designers participate in the designs decisions. Construction companies and maintenance companies get involved into the project once the design is completely defined. The communication between designers, construction companies and maintenance companies is mainly by technical reports.

4.2 Planned maintenance

Planned maintenance can be considered being a renovation strategy in the case that after execution of a long-term maintenance plan the condition status of the effected building components are the same than after a major renovation.

In planned maintenance the different interventions, e.g. replacement of the kitchen, replacement of the heating system, insulation of walls and roofs are done independently in different moments of time. See Figure 2. Thus every action takes only a few days and commonly the dwellings stays occupied while the intervention takes place. Moreover, as standard technical solutions are applied, commonly designers are not involved in the process.

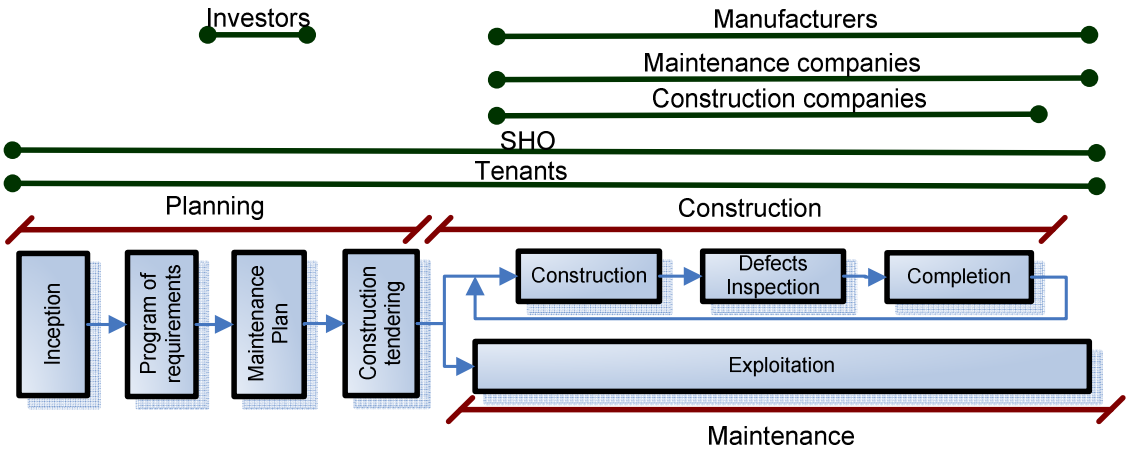

Figure 2. Planned maintenance process; phases and actors present in every phase.

5 Problem areas and possible alternatives to current energy renovation processes

Six different main problem areas have been indentified while analysing the SHOs participating in the projects: strategy, work organization, design decisions, tendering and contracting, knowledge and influence on tenants behaviour. In this chapter the problem areas will be presented as well as the possible alternatives to avoid them.

5.1 Strategy

In Belgium (Walloon region) and United Kingdom the renovation strategies don't have improvement of energy performance as one of the main decision making parameters.

Possible alternative

The SHOs could use an energy consumption parameter, e.g. the energy certificate, in the diagnosis and planning phase of their strategic asset management. This solution has already been implemented in two analysed countries, France and the Netherlands, and has allowed taking into account energy performance while prioritizing the renovation of the housing stock. Nevertheless, currently there is discussion about the accuracy of

energy performance certificates as reliable energy consumption indicators (Entrop et al., 2010). In the four analysed countries the energy certificate score is obtained by simulation. Therefore, it is an estimation that does not take into account the real energy use and tenants' behaviour.

5.2 Work organization

If SHOs use planned maintenance methods for energy renovations commonly there is no design phase. Therefore standard solutions for the replacement of specific elements are applied. Moreover, as the different actions (e.g. replacement of heating system, insulation of the walls or double-glazing of windows) are performed in different periods in time, they cannot be part of an integrated solution. Therefore, while using planned maintenance methods there is less room for innovative energy saving solutions.

Possible alternatives

Planned maintenance is defined by different independent components to be renovated. A possible alternative is to integrate them by defining a standard design per dwelling typology. Thus, there will not be a design phase for every dwelling, but it will be a design phase for all the dwellings of a certain typology. Therefore, it is possible to foresee positive and negative interactions of the different elements to be renovated.

5.3 Design decisions

Commonly only the designers (architects, engineers and consultants) and the SHOs are active during the design phase in major renovations. . This means that the practical knowledge gathered by construction companies and maintenance companies is not used properly, that may effect in needless costs, as the costs for modifications of a construction project increase in time, see Figure 3 (Uher and Loosemore, 2004).

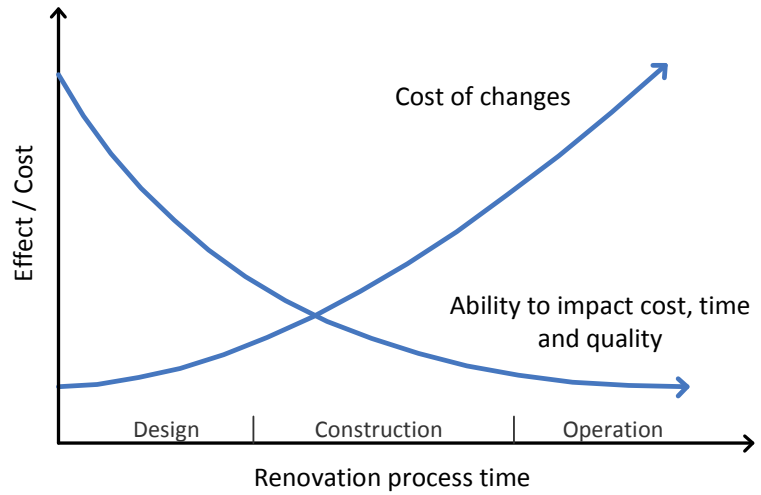

Figure 3. Major renovation process. The impact of decisions in design stage on project outcomes. Adapted from (Uher and Loosemore, 2004).

Possible alternatives

An alternative is to involve constructors and maintenance companies in the design phase of a renovation project. However, this simple solution is not easy to implement as the majority of SHOs are under restrictions imposed by the public procurement rules. Moreover, the level of these restrictions is quite different among the different analysed

countries, as shown in chapter 2.3. Thus, two different options for this collaboration during the design phase are possible.

- Use a design-renovate-maintain contract
- Invite maintenance companies as consultants during the design phase

The most complete, is to tender design-renovate-maintain in one single contract. Therefore, the consortium awarded with the contract will be working together from the start of the project. The consortium is formed by a group of companies like an architectural firm, technical consultants, a construction company and a maintenance company. Moreover, as the operation phase is part of the contract, the responsibility in case of a mistake can not be avoided. Even more, this kind of contract can take the maximum profit of performance-based specifications (see chapter5.4).

Design-renovate-maintain contracts are nowadays not possible for institutions under public procurements rules in some European countries, like Belgium (Walloon region). The first experiences for design-renovate-maintain contracts in the social housing sector are currently being implemented in France (Marote, 2010), some have already been implemented in United Kingdom and in the Netherlands some SHOs started to use design-renovate contracts in the year 2008 (Woonwaard, 2008). These experiences have highlighted two main possible dangers of this kind of contracts: rarely SME's apply for this type of contract as the risks associated are too big for the size of their company (European Commission, 2008); and the architect can lose his role of independent advisor for the SHO, having a contractual link with the construction company (Heller, 2008).

The second option is to involve the maintenance companies as consultants during the design phase. Commonly SHOs have 3 to 10 years contracts with maintenance companies responsible for responsive maintenance of (parts of) their dwelling stock. Therefore, these companies have a good practical knowledge of the properties and could participate as consultants during the design phase.

5.4 Tendering and contracting

The selection and award criteria used in tendering and contracting, the type of specifications (descriptive or performance-based) and the contract's volume can change the relation among actors involved in the renovation process and can even change the structure of the process.

Even though European public tendering rules promote the use of award criteria, currently numerous SHOs are still awarding the contracts by selecting the lowest bid, without valuing the quality of the services offered. Moreover, the tenders and contracts mainly use descriptive specifications. This reduces the opportunities for innovation by the construction companies and makes it difficult to define responsibilities in case of mistakes (Sexton and Barret, 2005).

There is a trend for contracting all renovation works in one single contract. Therefore, only general contractors can apply. This method reduces administrative and supervision tasks for the SHOs. However, there is less control by the SHOs of specialist works that will be subcontracted to other companies and it is more difficult to facilitate the participation of SME's.

Possible alternatives

In order to take into account other parameters rather than price while awarding the contracts there is a need to implement award criteria in all tendering procedures organized by SHOs. To facilitate the implementation of this procedure it is advisable that national and European institutions define a list of recommended award criteria.

The use of performance-based specifications in place of descriptive specifications allows the contractor to get involved in proposing possible alternatives (Straub and Mossel, 2007). Moreover, performance-based specifications allow defining clearly the responsibilities if the requested performance is not being achieved. However, the utilization of performance-based specifications requires that designers and contractors get used to these types of criteria. Moreover, it is needed to define evaluation methods to check the performance-based criteria after construction.

In the cases that SHOs make single contracts for renovation works it is possible to increase the control capacity over specific works maintaining a low profile of administrative and supervision tasks if SHOs, by dividing the contracts in two lots. The first lot includes most part of the work addressed to general contractors, the second lot is for specific works, as it could be the heating installation.

5.5 Knowledge

Construction projects require the participation of professionals with the necessary knowledge. In the case of energy renovations specific knowledge is needed for the designers, constructors and maintenance companies. Unfortunately, this is not always the case as the energy renovation sector is confronted with a constant evolution of building and system products. Moreover, public procurement rules (except for the Netherlands) force SHOs to tender every project separately, limiting the learning curve of the renovation projects of a SHO.

In the cases that works are contracted to a general contractor, commonly some specific works are subcontracted. The subcontracting will be done by the general contractor. In this case, the SHOs must trust the criteria of the general contractor as it does not have the possibility to identify if the subcontracted companies have the required knowledge and competences.

Possible alternatives

In order to assure that all actors participating in the renovation process have the required knowledge it is possible to use selection and award criteria in the tendering procedures. Selection criteria are used in the pre-selection of candidates in restricted procedures. Currently they are mainly used to test the economic and financial standing of the companies, but it could be used also to require certain official certificates about technical and professional competences. The implementation of certificates at European level that assure the professional quality can facilitate the selection of professionals with the required knowledge for the task to perform (ADEME et al., 2011). Moreover, as mentioned before, while awarding the contract among the pre-selected candidates a set of awarding criteria can be used to value the quality of the offer.

In case of works awarded to general contractors, SHOs can require to have a meeting with the designers and all the participating subcontractors in order to identify possible technical knowledge gaps among the participants and look for solutions to solve them.

5.6 Influence on tenants behaviour

The potential energy savings of energy renovations in social housing can be jeopardized by the inappropriate behaviour of the tenants; for example by the opening of windows at winter time to ventilate still being a common action in renovated buildings equipped with mechanical ventilation with heat recovery systems. Or by the increase of tenants comfort standards; for example by heating all the rooms of the apartment. SHOs commonly inform about the appropriate use of the dwelling installations after renovation to their tenants. Nevertheless, the influence on their behaviour still seems to be rather small.

Possible alternatives

In order to influence tenants behaviour is it possible to implement actions that make a direct link between their actions and the cost of the energy bill. These can be implemented by the use of smart meters and individualized energy advice to reduce the costs. Depending on the set up of the energy services, individual or common, different strategies can be implemented to use the savings obtained by the reduction of the energy costs to pay for the meters and the advice offered.

6 Conclusions

European SHOs, represented in this study by four different countries, have an enormous potential for energy saving through the renovation of their dwelling stock. Unfortunately, they are limited by the availability of funds and by the rigidity of the public procurement rules.

In this paper an overview of the alternatives existing in the current system for energy renovations in social housing has been presented covering six identified problem areas: strategy, work organization, design decision, tendering and contracting, knowledge and tenants' behaviour. The most important recommendations are:

- Introduce energy efficiency as one of the main parameters in the energy renovation strategy of SHOs.
- Define a standard design by dwelling typology for SHOs that use planned maintenance as renovation strategy.
- Involve construction and maintenance companies during the design phase in energy renovation projects.
- Define lists of recommended award criteria for contractors selected for energy renovation projects.
- Make use of performance-based specifications.
- Define separate contracts for specific works in energy renovation projects.
- Implement professional certificates at European level.
- Implement actions that make a direct link for the tenants between their behaviour and the energy bill.

Part of the proposed alternatives will be implemented and tested in posterior phases of Shelter and "Supply-chain integration in housing renovation" projects.

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Project governance as a means to enable project coordination and communication: a BSF case study project

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Abstract:
This paper intends to illustrate the significance of project governance as an approach to align all construction supply chain activities to facilitate information exchanges within project coalitions. The coordination of construction supply chain activities and communication within construction project networks are widely considered as areas that requires improvement to enable efficiency and effectiveness in the construction industry. A major impediment identified for managing task interdependencies and project teams' integration is that a number of construction organisations use centralised models for organising and coordinating design, construction and the whole supply chain. It implies that the traditional approach is not adequate to control construction supply chain as such there is need for supportive approaches.

The integration and connectedness of project partners is necessary to foster condition for knowledge sharing and enabling condition for innovative approaches. The key purpose of governance is to allocate resources, to coordinate and control actions across project networks. In this study, the paper investigates how governance structure affect project teams information exchange relationships and coordination in the course of delivering a construction project. As such data is gathered from the exchange relationships between project actors of a BSF project in the United Kingdom. All the information exchanges are analysed with UCINET 6 software to investigate the varied relationships**.**

The results indicate that a good mix of project governance influences project actors exchange relationships and cooperative activities. Furthermore, the study also suggests that governance ensures service outcomes are realised but if well defined and guided.

Keywords:
BSF, Social Network Analysis, UCINET 6, Project governance, Communication, Coordination

1 Introduction

The construction industry has seen significant changes in forms of procurement systems been used to procure services. The procurement systems used are for varied reasons amongst them are: project complexity, to enable competitive advantage and to transfer project risks. According to Tookey et al., (2001) the choice of procurement method is dictated by the requirements of the client, cost, quality and time. Winch (2000, 2002) described the procurement reforms that took place in the United Kingdom. The systems

include: craft system, trade system, general contracting and professional system. (1) The craft system – relies on the appointment of a master craftsman who employs the services of tradesmen on daily basis to accomplish the job. (2) The trade systems - refers to where the architect took on the task of coordinating the building crafts. The system witness the designation of actors to separate functions such as 'conception and control' on the one hand and 'construction' on the other; (3) General contracting - refers to a group or single contractor that undertakes the sole financial responsibility for entire works (construction, renovation or demolition of a building, road or other structure) in a single contract; and (4) The professional system – its most distinctive features are the separation of the conception and control functions, together with a reinforcement of the construction function.

In spite of the reformation the industry have gone through it is claimed that the procurement systems are still fashioned to segment the various construction delivery processes of which it affects coordination and communication within the functional delivery teams. As such the approaches are still believed to still follow the methods of the trade system (Winch, 2000, Masterman, 2001, Langford and Murray, 2004). This problem was earlier identified by Higgins and Jessop (1965) and Tavistock Institute (1966) as a setback for effective communication and coordination between members of building teams in the industry. As such project team integration was seen as an appropriate or necessary solution to solve interdependence, uncertainty and complexity of the industry. Green et al., (2004) referred to the fragmented structure of the construction industry as a significant hindrance to the diffusion of ideas. These issues had already attracted widespread publication for example Latham (1994) and Egan (1998) introduced the concept of partnering relationship as a means to improve the working processes of the UK construction industry. Subsequent studies have advocated the principles of integrated supply chain management (ISCM) as an appropriate means for the integration and management of the construction supply chain (Holti et al., 2000, NAO, 2001, Nicolini et al., 2001, Venkataraman, 2004).

In a similar vein, the fundamental challenge for large infrastructure projects is system integration but project governance was found to be an appropriate means to assume the responsibility for project partners' integration and to lead the temporary project coalition (Davies et al., 2009). It is also found to be significant in aligning all project resources (Robinson et al., 2010) but there appears to be no compelling argument for industry-wide adoption of new working practices (Green et al., 2004). Accordingly, the functional segregation and clustering of construction processes inhibits efficient knowledge creation and organisational learning. The implication is such that knowledge sharing and learning opportunities are reduced or neglected (Gann and Salter, 2000, Ingirige and Sexton, 2006). The crux of this paper in relation to the BSF scheme is based on Sunand Prasad's (Royal Institute of British Architects - RIBA, President) argument at RIBA (2008) event in Manchester that the BSF procurement process inhibits core relationship between architects and teachers, resulting in below-par schools. One important approach to improve this is through encouraging recurrent interaction with all partners of which it will lead to an expectation of behaviour superior to that of an untested partner (Gulati, 2008).

This paper is set out as follows: in the first section, the paper will attempt to review relevant literature on construction project coordination and communication in the construction industry to build the research problem of this study. In the second section, the concept of network perspective is presented. Third, the research methodology is presented. In the fourth section, a case study project is presented procured under the UK

BSF scheme to investigate the significance of network governance in project actors' exchange relationships. It will discuss significant factors that construction organisations need to promote to enable communication. Finally, the conclusion will examine the implications to the construction industry.

2 Project coordination and communication in the construction industry

According to Hossain (2009a) construction process requires a high level of coordination mechanisms to align all the professionals and trade persons within the construction delivery process from project design to the construction site until the project is completed. Grandori and Soda (1995) identified 10 coordination mechanisms organisations can employ to sustain cooperation within inter-organisational networks as follows: a) communication, decision and negotiation; b) social co-ordination and control; c) integration and linking –pin pole and unit; d) common staff; e) hierarchy and authority relations; f) planning and control systems; g) incentive systems; h) selection systems; I) information system; and j) public support and infrastructure.

These mechanisms can be employed in: a) social networks (collaborative arrangements); b) bureaucratic networks (contractual arrangements); and c) proprietary networks. Social networks are specifically based on interpersonal relationships of which does not need to be formalised into external and internal contracts in order to achieve effective and efficient coordination. Bureaucratic networks emphasize formal contractual agreements between collaboration partners of which are never complete. Proprietary networks are conceived as bureaucratic formal contractual agreements based on financial or property rights. Bureaucratic networks need a wider mixture of co-ordination mechanisms depending on the type of network arrangement. The coordination mechanisms employed for differentiated and integrated type of complex projects such as design and construction projects requires a wide mix of mechanisms such as inter-firm planning, mutual control systems, and penalty systems. Although, for proprietary networks there is need to use 10 of the coordination mechanisms to ensure high level of integration (Grandori and Soda, 1995, Grandori, 1997). A good example of such is the BSF programme which has multiple contractual relationships.

However, project partners' coordination and their integration across project networks are critical for effective construction and project management. Most significantly, sharing information is a key component or outcome for tight integration to optimize the chain-wide performance of the project team (Titus and Bröchner, 2005). Similarly, Edum-Fotwe et al., (2001) have pointed out that information in construction supply chain is a strategic resource that drives both the processes and competitiveness of the companies in the chain. In a similar vein, based on research findings by Hatmoko and Scott (2010) their study suggest that delays in: a) material flow; b) labour flow; c) information flow; and d) plant, equipment and temporary work flow can impact on project performance. In an earlier study, Dainty et al., (2001) found that lack of trust over the motives behind supply chain management practices and negative attitudes hinder successful construction supply chain integration to facilitate cooperative behaviours. The implication of these findings suggests that managing the construction supply chain is significant to facilitate effective and efficient knowledge/information exchange relationships.

Concerning communication, Thomason (1988) defined "communication as the lifeblood of any system of human interaction as without it, no meaningful or coherent activity can take place". Therefore, to facilitate effective communication within project teams requires early establishment of clear lines of responsibility and clear problem resolution process within the integrated team (Ochieng and Price, 2010). Cheng and Li (2004) suggest that for a successful partnering relationship a series of mechanisms should be taken into consideration such as communication mechanism to sustain the collaborative relationship. However, considering the nature of construction delivery process, information sharing can be hindered where the project is one-off or a temporary project coalition (Turner and Müller, 2003, Ingirige and Sexton, 2006). Hossain and Wu (2009) suggest that organisations should consider structural position in a network in designing and mapping coordinated groups. This implies that centrality have a profound effect on project coalition coordination in construction projects (Hossain, 2009b, Hossain, 2009a). This is helpful but to support and strengthen coordination and communication, project governance is highly significant because it can align project resources and as well enable information flow. However, there has been little research to date investigating the impact of project governance on project partners' information exchange relationships in the construction industry. However, the significance of governance in project-based organisations has been acknowledged as a means to support project teams in the management of projects (Turner and Keegan, 2001, Abednego and Ogunlana, 2006, Müller, 2009). To support this claim, Robinson et al., (2010) suggested that the establishment and development of project governance within project organisations ensures the proper flow of information.

3 Application of social network analysis in construction

The use of social network analysis (SNA) tools in construction to explore project coalitions or multiple project network relationships is increasing. Notable studies conducted using the concept includes: Loosermore, (1998) who used social network analysis to explore the social and behavioural phenomena within the management of construction crises. Kratzer et al., (2010) also investigated different structural aspects of social networks of teams and their creativity within two multinational product development programs. It implies that SNA can be used to study 'project teams' structure and relationships'.

It has also been used as an analytical tool for the identification and classification of procurement and project coalitions (Pryke, 2004a, Pryke, 2004b, Pryke, 2005, Pryke and Pearson, 2006). Similarly, using same approach Hossain and Wu (2009) and Hossain (2009b, 2009a) explored the correlation between actor centrality and project-based coordination using social network analysis software.

In addition, Chinowsky et al., (2008) integrates classic project management concepts with social science variables to improve knowledge sharing as the foundation to attain a high performance team to achieve project outcomes based on social network concept. In a similar vein, a study was conducted using SNA to gain insights of the performance of individuals (workgroup) in geographically distributed knowledge-intensive work environments (Chung and Hossain, 2009). Also, from another viewpoint but still focusing on performance, Park et al., (2009) studied a variety of collaboration patterns and their impact on performance using social network analysis. The findings demonstrates that collaborative networks are developed in order to realise improved performance when project conditions are risky

Finally, from another standpoint based on a case study conducted by Ndoni and Elhag (2010), that focused on the benefits of collaborative network. A network perspective was proposed because it provides the benefits of optimizing relationships to achieve economies of scale and to enable the management of multiple contractual relationships within project organisations.

Overall, this section demonstrates that social network analytical tools, especially UCINET 6, can be applied or employed to study and understand the structure of project organisations and their multiple relationships. However, there is yet to be a study as this paper is aware of that has investigated the impact of 'project governance' on information exchange relationships of project teams within project-based organisations using SNA. This is a significant contribution to project management literature.

4 Research methodology

A case study research approach is preferred to substantiate the paper's proposition using social network analysis software. The case study project is a UK Building Schools for the Future (BSF) scheme. The name of the scheme is withheld for confidentiality reason. The rationale for selecting the BSF project as a case study is based on the nature of the BSF programme. Overall, the project team comprise: a) the client (Local City Council); b) the design organisations (two design organisations); c) the construction teams (ICT, Mechanical & Structural, Cost consultants and the led construction organisation); and d) facilities management organisations.

To achieve the objective this paper a project questionnaire was designed in a format that data collected can be transferred into UCINET 6. Subsequently, the developed questionnaire was distributed amongst the defined project team. For validity and reliability of the research results, respondents were mainly senior executives from the respective project organisations. The following questions were asked respondents: From whom do you receive information which helps you carry out the project? From whom do you send information which helps you carry out the project? Twenty-one (21) respondents were involved in the information exchange relationship.

It provides a good means to study the flow of information between project partners. In addition, most significantly the project organisations developed a governance framework that is focused on aligning people, roles, processes, standards, tools and mechanisms for project compliance (Robinson et al., 2010).

Social network analysis is appropriate for 'relational data', and this are contacts, ties and connections relating to one person to another (Scott, 2001). Relational measures capture emergent properties of social systems (or social structures) that cannot be measured by simply aggregating the attributes of individual members (Knoke and Kuklinski, 1982). The visualization in KrackPlot format is relevant to the construction industry in terms of providing a means of communication that construction practitioners and student can relate and understand (Pryke, 2001).

5 Discussion on the project organisations' project governance structure and network analysis

Fig 1.1 presents the BSF consortium governance structure. The governance structure shows different lines of relationships within the project network as such it explains how

the whole project delivery team has been monitored and coordinated to achieve expected project outcomes.

As illustrated in Fig 1.1, the Scrutiny and Approval strategy of the consortium refers to the approaches used to coordinate and control the multiple contractual relationships within the project network. These includes: a) NPAP, Strategic Partnering Agreement, the Executive Boards and the LEP. By examining the governance structure it is obvious that the lines of communication are clear to enable the delivery of the BSF programme.

A critical examination of the governance structure reveals an overlap of the 'Scrutiny and Approval' approaches adopted for the BSF scheme with the 'Strategic Approach' to deliver the BSF programme. It illustrates effective lines of contact between the Local Authority, the LEP and the integrated project team to ensure that detail contractual agreements are achieved for the overall school projects. The fact is that the governance structure seems to encourage the frequent interactions between all the project delivery organisations. In addition, it also seems to be a significant approach for the partnership to learn and transfer knowledge within the BSF programme. This is a fundamental benefit of having a governance structure because it ensures the effective planning of projects and proper flow of information (Müller, 2009, Robinson et al., 2010).

Finally, it evidence that the governance structure provide for lines of communication to enable the effective management of the BSF programme. In examining the governance structure there is a clear linkage between the client (local authority), the project organisations and the various schools and stakeholders. The lines of interactions can be vital to enable better understanding of the respective schools authority's vision for learning environments.

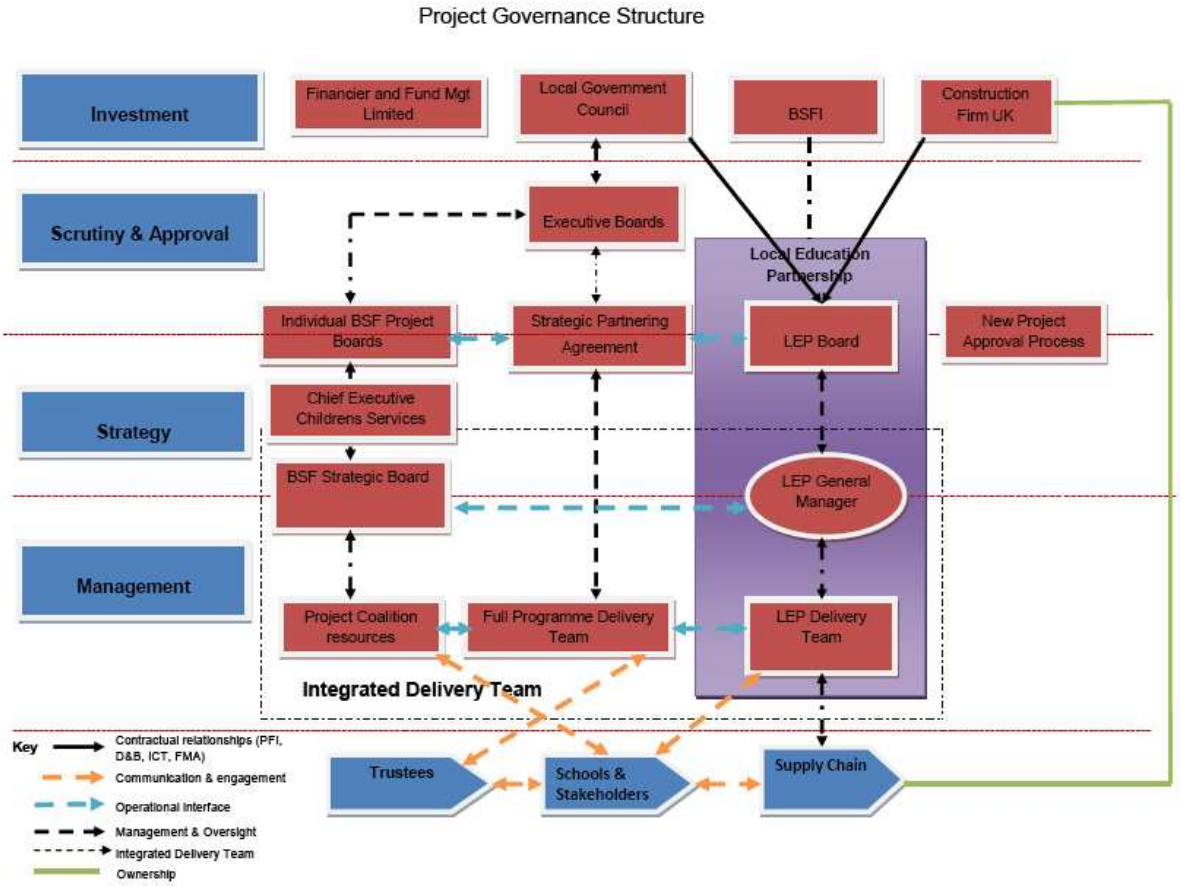

Fig 1 the BSF delivery project governance structure

The governance structure has been able to align project resources, control and co-ordinate all project activities at the project level of the BSF programme. The implication is that it facilitates accountability and transparency within the BSF delivery framework. This is significant for PPP/PFI projects because efficiency is encouraged and the project supply chain is integrated through the governance structure.

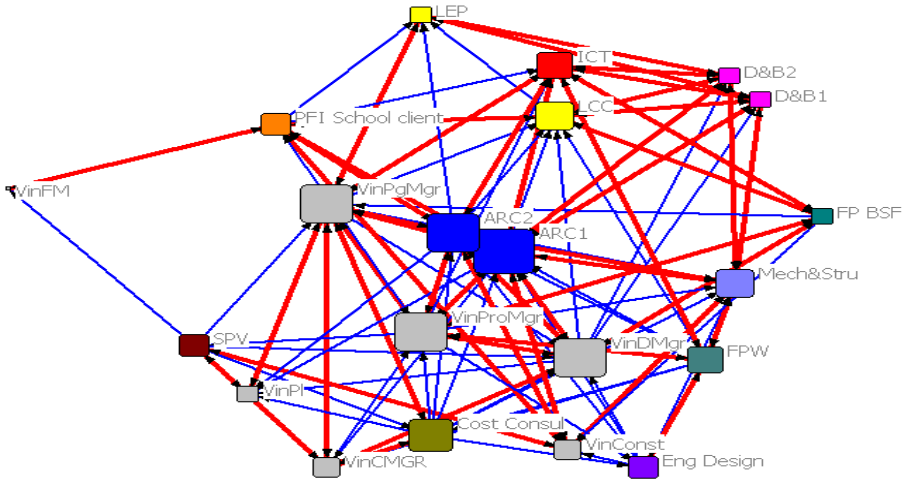

Fig 2 Information exchange network

Table 1 information exchange network -HubAuth

Key	Network population	Hub	Authority
VinPgMgr	Programme Manager	0.359	0.256
Eng Design	Engineering Design Company	0.197	0.111
VinConst	Construction Company	0.151	0.201
D&B1	Design and Build Schools	0.181	0.137
D&B2	Design and Build Schools	0.181	0.137
VinFM	Facilities management firm	0.019	0.048
VinDMgr	Design manager	0.255	0.291
LEP	Local Education Partnership	0.067	0.167
LCC	Local City Council	0.088	0.295
FPW	Full Programme of Works	0.288	0.103
SPV	Special Purpose Vehicle	0.170	0.072
VinCMGR	Cost Manager	0.128	0.217
Cost Consul	Cost consulting firm	0.295	0.119
VinPl	Planning manager	0.032	0.220
Mech&Stru	Mechanical & Structural firm	0.154	0.329
FP BSF	Full programme of BSF	0.204	0.102
PFI school Client	School delivery through PFI	0.208	0.154
VinProMgr	Project Manager	0.297	0.276
ICT	ICT provider	0.174	0.300
ARC1	Architectural firm	0.354	0.345
ARC2	Architectural firm	0.313	0.299

Fig 2 and Table 1 shows information exchange network of project actors and their centrality values. The values of each project actor in the exchange are relatively moderate in centrality. A closer look at Fig 2 shows extensive information exchanges between project actors within the project network. It also illustrates a well connected project team. The connectivity of actors in construction supply chain has been argued to be vital (Nicolini et al., 2001) for information flow. Hence, 'degree centrality' was used to observe the information network to see how connected project actors are to each other. Degree centrality measures network activities. Furthermore, to further calculate the centrality of actors in the project delivery network a measure referred to as Hubs and Authorities centrality was used. It measures how connected an actor is to the well connected. There are two scores for each actor, a hub and an authority. A high hub actor points to many good authorities and a high authority actor receives from many good hubs (Borgatti et al., 2002).

A significant inference from this network analysis is that notwithstanding the separation of design, construction and other project activities within the network information sharing was not hindered. One significant factor for this is that the governance system enhanced cooperation and diminished behavioural uncertainty. As such the ties formed facilitated the exchange of information. The data analysis also demonstrate that client and project teams' interface is important to successfully manage BSF/PFI projects (Pryke and Smyth, 2006, Smyth and Edkins, 2007). It implies that project governance structures that bind and bond team members together are an essential approach to generate knowledge. Although, the case study is based on a single case study it might be concluded that the project governance structure contributed to project actors' coordination and communication within the integrated delivery team.

6 Conclusion

So far the social network analysis has shown that the connectedness of project partners is highly significant in facilitating knowledge sharing in construction and engineering projects. The development and establishment of a governance system in projects can assist in aligning the resources and independencies of project partners. However, to support this assertion the findings of Johnston and Gudergan (2007) provide important lessons for organisations and PPP/PFI practitioners of the importance of project governance to improve project performance. The research revealed that to a greater extent the failure of the projects they examined was attributed to weak governance structure.

Therefore, the ability to plan and to manage the technical components of construction projects such as the tasks and resources; and the ability of project partners to effectively develop into a high performance team (Chinowsky et al., 2008) may depend on how the project governance is framed taking into consideration the characteristics of the project.

Overall, the BSF projects are delivered through project consortiums or Special Purpose Vehicles (SPVs). The project network structure can as well have significant influence on the exchange relationships of project partners. The project organisations are mutually dependent on each other to achieve the BSF programme objective. The implication of the dependencies is that it binds project actors' to continually interact to share knowledge/information to enhance the project delivery process. As illustrated in Fig 2, the information network has strong connections that link the various teams. Therefore, the point this paper is conveying is that project governance is highly significant and should be an integral part of the BSF delivery process. In addition, SNA can be used by project-based organisations to monitor their information exchange relationships. For example if the outcomes of SNA suggests that the project teams' information exchange relationships are weak, the project-based organisation may introduce supportive mechanisms to improve interaction between project actors.

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Understanding the conditions of trust in the ALT and AMT relationships in project alliancing

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Abstract:
This research aims to develop a framework to explore the conditions of trust between the ALT and AMT relationship within project alliancing. This research also aims to develop a robust trust framework which can improve the understanding of the theory to support trust in alliancing, in particular the ALT and AMT relationship to improve project success factors. Research in trust within the construction industry has not yet examined how the relational signals within the five situations in the normative framework identified by Siegwart Lindenberg affect the level of trustworthiness between partners. More research is necessary to explore potential frameworks that can be used as the basis for future research in trust. Data from previous research in the performance of alliance has been used to verify the proposed framework. The framework will be developed in the ALT and AMT relationship to improve project success factors within the alliance. The originality of this research is trying to understand trust in the context of project alliancing in Australia as there are an increasing number of construction projects using the alliancing procurement method. Additionally, this research is examining the conditions of trust from the ALT and AMT teams specifically formed for the collaboration of project alliancing.

Keywords:
project alliancing, procurement, trust

1 Introduction

Research on project alliancing in Australia have revealed that communication and trust between the Alliance Leadership Team (ALT) and Alliance Management Team (AMT) was a major issue that impacted on the effectiveness of the alliance (Mills & Harley 2010). The precondition for project alliancing to be successful is to develop a trust framework that allows the ALT and AMT to deliver superior project management coordination.

An empirical study (Smyth, 2005) of construction projects demonstrated that performance derived from trust was related to individuals rather than project factors. Conditions of trust have been examined for clients/consultants and contractors and

results have found (Wong *et al*, 2003) that trusting behaviours on behalf of contractors has a significant correlation with the trust level of contractors as perceived by client/consultant. Contractors are more cautious towards trusting behaviours by the client which means that contractors trust less than the clients therefore research should concentrate on building trust from the contractor perspective to improve the client relationship.

Furthermore, other results (Smyth, 2005) have indicated that clients do not have extremely high expectations but this does not translate that they are satisfied with the service delivered by the contractor (Smyth, 2005).

This research aims to develop a framework to explore the conditions of trust between AMT and ALT relationship within project alliancing. This research also aims to develop a robust trust framework which can improve the understanding of the theory to support trust in alliancing, in particular the AMT and ALT relationship to improve project success factors. The results will demonstrate the conditions of trust which affect cooperative attitude under the five situations identified by Siegwart Lindenberg (2000) which affect the levels of trust and how these conditions of trust that can be embedded in the ALT and AMT teams for project alliancing are impacted.

1.1 Nature of Relationship contracting

Two influential reports on the review of the construction industry of U.K. was published in 1994; *The Latham Report-Constructing the Team* and *The Egan Report-Rethinking Construction* (Cheung, 2007). The Latham report recommended that contracts should be founded upon principles of fairness, mutual trust and teamwork rather than mistrust and confrontation (Latham, 1994). The Egan report identified fragmentation as an issue to procurement practice and suggested that partnering and collaborative efforts should be used to resolve problems (Egan, 1998).

The paradigm for cooperative contracting has continued to evolve from traditional procurement to partnering and now to project alliancing. Each of the procurement contracting models is a risk management strategy and an attempt to mitigate adversarial attitude between project participants. In the traditional model, owners try to transfer as much of the risk as possible to others (Ross,1999).

Moore (1999) suggests that partnering is about management of relationships that are trust-based. Successful partnering requires mutual trust, effective communication, commitment from senior management, clear understanding of different parties‟ roles, consistency of objectives and flexibility to change. Factors which hinder the successful use of partnering are: non-compromising tendering process, poor perceptions of the partnering process, lack of knowledge and skill to adopt partnering as well as non-commitment of parties (Cheung *et al*, 2003). Unbalanced risk allocations in traditional contract provisions create adversarial relationships between project participants (Cheung *et al,* 2003). Contract provisions are often rigidly interpreted without taking into account of parties‟ needs and construction difficulties (Cheung *et al,* 2003; Piper, 2001). When liability is uncertain, responsibilities are allocated to parties on the basis of administrative conveniences which can hinder problem solving and the tendency for parties to revert to their contractual positions (Cheung *et al,* 2003). For the reasons stated partnering may not be the best procurement option due to the inherent conflicting objectives of the contracting parties (Cheung *et al,* 2003).

Project alliancing is used to deliver large complex projects in the field of resources, infrastructure and building (Ross, 1999). Complex projects have higher uncertainty in risks, diverse stakeholder interests, changing business, political influence and rapid technological change. These circumstances cannot be smoothly dealt with by the traditional risk-transfer contracting models including Public-Private partnerships (PPP) (Ross, 1999).

1.2 Nature of project alliancing

The Construction Industry Institute Australia (CIIA 1996) and Larson and Drexler (1997) suggested that developing trust was pivotal to the success of project partnering. Project alliancing in relational contracting is similar to partnering in that an entity is formed for the purpose of achieving mutual goals in the delivery of the project but this method is mainly used for infrastructure and mega projects where there is high level of complexity as well as opportunity for innovation therefore, more research is needed to explore how trust affects the AMT and ALT teams which are formed specifically for the purpose of project alliancing.

In alliancing each alliance member places their profit margin and reward structure "at risk" this the entire alliance entity either benefits together or lose all (Walker *et al*, 2002). This then creates a motivation to collaborate and cooperate within the alliance relationship. Alliances work on the principles of mutual trust, commitment and communication to reduce conflict and enhance productivity and overall performance (Lee & Cavusgil, 2006).

Project alliancing differs from partnering in that it achieves unity of purpose between project teams. In an alliance, the project price is developed by a pool of professionals through innovation in design with agreed risk and reward sharing arrangement (Walker *et al*, 2002). Cost savings are expected from improved value for money through the leverage of skills and expertise of the alliance partners in innovative construction from project conception through to project delivery. The idea relies on a "best value" outcome rather than least expensive cost or quickest project outcome (Walker *et al*, 2002).

The agreed project price is determined only when the alliance partners have been selected. Contract variations from scope changes does not substantially arise due to the alliance's work in pre-planning and defining the project scope before agreeing the risk and reward arrangements (Walker *et al*, 2002). Variations that do occur must demonstrate substantial changes in the project scope and on site variations are managed by the alliance team.

There are two teams which are formed in an alliance: The Alliance Management Team (AMT) in charge of the operation of the project and the The Alliance Leadership Team (ALT) team which are in charge of the strategic decision making of the project as well as supporting the AMT team (Mills & Harley, 2010). The ALT team includes the client and determines the Turn Out Cost (TOC), which is the agreed amount the building would cost to deliver (Walker *et al*, 2002). The AMT would include a personnel from the contractor's side. Both AMT and ALT teams would have representatives from both the client and contactors' side to facilitate equity, knowledge as well as collaborative spirit in decision making.

A base target cost is established from an agreement on a risk and reward formula where an open-book accounting approach is undertaken to determine cost reimbursement

together with agreed and verified site management costs (Walker *et al,* 2002). The firm's profit margin (determined from audited figures over an agreed period) is placed as an "at risk" component to ensure the agreed project costs are met. Bonuses are shared by all parties to encourage further innovation (Walker, *et al,* 2002).

Purcell and Ross (2005) consider that project alliancing is generally suitable for projects which are complex, high-risks, have strict time lines, myriad of stakeholders issues and external threats.

Infrastructure projects involve a high degree of integration between design, construction and operations groups (Mills & Harley, 2010). The intense integration of the alliance members require excellent communication skills at a personal, business and operational level (Walker *et al,* 2002). Research on project alliancing in Australia have revealed that communication and trust between the Alliance Leadership Team (ALT) and Alliance Management Team (AMT) was a major issue that impacted on the effectiveness of the alliance (Mills & Harley, 2010). The precondition for project alliancing to be successful is to develop a trust framework that allows the ALT and AMT to deliver superior project management coordination.

2 Trust in Construction Procurement

Construction is a highly risky activity where there are high levels of trust and distrust occurring simultaneously due to uncertainties in the time restraint, resource investment and complexity of the design and build of each project (She, 2008). External factors such as escalating prices of raw material, changes in building legislations and regulations, community protest, adverse weather conditions as well as macroeconomic changes in the financial market (interest rates) can affect the original plans of the project (She *et al,* 2010). In addition, internal interruptions such as management restructuring, industrial relation disputes, site issues, personnel changes, significant documentation changes or errors, incompatibility personality classes between contractor and consultant resulting to conflicts can also create delays, disputes and obstacles to the timely completion of the project within the specified quality, agreed cost and any other criteria which may have been documented in the contract (She, 2008).

The nature of construction activity as well as industry dynamics forces everyone involved in the project to make shrewd calculations on potential gain versus loss and this calculation is largely dependent on the belief of ones' own judgment of the other party's behaviour in the collaboration under risky situations as discussed above (She, 2008). In another words, trust for construction personnel is a psychological construct which is in a constant state of change depending on the circumstances that arises therefore, it is naive to postulate that trust between parties without any element of mistrust suspicion occurring at the same can be possible in the delivery process of the project (Rousseau *et al*, 1998; Lindenberg, 2000).

2.1 Definition of trust

Trust has been defined by different scholars over the years as predictability on human behaviour (Cheung *et al,* 2003). For the nature of the construction industry as discussed above, the following definition of trust by Robinson's (1996) is most applicable to this research which is investigating the stability of trust within the ALT and AMT relationship in project alliancing.

> " Trust is "one's ***expectations, assumptions***, or ***beliefs*** about the ***likelihood*** that another's future actions will be beneficial, favourable, or at least ***not detrimental to one's interest***" (Robinson, 1996).

Robinson's (1996) definition of trust isn't the most optimistic outlook but it implies that even if parties are not absolutely considerate of each other's interests at least their actions will not be detrimental to the extent that it would break the partnership of shared goals. This allows legitimate inherent mistrust to co-exist with trust and so it is the stability of trust at any given point of time or situation that can be measured to determine the intention of future behaviour.

There are several advantages of trust in construction project relationship. According to Karlsen & Mssaoud (2008), the advantages of having trust are time saving, solving problems informally, encourage motivation for cooperation, openness between parties in sharing knowledge, being honest, predicting more accurate risks within the project as well as allowing direct speech to occur.

2.2 Volatility of trust in five situations of any cooperative project (Lindenberg, 2000)

A normative frame is important for trust in a business relationship. It largely suspends opportunistic behaviour when interests are aligned. Legitimate mistrust is the perceived likelihood that a potential or actual transaction partner's interests are not aligned with one's own interests and that the partner's actions are driven by a salient gain frame such that relational and normative considerations are pushed into the background (Lindenberg, 2000). Mistrust is different from distrust. Scholars understand distrust to be the "expectation that others will not act in one's best interests, even engaging in potentially injurious behaviour (Govier, 1994;Lewicki & McAllister, 1998) and the 'expectation that capable and responsible behaviour from specific individuals will not be forthcoming (Barber, 1983;Lewicki & McAllister, 1998).

Distrust is when a party has a negative reaction towards another party's action or transmitted message regardless of the actual intention of the party as it is doubting someone's honesty. Mistrust is when there is lack of confidence or doubt as there may be a hidden agenda but not necessarily imply that there is serious malicious suspicion. Mistrust can occur in a positive state of a relationship and may even assist in the building of trust as parties may communicate more openly regarding potential issues before the commencement of the partnership but distrust is a negative attitude and signifies that there is an issue or conflict that needs to be resolved in a trustworthy manner or else all endeavours to build trust within a relationship would be rendered ineffective.

In the highly adversarial construction industry, there are currently high levels of distrust beyond legitimate inherent mistrust. It is distrust which is hindering trust building. There are five situations identified by Siegwart Lindenberg (2000) which ask for sacrifice for the relation. These situations are:

2.2.1 Common good situation:

both parties will contribute to the common good even if one party could freeride (the minimal amount of contribution expected for solidary behaviour varies in terms of money, effort and time etc

2.2.2 Sharing situation:

if there are joint divisible benefits and costs and if one party is the one who can divide them, that party will not seek to maximise what he gets from the benefit and minimise what he gets from the costs but take his "fair share" of both (what the "fair share" is varies).

2.2.3 Need situation:

one party will help the other party in times of need (what constitutes need and how much help is minimally expected for solidary behaviour varies)

2.2.4 Breach temptation:

one party refrain from hurting the other party even at a cost to himself (the minimal amount of cost expected for solidary behaviour varies)

2.2.5 Mishap situation:

acts can be intended solidary but factually turn out to go against the expectation of solidary behaviour. In that case, one party will show that the meant to act differently, that he feels sorry that it turned out that way, and he will make amends if the mishap has caused damage to others. Also if that party knows in advance that he will not be able to keep to the agreement, he will warn others in advance, so that they can mitigate the damage.

People in a normative frame want to act "appropriately" therefore, they want to follow the norms that are appropriate in these situations and act according to these norms (Lindenberg, 2000).. This way, they will always come to the same expectations in each of the five solidarity situations. Behaviour in these five situations is important for the relational signals it gives off. If all these signals are positive, the normative is stable and the partner is trustworthy (Wielers, 1993). Partners can monitor other behaviour via these relational signals and reduce monitoring costs.

In an empirical research that has been conducted by Mills & Harley (2010) examining the perception of alliance performance in public sector infrastructure, a range of factors has been identified where AMT and ALT performed above and below expectations. Overall, the respondents were more critical of the performance of the ALT with more than two thirds of respondents believing that the ALT did not perform above expectations. The results found that ALT need to perform not only at strategic levels but also be proactively involved in project issues and providing supportive operational environments to delivery successful project management (Mills & Harley, 2010). It would be beneficial to examine the specific issues under the five situations in light of the inherent mistrust issues which co-exists in each case.

2.3 Conditions of Trust- Performance trust, permeability trust, System Based trust and Relational Bonding trust

Wong *et al*, (2004) used fourteen attributes (conditions or criteria) of trust to determine the four factors (categories) of trust which affected partnering projects in Hong Kong. The survey was sent out to private and public sector developers, consultant firms and contractor firms. Results from this study demonstrated that 3 of the 4 factors were important to Developers/Consultant/Contractor; namely performance trust, permeability trust and system based trust.

2.3.1 Performance trust

(performance and permeability can build trust but is dependent upon change in attitude in system-based trust). Competence trust defined to be based on one's perception of the other's capacity to perform (Zaghloul & Hartman, 2003) can also be known as performance trust.

The trust attributes or trust conditions according to Wong *et al*, (2005a) which determine performance trust are: competence, problem solving, unity, alignment, respect.

2.3.2 Permeability trust:

openness to sharing information. Can also be known as integrity trust whichis found upon one's perception of the other's attitude to act ethically and be motivated not to take one's advantage (Wong & Cheung, 2004).

The trust attributes or trust conditions which determine permeability trust according to Wong *et al*, (2005a) are: communication, openness, information flow and financial.

2.3.3 System-based trust:

(most important). Can also be known as institution-based trust legal systems, conflict management and cooperation, systems regulating education and professional practice were suggested as tools to sharp trust in institutions (Rousseau *et al*, 1998).

The trust attributes or trust conditions which determine system-based trust according to Wong *et al*, (2005a) are: Adopt ADR, reputation and satisfactory terms.

2.3.4 Relational trust:

(less relevant to the construction industry): trust arisen by continual interactions between individuals. Emotions and personal attachments are also influential to the trusting relationship (Rousseau *et al*, 1998).

The trust attributes or trust conditions which determine relational bonding trust according to Wong *et al*, (2005a) are: compatibility and long- term relations.

It would be beneficial to examine the level of these four types of trust under the five situations identified by Lindenberg (2000). The results would demonstrate the strength of the three type of trust and highlight the prominent conditions of each type of trust. This will assist project managers to predict the likely future behaviour of their project partners as well as team colleagues with an understanding of *why* a behaviour or reaction has or will occur under the condition of trust or mistrust.

3 Research aims

This research aims to develop a framework to explore the conditions of trust between ALT and AMT relationship within project alliancing. This research also aims to develop a robust trust framework which can improve the understanding of the theory to support trust in alliancing, in particular the ALT and AMT relationship to improve project success factors

3.1 Research objectives

- Find the conditions of trust from the perspectives of the ALT and AMT teams of project alliancing which encourage cooperative attitude under the five situations in the normative framework identified by Siegwart Lindenberg (2000).
- Develop a trust framework that demonstrates the how the conditions of trust can be embedded in the ALT and AMT relationship to improve project success factors performance whilst allowing inherent mistrust to co-exist.

4 Research Methodology

Yin's (2003) model of assessing which methodology is best appropriate for the research questions investigated suggests that if a question is endeavoring to find out how or why of a particular phenomenon and there is no need for the control of events but there is a focus on contemporary events then a case study approach is the best method for research. For this research, case study approach will be the best approach to examining the perceptions of trust in relationships as project alliacning is unique in nature, scope and particularise so generalisation from quantitative analysis would not justify the benefits of qualitative research, particularly in complex situations some of the critical factors which may have an impact on the conditions of trust and confidence in relationships. Case studies can also highlight the preconditions which are important when interpreting the results.

The Soft System Methodology (SSM) Approach will be used to develop a trust framework. There may be some inherent mistrusting behaviour which would always co-exist with trusting behaviours therefore the issues relating to trust may not be easily defined as different stakeholders would have very different views on what constitutes a problem in construction. This makes the soft system approach an appropriate methodology to explore trust issues within relationship as SSM treats the notion of a system as an epistemological rather than an ontological entity meaning that there are different ways of understanding what is going on rather than defining which descriptions are right or wrong (Checkland & Poulter, 2006).

5 Development of trust framework based on Lindenberg (2000)

The factors of trust which are relevant to this research are: Performance trust, permeability trust and System based trust. Additionally, the conditions of trust identified by Thompson (1997) are also relevant namely, receptivity, promise-fulfilment, consistency/experience, integrity, loyalty, fairness, openness, competence, discretion, availability.

Using the issues that has been identified in Mills and Harley (2010) report on the performance of Project Alliancing, the trust classifications and the levels of trust which follows in the following four tables:

Table 5.1 Classification of ALT's below average performance areas into trust types and situation as identified by Siegwart Lindenberg (2000).

Situation as identified by Siegwart Lindenberg (2000)	Trust types	ALT performing BELOW expectations
Mishap situation	Performance trust	Bogged down in detail-not enough strategic thinking
Need situation	Performance trust	Not necessarily wanting to get involved in the micro management issues that were impacting on the function of the AMT
Common Good situation	Performance trust/ Permeability trust	Areas of improvement include risk management, forecasting and earned value reporting, schedule recovery during construction, safety
Need situation	Performance trust	The ALT provided very little real/material leadership or onsite support to the AMT. The AMT had to consistently seek out members of the ALT for support and assistance, with little proactive response back from the ALT
Breach Temptation situation	System based trust	Governance

Table 5.1 demonstrates that for mishap and need situation, performance trust is the trust that requires further understanding and improvement from the ALT team within the alliance relationship. For common good situation, both performance trust and permeability trust require improvement and under breach temptation situation, system based trust require further improvement.

Table 5.2 Classification of AMT's below average performance areas into trust types and situation as identified by Siegwart Lindenberg (2000).

Situation as identified by Siegwart Lindenberg (2000)	Trust types	AMT performing BELOW expectations
Need situation have	Performance trust	Capacity to appropriate Change control resources on board when needed
Common Good situation	Performance trust	Community stakeholder management
Mishap situation	Performance trust	Setting safety standards in regard to protection of citizens on and around construction site
Sharing situation/ Common Good situation	Performance trust	Improvement required in the area of cost control
Common Good situation	Performance trust	Lack of in-house schedule programming skills
Mishap situation/ Breach Temptation situation	System based trust	Too caught up in Alliance behaviour and not concentrating on the contract and its relationships
Sharing situation/ Breach Temptation situation	Performance trust / System based trust	Verification model for the D&C stages
Common Good situation/ Mishap situation	Permeability trust	Improving information flow to the ALT

Table 5.2 demonstrates that for need and sharing situations, performance trust requires further understanding and improvement from the AMT team within the alliance relationship. For mishap situation, performance trust, permeability trust as well as system based trust require improvement. For common good situation, both performance trust and permeability trust require improvement and under breach temptation situation, system based trust is the issue.

Lindenberg's (2000) framework with the five situations is reflected in the above two tables which demonstrates that a theory can be developed regarding the role of trust within the ALT and AMT relationship. The issues identified by Mills and Harley (2010) demonstrate that performance and system based trust are the main type of trust that require further understanding and improvement for alliancing projects. It is interesting that performance trust affects all five situations. Trust is vital for the effectiveness of Alliances. Little research has been undertaken in this area therefore Lindenberg's framework can convey deeper insights into the complexity of trust and mistrust.

6 Limitations

This research will relie on in-depth investigation of small sample size of case study projects specific to Australia only with a focus on public sector infrastructure projects.

7 Conclusion

This paper introduces a conceptual trust framework to examine the trust between ALT and AMT teams for project alliancing based on Siegwart Lindenberg's (2000) five situation normative framework. Data from previous research in the performance of alliance has been used to verify the proposed framework. This research is trying to understand trust in the context of project alliancing in Australia as there are an increasing number of construction projects using the alliancing procurement method. The framework will be developed to improve project success factors within the alliance.

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Project Leaders' Assessment of the Contribution of Contractors to Delay in the Delivery of Federal Government Projects in Nigeria

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Abstract:
Projects developed by the Federal Government of Nigeria (FGN) are very crucial to the economy of the nation. The failure of contractors to deliver them on time has serious negative implications on the growth of the Nigerian economy. This study investigates the factors that affect contractors' contribution to delay in the delivery of FGN projects. The objectives are to evaluate the relative effects and significant difference in the effects of selected factors that affect the contribution of indigenous and expatriate contractors to delay in the delivery of FGN projects. To achieve these objectives, a field survey involving a sample of 78 project leaders was conducted. Data were collected using structured questionnaires and analysed using percentage, Relative Effect Index (REI) and t-tests. The results reveal that the effects of the factors that affect the contribution of indigenous and expatriate contractors to delay do not differ. It was equally discovered that material management problems, Plants and Equipment (P&E) management problems, poor construction planning and scheduling, poor communication and coordination, delay in mobilising to site and inadequate provision of required utilities on site which are contractor related rank high in factors that contribute to delay in FGN projects. The major conclusions are that the effects of the factors on delay in projects executed by the two categories of contractors are the same and that several contractor-related factors found in previous studies to be responsible for project delay still persist in the delivery of FGN projects. The main suggestions are that the contractors should adopt effective and efficient material and P&E management strategies, effective communication, construction planning and scheduling, avoid delay in mobilising to site and ensure the provision of essential utilities on site.

Keywords:
expatriate contractors, federal government of Nigeria projects, indigenous contractors, project leaders and project outcome.

1 Introduction

Both governments and private organisations commit substantial fund into the development and maintenance of construction projects annually because of their importance and contribution to the development, growth and the achievement of the objectives of every organisation. In developing economies, studies have shown that government is the major financier of construction projects. Wong (2003) maintained that government spending is one of the three major factors that influence the growth of the construction industry in Malaysia. Okpala and Aniekwu (1988) opined that the biggest customer of the construction industry in most developing countries is the government. In Nigeria, the dominance of government as the main promoter of

construction projects is highly pronounced as the private sector even depends on government expenditure. The Federal Government of Nigeria (FGN) according to the Nigerian constitution is made up of three arms namely: Executive, Legislative and Judiciary (Federal Government of Nigeria, 1999). The FGN Appropriation Acts from January 2000 to December 2008 showed that the sum of N5.036 trillion (43.5%) was appropriated for capital expenditure while the sum of N6.545 trillion (56.5%) was appropriated for recurrent expenditure (Federal Government of Nigeria, 2009). The figure indicated that the development of construction projects depends mostly on public sector funding.

The rate of completion of these projects falls considerably below the rate at which they are conceived. Dlakwa and Culpin (1999) opined that the main cause of this phenomenon is the delay experienced in the delivery of the projects. The importance of time in construction projects cannot be over-emphasised. Scott (1993) opined that the completion of construction projects within prescribed time scale is an important measure of project success. Studies (Frimpong *et al.* (2003), Williams (2003) and Luu *et al.* (2003) described time as one of the three common and most important criteria for project success. Studies conducted by Okpala and Aniekwu, (1988) and Assaf and Al-Heiji (2006) showed that time-overrun is an existing phenomenon and a major problem in the delivery of construction projects. Mansfield *et al.* (1994) found excessive time-overruns in completed projects executed by the Federal Ministry of Works and Housing (FMWH) the ministry responsible for the implementation of FGN projects. Elinwa and Uba (2001) equally found that in Nigeria, time and cost overruns were regarded as the most important causes of project abandonment and contractors' failure.

Delay in project delivery has been acknowledged as a global phenomenon. Studies on the problem are focussed on the causes and have identified several causes of the problem (Okpala and Aniekwu, 1988; Dlakwa and Culpin, 1999; Mansfield *et al.* 1994; Odeyinka and Yusif, 1997; Kaming *et al.* 1997; Radujkovic, 1999; Odeh and Battaineh, 2002). Some of these studies (Aibinu and Odeyinka, 2006) recognised the role of the parties to the delivery of projects on the problem by categorising the factors according to the parties responsible. The notable parties identified are client, consultants, suppliers and contractors. Among these parties, the contribution of contractors is significant because the party is the major player at the construction stage of a project where the works are executed and delay has serious cost implications. A study conducted by Ogunlana *et al.* (1996) showed that the blame for most project delays was laid on contractors. Another study conducted by Abd-Majid and McCaffer (1998) showed that 50% of the delays can be categorised as non-excusable delays for which contractors were responsible. The findings of these studies tend to confirm that contractors are major contributors to project delay and that the problem of project delay in the industry could be solved by focusing on the factors that affect contractors' contribution to project delay.

Several studies (Iyagba, 1999; Oni, 2001; Eze, 2004; Idoro, 2004 & 2007; Okafor, 2005) have found that Nigerian contractors are classified into two groups namely: indigenous and expatriates. Indigenous contractors refer to construction firms that are fully owned and managed by Nigerians while expatriate contractors refer to construction firms that are jointly owned by Nigerians and foreigners but their management is fully controlled by expatriates. Ogunpola (1984), Olateju (1991), Samuel (1999) and Idoro (2004) found that expatriate contractors are few in number, operate on a large scale and execute a major proportion of the value of contracts in Nigeria while indigenous contractors considerably outnumber their expatriate

counterparts; operate on small and medium scales but are responsible for a very small proportion of the value of contracts executed in Nigeria.

These two categories of contractors are responsible for the execution of projects procured by the FGN and their activities contribute in no small measure to the problem of delay in the delivery of FGN projects. However, there are several factors that are responsible for the contribution of the contractors to delay in the delivery of the projects and their identification is the first step in the effort to solve the problem of delayed delivery of FGN projects. Chan (2002) opined that the first step when addressing a problem is to identify its causes thereafter, corrective actions can be taken. This study therefore attempts to examine how indigenous and expatriate contractors contribute to delay in the delivery of FGN projects by investigating the factors that affect their contributions to delay in the delivery time of the projects. The objectives are to evaluate the relative effects and significant difference in the effects of selected factors that affect the contribution of indigenous and expatriate contractors to delay in the delivery of projects procured by the FGN.

2 Contractors' Contribution to Delay in Project Delivery

It has been established in studies that contractors are major contributors to project delay. Al-Khalil and Al-Ghafly (1999) identified contractors' performance as one of the most important and common causes of delay in public utility projects in Saudi Arabia. Several factors make contractors to contribute to project delay. In a study, Chan and Kumaraswamy (1997) identified poor supervision on the part of contractors as one of the principal delay factors. In another study, Kumarawamy and Chan (1998) found poor site management and supervision, low speed of decision making involving all project teams and inadequate contractors' experience to be three of the six common significant factors that caused delay in both building and civil engineering projects. Kaming *et al.* (1997) identified poor labour productivity, inadequate planning and resources which are contractor-related factors as two of the major causes of project delay. Late delivery of materials was found to be one of the seven factors responsible for delay in 106 out of 130 public projects surveyed. Odeyinka and Yusif (1997) also identified contractors' financial difficulties, material management problem, planning and scheduling problem, inadequate site inspection, equipment management problems and shortage of manpower which were traced to contractors as the major the major causes of delay in the delivery of housing projects in Nigeria. The study by Aibinu and Odeyinka (2006) supported this claim when it found that contractors financial difficulties, planning and scheduling problem, equipment breakdown and maintenance problem as some of the high ranking causes of project delay in Nigeria. Other causes of project delay for which contractors are responsible include shortages of materials (Mansfield *et al.*, 1994), choice of construction method, management of construction resources, schedule management, supervision and control, and communication (Meeampol and Ogunlana, 2006).

3 Research studies

A questionnaire survey design approach was adopted in the study. In the approach, a field survey involving projects procured by the FGN located in the 36 states and the Federal Capital Territory (FCT) in Nigeria in 2008 fiscal year was carried out in early 2009. A preliminary survey was first conducted from which 115 projects made up of 69 projects executed by indigenous contractors and 46 projects executed by expatriate contractors were identified and adopted as the population frame of the study.

Two categories of variables namely: construction contractors and project delay factors were used in the study. The two categories of contractors in Nigeria namely: indigenous and expatriate constituted construction contractors. Twenty-two factors namely: delay in procurement and delivery of materials, shortage of materials, use of inferior materials, lack of utilities (water, electricity, telephone, etc) on site, poor communication and coordination by contractors, Plant & Equipment (P&E) breakdown, shortage of P&E, low productivity of P&E, delay in mobilising to site, ineffective planning and scheduling, delay in sub-contractors' work, poor communication with other parties, poor site management, inappropriate construction methods, use of unskilled workers, conflict between contractor and consultants, use of unqualified technical staff by contractor, shortage of labour, low productivity of labour, accidents during construction and rework due to errors in construction were used. The factors were identified from previous studies and an interview with the respondents conducted during the preliminary survey.

Two hypotheses were postulated in the attempt to achieve the objectives of the study. The first hypothesis states that the ranks of the effects of selected factors on the contribution of indigenous and expatriate contractors to delay in FGN projects are not significantly different. The second hypothesis states that the effects of selected factors on the contribution of indigenous and expatriate contractors in Nigeria to delay in the delivery of FGN projects are not significantly the same. The two hypotheses were postulated to ascertain whether or not the effects of the factors are the same in projects executed by the two categories of contractors.

Data were collected on the project characteristics (ownership, project, contract, procurement and contractor types) and the respondents' assessment of the effect of 22 factors on the level of contribution of indigenous and expatriate contractors to delay in the delivery of the projects. The respondents' assessments were measured on a 5 point Likert-type scale: nil, low, moderate, high and very high. The ranks were scored 1, 2, 3, 4, and 5 respectively.

The data were collected using structured questionnaires which were administered on engineers and builders who were the heads of contractors' site staff on the projects. From the population frame, 78 projects made up of 48 projects executed by indigenous contractors and 30 projects executed by expatriate contractors were selected by stratified random sampling to form the study sample. The sampling option was adopted to ensure that the two categories of contractors were covered in the study. Data collected on the characteristics of the projects sampled were analysed using percentage. The relative effects of delay factors were analysed using Relative Effect Index (REI) which is similar to Relative Importance Index (RII). REI was derived as the total score or sum divided by the number of respondents. The hypotheses of the study were tested using Chi-square test and t-test.

4 Results

The results of the analysis of data collected are presented as follows:

4.1 Descriptive results of the characteristics of projects used for the study

The characteristics of the projects sampled were investigated. For this purpose, five project characteristics namely: project ownership, type, contract type, procurement type and contractor type were analysed. The results are presented in Table 1.

Table 1 Descriptive results of the percentage distribution of the projects used for the study

Project characteristic	N	%	Project characteristic	N	%
Project Ownership			**Project Type**		
Executive	62	88.6	Building	56	73.7
Judiciary	6	8.6	Road	12	15.8
Legislative	2	2.9	Water	4	5.6
Total	70	100	Electricity	4	5.6
Contractor Type			Total	76	100
Indigenous	48	61.5	**Procurement Method**		
Expatriate	30	38.5	Design-Bid-Build	60	78.9
Total	78	100	Design-Build	12	15.8
Contract Type			Direct Labour	2	2.6
Fluctuating sum	28	36.8	Labour-only	2	2.6
Lump sum	26	34.2	Total	76	100
Fixed sum	22	29.0			
Total	76	100			

N=Number

Table 1 reveals that projects procured by the three arms of the FGN namely: executive, legislative and judiciary were covered in the study however, projects procured by the executive arm of FGN constituted the majority. Table 1 shows that four types of projects namely: building, road, water and electricity projects were covered by the study. However, building projects constituted the majority.

The results in Table 1 reveal that the projects sampled were executed by three types of contract namely: lump sum, fixed sum and fluctuating sum contracts however; fluctuating sum is the most used contract type, followed by lump sum contract and fixed sum contract. The projects sampled were procured by four methods namely: design-bid-build, design-build, direct labour and labour-only options however, majority of the projects were procured by traditional or design-bid-build method. Projects executed by the two categories of contractors in Nigeria namely: indigenous and expatriate contractors were covered by the study but majority of the projects was executed by indigenous contractors.

4.2 Factors affecting the Contribution of indigenous and expatriate contractors to time-overrun in FGN projects

The factors that affect the contribution of the two categories of contractors to delay in the delivery of projects procured by FGN were investigated. For this investigation, twenty-two factors listed in Table 2 were selected from delay factors identified from literature and suggested by the respondents through an interview with them during the pilot survey. The respondents were requested to indicate their assessment of the effect of each factor to their contribution to the delay in the projects sampled using 5 point Likert-type scale: nil, low, moderate, high and very high. The ranks were scored 1, 2, 3, 4 and 5 respectively. The Relative Effect Index (REI) similar to Relative Importance Index (RII) of the score of each factor was analysed. The results are presented in Table 2.

Table 2 Ranks of the Relative Effect Index (REI) of factors affecting the contribution of contractors to time-overrun in FGN projects

Factors	Expatriate contractors				Indigenous contractors			
	N	Sum	REI	Rk	N	Sum	REI	Rk
Delay in procurement of materials	30	74	2.47	5	48	140	2.92	1
Lack of utilities on site	30	64	2.13	16	48	136	2.83	2
Poor communication and coordination	30	66	2.20	12	46	128	2.78	3
Delay in delivery of materials to site	30	82	2.73	2	48	128	2.67	4
P&E breakdown	30	80	2.67	3	50	130	2.60	5
Material shortage on site	30	68	2.27	10	48	114	2.48	6
Delay in mobilising to site	30	66	2.20	12	50	124	2.48	6
Ineffective planning & scheduling	30	76	2.53	4	48	118	2.46	8
Delay in sub-contractors' work	30	70	2.33	8	46	112	2.43	9
Shortage of equipment	28	64	2.89	1	50	120	2.40	10
Low productivity of P&E	30	62	2.07	18	50	118	2.36	11
Poor communication with other parties	30	72	2.40	7	46	108	2.35	12
Poor site management	28	68	2.43	6	44	102	2.32	13
Inappropriate construction methods	30	64	2.13	16	46	100	2.17	14
Use of unskilled workers	30	54	1.80	20	50	106	2.12	15
Use of inferior materials	28	50	1.79	21	46	92	2.00	16
Conflict between contractor & consultants	30	70	2.33	8	46	92	2.00	16
Unqualified technical staff by contractor	30	52	1.73	22	46	90	1.96	18
Shortage of labour	30	56	1.87	19	48	94	1.96	18
Low productivity of labour	30	66	2.20	12	46	90	1.96	18
Accidents during construction	30	66	2.20	12	48	88	1.91	21
Rework due to errors during construction	26	58	2.23	11	46	86	1.87	22

N=Number of respondents, P&E=Plant & equipment, REI=Relative Effect Index, Rk=Rank

Table 2 shows that the twenty-two selected project delay parameters vary in effect among the two categories of contractors. While some parameters rank higher in their effects on the contribution of indigenous contractors to project delay than expatriate contractors, others rank higher in their effects on the contribution of expatriate contractors to delay than indigenous contractors. Delay in procurement of materials ranks 1st among the factors affecting the contribution of indigenous contractors but it ranks 5th among the factors that affect the contribution of expatriate contractors to delay. Lack of utilities such as water, electricity, telephone, etc ranks 2nd among the factors that affect the contribution of indigenous contractors while it ranks 16th among the factors that affect the contribution of expatriate contractors to delay. Poor communication/coordination with other project team members by contractor ranks 3rd among factors that affect the contribution of indigenous contractors while it ranks 12th among factors that affect the contribution of expatriate contractors to delay. Delay in delivery of materials to site is discovered to rank 2nd among the factors that affect the contribution of expatriate contractors but it ranks 4th among the factors that affect the contribution of indigenous contractors. Similarly, equipment breakdown ranks 3rd among the factors that affect the contribution of expatriate contractors to delay while it ranks 5th among the factors that affect the contribution of indigenous contractors.

Material shortage on site and delay in mobilising to site rank 6th among indigenous contractors but they rank 10th and 12th among expatriate contractors. Ineffective planning and scheduling of project and delay in subcontractors' work rank 8th and 9th

among indigenous contractors while they rank 14th and 15th among expatriate contractors. Shortage of P&E ranks 1st among expatriate contractors while it ranks 10th among indigenous contractors. The productivity of P&E ranks 11th among indigenous contractors while it ranks 18th among expatriate contractors. Poor communication with other parties and poor site management rank 12th and 13th among indigenous contractors while they rank 17th and 16th among expatriate contractors. The use of inappropriate construction methods ranks 14th among indigenous contractors while it ranks 16th among expatriate contractors. The use of unskilled workers and inferior materials rank 15th and 16th among indigenous contractors but rank 20th and 21st among expatriate contractors. Conflict between contractor and consultants ranks 8th among expatriate contractors while it ranks 16th among indigenous contractors. Low productivity and shortage of labour and the use of unqualified technical staff by contractors rank 18th among indigenous contractors but they rank 12th, 19th and 22nd among expatriate contractors. Delays caused by accidents on site and rework caused by errors in construction rank 21st and 22nd among indigenous contractors but rank 12th and 11th among expatriate contractors.

4.3 Difference between the Ranks of the Effects of selected Factors on the Contribution of Indigenous and Expatriate Contractors to Delay in FGN Projects.

In Table 3, it is discovered that the ranks of the selected factors differ among the two categories of contractors. This finding suggests that the effects of the factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects vary. Further investigation was carried to determine whether or not this variation is significant or not. This investigation involved the test of the first hypothesis which states that the ranks of the effects of selected factors on the contribution of indigenous and expatriate contractors to delay in FGN projects are not significantly different. The ranks of the effects of the selected factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects in Table 3 were compared in the test. The hypothesis was tested using rank correlation with $p \leq 0.05$. The rule for the rejection or non-rejection of the hypothesis is that when the t-calculated > t-table, the test fails to reject the hypothesis but when the value of t-calculated ≤ t-table, the test rejects the hypothesis. The results are presented in Table 4.

Table 4 Results of rank correlation test between the effects of delay factors on the contribution of indigenous and expatriate contractors to project delay

Parameters correlated	R_s	t-cal	t-table	p-value	Decision
Ranks of effects of delay factors on indigenous & expatriates contractors contribution to delay	0.465	2.32	2.09	sig≤0.05	Accepted

R_s=Rank correlation value; t-cal= value of t-calculated.

Table 4 shows that the value of t-calculated is higher than t-table therefore, the test fails to reject the hypothesis. The result implies that the ranks of the effects of the factors on the contributions of the two categories of contractors are not significantly different.

4.4 Difference between the Effects of selected Factors on the Contribution of Indigenous and Expatriate Contractors to Delay in FGN Projects.

Further investigation was carried out to determine whether or not the factors have the same effects on the contribution of the two categories of contractors to delay in the delivery of FGN projects. This involves the test of the second research hypothesis which states that the effects of selected factors on the contribution of indigenous and expatriate

contractors in Nigeria to delay in the delivery of FGN projects are not significantly the same. Data collected on the respondents' assessment of the effects of the factors were used for the test. The hypothesis was tested using the t-test with $p \leq 0.05$. The rule for the rejection or non-rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. The results are presented in Table 5.

Table 5 Results of t-test for difference between the effects of selected factors on the contribution of indigenous and expatriate contractors to delay in FGN projects

Factors	N	t-value	Df	p-value	Decision
Delay in procurement of materials	78	1.766	76	0.081	Accept
Lack of utilities on site	78	1.549	76	0.126	Accept
Poor communication and coordination	76	0.535	74	0.592	Accept
Delay in delivery of materials to site	78	-0.272	76	0.787	Accept
P&E breakdown	80	-0.280	78	0.780	Accept
Material shortage on site	76	0.722	74	0.461	Accept
Delay in mobilising to site	80	1.120	78	0.266	Accept
Ineffective planning & scheduling	78	-0.278	76	0.783	Accept
Delay in sub-contractors' work	76	-0.667	74	0.507	Accept
Shortage of P&E	78	0.389	76	0.698	Accept
Low productivity of P&E	80	1.161	78	0.249	Accept
Poor communication with other parties	76	-0.207	74	0.837	Accept
Poor site management	72	-0.437	70	0.663	Accept
Inappropriate construction methods	76	0.210	74	0.834	Accept
Use of unskilled workers	80	1.606	78	0.112	Accept
Use of inferior materials	74	0.844	72	0.401	Accept
Conflict between contractor & consultants	76	-1.544	74	0.127	Accept
Unqualified technical staff by contractor	76	0.135	74	0.893	Accept
Shortage of labour	78	0.438	76	0.662	Accept
Low productivity of labour	76	-1.873	74	0.065	Accept
Accidents during construction	78	-1.846	74	0.069	Accept
Rework due to errors during construction	72	-1.904	70	0.061	Accept

N=Number of respondents, Df=Degree of freedom, P&E=Plant and equipment

Table 4 reveals that the p-values for the test of difference in the effect of all the selected factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects are higher than the critical p-value (0.05) therefore the test fails to reject the hypothesis. The results imply that the factors have the same effects on the contribution of the two categories of contractors to delay in the delivery of FGN project.

5 Discussion of Findings

The results of the test of the first research hypothesis has established that the ranks of the effects of the selected factors on the contribution of indigenous and expatriate contractors in Nigeria to delay in the delivery of FGN projects are the same. The implication of the result is that although the ranks of the effects of the factors affecting the contribution of indigenous contractors to delay in the delivery of FGN projects are different from those of expatriate contractors, the differences are insignificant. In other words, the extents of the effects of the factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects are the same. The results of the

test of the second research hypothesis also supports this ascertain by revealing that the effects of all the factors on the contribution of indigenous and expatriate contractors to delay in the delivery of projects procured by the FGN are not significantly different. This finding shows that efforts at reducing delay in the delivery of projects procured by FGN should be equally applied whether or not a project is executed by indigenous or expatriate contractor.

The results in Table 2 indicate that material management related factors rank among factors that have the highest in effect on the contribution of the two categories of contractors to delay in the delivery of FGN projects. Delay in procurement and delivery of materials to site and shortage of materials are discovered to be some of the factors that have high contribution to delay in the delivery of projects among the two categories of contractors. This finding shows that material management problems such as shortages and late delivery of materials found in studies conducted by Mansfield *et al.* (1994), Odeyinka and Yusif (1997) and Al-Momani (2000) still persist in the delivery of FGN projects. It indicates that improvement in the management of materials is one of the measures required to minimise the contribution of the two categories of contractors to delay in project delivery. P&E management related factors are also discovered to rank high in effect on the contribution of the two categories of contractors to delay in the delivery of FGN projects. Shortages and breakdown of P&E are discovered to be among the ten highest ranking factors that affect the contribution of the two categories of contractors to project delay. This finding supports the assertion that the problem of delay in delivery and effective maintenance of P&E found in studies conducted by Odeyinka and Yusif (1997) and Aibinu and Odeyinka (2006) still persist in the delivery of FGN projects. The finding indicates that early procurement and prompt delivery of the P&E required for the execution of projects procured by FGN are some of the measures that can reduce the contribution of the two categories of contractors to delay in project delivery. Furthermore, the finding shows that the use of P&E that are in good condition and their effective maintenance can also reduce the contribution of the contractors to delay. Poor planning and scheduling of projects by contractors is also discovered to be among the ten high ranking factors that affect the contribution of contractors to delay. This factor is discovered to rank 8th among indigenous contractors and 4th among expatriate contractors. This finding suggests that the problem of inadequate planning and scheduling earlier identified by Kaming *et al.* (1997), Odeyinka and Yusif (1997) and Aibinu and Odeyinka (2006) is still a major cause of delay in the delivery of FGN projects. It also suggests the need for improvement in construction planning among the contractors as a way of minimising their contribution to delay.

Lack of utilities such as water, electricity, telephone etc, poor communication and coordination and delay in mobilising to site are some of the factors that rank high in effect on the contribution of indigenous contractors to delay. Supervision, control and communication have been identified as major factors that determine success in project time performance by Meeampol and Ogunlana (2006) therefore, the result of the study indicate that the problem still persist in the delivery of FGN projects. This finding suggests that indigenous contractors do not communicate effectively with other project members and they do not mobilise to site promptly to start work after the award of contract and these inadequacies contribute to delay in the projects they execute. The result also suggests that inadequate provision of required utilities on site which before now has not been the focus of research is major delay factor in projects executed by indigenous contractors. The implication of the finding is that indigenous contractors need to ensure adequate provision of the required utilities in their project sites, embark

on effective communication with other project team members and ensure prompt mobilisation to site to start work as soon as contracts are awarded to them in order to minimise delay in the delivery of the projects they execute.

Poor communication with other project parties, poor site management and conflict between contractor and consultants are discovered to rank among the ten highest factors that affect the contribution of expatriate contractors to project delay. Considerable information is generated when executing a project that need to be communicated to all project participants. This finding indicates that ineffective communication of project information to project participants and poor site management by expatriate contractors contribute to delay in the delivery of FGN projects.

6 Conclusion

The main aim of the study is to determine how indigenous and expatriate contractors contribute to delay in the delivery of FGN projects by investigating the factors that affect their contributions to delay in the delivery time of the projects. This was achieved by conducting a survey of 78 heads of contractors' project site staff drawn from both indigenous and expatriate contractors in Nigeria that executed FGN projects in 2009. In the survey, 22 contractor related factors were assessed by the respondents to determine their effects on the contribution of the two categories of contractors to delay in the delivery of FGN projects that they executed. The main conclusions are that first, the extents of the effects of the factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects are the same. It was discovered from the results of the two research hypotheses tested in the study that the respondents' assessment of the effects and the ranks of the effects of the factors on the contribution of the two categories of contractors to delay in the delivery of FGN projects are significantly the same. This shows that measures aimed at reducing the effects of the factors will minimise the contribution of the two categories of contractors to delay in FGN projects.

Second, the findings of the study confirm that several contractor-related factors found in previous studies to be responsible for project delay still persist in the delivery of FGN projects. These include material management problems, P&E management problems, poor construction planning and scheduling, poor communication and coordination and delay in mobilising to site. Third, inadequate provision of required utilities such as water, electricity and telephone on site is one of the major causes of the inability of the contractors to deliver FGN projects on schedule. Efforts of the two categories of contractors at addressing these factors will go a long way to ensure that the contractors deliver the projects to time.

It is therefore suggested that both indigenous and expatriate contractors that execute FGN projects should adopt more effective and efficient material and P&E management strategies, embark on effective communication, construction planning and scheduling, avoid delay in mobilising to site as soon as contracts are awarded and ensure the provision of essential utilities on site in order to minimise delay in the delivery of FGN projects. The task of managing FGN projects effectively cannot be left for contractors alone. Clients and their consultants should support contractors in this task by ensuring that adequate planning is done before construction and this should be used as one of the criteria for contract award. Furthermore, adequate fund should be provided in the budgets of FGN projects for the provision of essential services on site.

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Conflict Resolution in Labour Only Contracts in Nigeria

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Abstract:
In recent times of ailing economy, the Construction Industry now employs more the use of labour-only procurement method in executing both private and public projects. This has resulted in dramatic increase in conflict and consequential adversary relationship between the clients and the contractors. The study therefore investigated the causes of conflicts in labour only contracts and recommended ways of resolving them from time to time. The study identified some of the major factors causing conflicts in labour only contracts as poor communication between project participants, ambiguous contract document, lack of trust between the client and the contractor and no provision for Alternative Dispute Resolution (ADR) mechanism in the contract It was also found out that the inter-relatedness of the factors causing conflict is significant as it explains why conflicts and disputes occur in some projects and not in other projects of the same procurement method. It also found out that abandonment of project is the most severe consequence of conflict as it invariably results in prolongation of duration (time overrun) and increased cost (cost overrun) of the project. It is recommended that clients should proactively endeavour to limit or reduce contract in-completeness and attenuate the opportunities inclinations of the contractors by incorporating Alternative Dispute Resolution (ADR) mechanism in the contract to minimize the incidence of conflicts during and after construction.

Keywords:
Alternative Dispute Resolution (ADR), claim, conflict, labour only procurement method

1 Introduction

Labour only contract is one of the project procurement methods used in the construction industry in Nigeria, which principally involves the client and the contractor. The labour only contract requires the client to provide all the materials required for the project while the contractor provides the labour force and he is equally paid for the cost of labour including his overhead and profit by the client. (Ogunsanmi and Bamisile, 1997). Due to down-turn in the economy, with the resultant lean economic resources has forced employers (clients) to expand the scope of work of labour only method of construction to include construction of new projects as a means of saving cost as a means of providing needed facility. For survival, indigenous contractors whose amount of remuneration for construction works is not commensurate to their effort/input to the industry may agree to engage in labour only contract instead of the traditional based on long term or open ended employer-employee relationship. (Adenuga, 2003)

Dispute between men are inevitable in any business transaction (labour only contract inclusive), their religions etc social status, level of education notwithstanding, the

parties must therefore either anticipate them in advance or expect to litigate them later (Derr 1998). Misunderstanding and dispute often occur between parties in business transaction on a variety of matters. Such disagreements may relate to the validity or terms of contract between them no matter how meticulously worded. Performance schedule, completion period, insurance claims for loss or damage or the issue may be what legal provisions determine the liability of insurer. The issue may also concern force majeure, which has delayed or frustrated a contract and what the consequence should be (Taiga, 1998). Not only does the incidence of conflict vary from project to project but also seemingly similar circumstances (and sometimes even the same design or construction team) lead to conflict in the project but not on another.

Nevertheless, it is generally believed that detailed contracts tend to prevent dispute because most issues that may give rise to disputes have been anticipated from the onset with adequate dispute resolution clauses, but unfortunately this is not the case as there appears to be a wide field for conflict in construction industry most especially in labour only contracts (Diekman et al., 1995). Conflict and disputes do exist at all levels in the contractual chain client/consultant, client/contractor, contractor/subcontractors, subcontractor/subcontractor and so on. The study therefore sought to find out the causes of conflict in labour only contracts between the client and the contractor and also to recommend methods of resolving them when they do occur.

1.1 Aim of the study

The aim of this study to find out the root causes of conflicts in labour only contracts and profer solution on how it can be resolved so as to reduce conflict and litigation in the execution of labour only contracts.

1.2 Objectives of the study

The research objectives are as follow: -

1. To find out the causes of conflicts in labour only contracts
2. To investigate the interrelated nature of the causes of conflicts in labour only contracts
3. To find out way of resolving conflicts in labour only contracts.
4. To determine the consequences of conflicts in labour only contracts.

Research questions

- What are the causes of conflict in labour only contracts?
- Are the factors causing conflict in labour only contracts interrelated?
- Does detailed contract document prevent conflict in labour only contracts?
- What are the methods used in preventing and resolving conflict in labour only contracts?
- What are the consequences of conflict in labour only contracts?

Research hypotheses

To achieve the aim and objectives of the study the following hypotheses were set up as a guide to test the validity of the data obtained.

1.2.1 Hypothesis I (H_i)

Conflicts in labour only contracts are not caused by the following factors: Ambiguous contract documents; Poor communication between project participants; In-adequate contractor's management, supervision and co-ordination; Overly complex construction processes; Mistakes of the in- experienced contractor and client.

1.2.2 Hypothesis II (H_{ii})

The factors causing conflicts are not interrelated.

1.3 Delimitation

The study is limited to Lagos-State, being a former state capital with a lot of economic activities and housing development projects. The study focused on clients, consultants and contractors based in Lagos State using labour only procurement method for executing their projects in different parts of the country, Nigeria, with the aim of examining the factors which adversely cause conflicts in the execution of these labour only projects.

1.4 Justification of the study

The construction industry is now employing more the use of labour only procurement method in executing both private and public projects and this has resulted in increase in the incidence of conflicts disputes, and related litigation without precedence in our history. It most often leads to adversarial relationship between the clients and contractors. Conflicts and disputes also result in a substantial dilution of effort and diversion of capital from what should be the goal of the industry (i.e creation of works and structures to serve the public).

Consequently, the study of the causes of conflicts in labour only contracts will help to improve the working relationship of the parties to the contract and will lead to the development of preventive measures and methods of resolving conflicts without bitterness through the use of Alternative Dispute Resolution (ADR) mechanism.

1.5 Conditions upon which Labour Only Contract Procurement Method is based:

These are availability of labour, availability of plant and machinery, design must be modified to suit labour only contract, good management technique.

2 Review Of Literature

2.1 The problem of conflict in labour only contracts

Great concern has been expressed in recent years regarding the dramatic increase in conflict and dispute in the construction industry most especially in labour only contracts, and the attendant high cost in terms of direct costs (lawyers claims, consultants management time, delay to project completions etc) and indirect/consequential costs (degeneration of working relationships, mistrust between participants, lack of team work and resultant poor standards of workmanship). The multi-organizational structure of a construction project accounts for the high levels of conflict. Loosemore et al (2000) is of the opinion that conflict is an inevitable byproduct of organizational activity. "Each firm has conflicting aims. The management of each firm has to consider the short and long term goal of their firm against the

objectives of the management teams of each of the projects they are working on". There is need to make distinction between functional and dysfunctional conflict in the construction industry. Loosemore et al (2000) there are merits in positively encouraging functional conflict "because it is a door way of opportunity to organizational learning and creativity".

Godfrey (1996) stated that the construction industry was and is, experiencing a growth in claims and related litigations that is without precedent in our history. All too often an adversarial relationship between the owner and the contractor is not only expected but is considered natural and even acceptable, companies and consultants are emerging from every nook and cranny to either create a claim situation or to help an owner mitigate claims. Disputes result in a substantial dilution of efforts and diversion of capital from what should be the goal of the industry which is basically the creation of works and structures to serve the public.

Ridgway (1994) addressed the theme of moral degeneration and argues that the cause of conflict and disputes "may lie in the venality of the people's character and lack of ethics in the building industry. Uher (1994) is also of the opinion that construction industry is characterized by lack of trust between the participants. "The party in the best bargaining position at the time, take advantage of the position. The disadvantaged parties bid their time and wait for the cycle to change for their turn to get back and take advantage". The culture is win-lose. Contractors look for loopholes in the documentation and structure tenders to take advantage of the construction documents. The client and especially architects see the contractor as an adversary. Professional litigators and claims experts here appeared in the industry to prey on the win-lose nature of project stakeholders Uher (1994).

The construction process involves multi organizational activity. Conflict and disputes can therefore exist at all levels in the constructional chain; client/consultant; client/contractor; contractor/sub contractor: subcontractor/subcontractor and so on. Disputes however are seen as an affliction in the construction industry because of the multi organizational activities of the industry. A conflict exists, where there is an incompatibility of interest. It would appear that a conflict occurs at the same point in time as when a notice of a claim is given, and exists until the claim or disputes resolved. A claim, which is not resolved, becomes a dispute when either party gives written notice to that effect. Yate and Hardcastle (2003)

Types of conflict arising from this contractual arrangement can be summarized into three categories.

1. Time related (i.e. claims from the contractor for extensions of time for completion of the project)
2. Money related (i.e claims from the contractor for payment of the values of variations and / or reimbursement of loss and expense)
3. "Quality related (i.e assertions by the client of defective materials and workmanships. Claims from the contractor can be categorized according to three main types:

1. Claims for additional payment or "loss and expense" (i.e "money" claims)
2. Claims for "extension of time" (i.e time claims)
3. Routine measurement and valuation of variations (i.e "variation" claims)

Wilson (1982) who identified as the more common causes: -Misunderstanding and poor communications, personal and cultural values and professional ethics, diverging interest and personality of individuals. Ridgevey (1994) attributed the causes of conflict and disputes to the venality of the people's character and the lack of ethnic in the building industry" In his view, greed, lack of commitment and lack of responsibility are reflected in claims and disputes. "A man's word is given but not trusted" "A contract is studied for legal opportunity not for common benefit". Boland (1997) attributed the high levels of conflict and disputes to the demise of the general contractor "structure" of the industry and the "indiscipline" of calling tenders based on partially completed designs and the consequent high incidence of variations.

Revay (1992) in a study is of the view that the most frequent causes of claims, which can be traced back to clients "misguided" desire to save money at the wrong "end" of the project. These are: Inadequate site and /or soil investigation prior to starting the design; Starting design efforts too late and / or unduly limiting the cost of engineering /designs; Calling for bids with an incomplete set of drawings; Endeavouring to complete the design through shop drawing review; Introducing untimely design revisions without allowing commensurate time extension for the completion of the project or without recognizing the contractor's right to impact; Interfering both with the sequence and the timing of construction (e.g to compensate for the delay in the delivery of owner supplied equipment /materials) and Continuing to introduce changes under the disguise of correcting deficiencies.

The Centre for Public Resources Inc. (1991) in its publication "prevention and resolving construction Disputes" suggested that the ten most common specific causes of construction disputes are: Contract provision, which unrealistically shift project risks to parties who are unprepared to cover those risks; Unrealistic expectations of the parties particularly employers who have insufficient financing to accomplish their objectives; Ambiguous contract documents; Contractors who bid too low; Poor communications between project participants; Inadequate contractor management, supervision and coordination; Failure of participants to deal promptly with changes and unexpected conditions; A lack of team spirit or collegiality among participants; A "macho" or litigious mind set on the part of some or all project participants; and Contract administrators who prefer to buck a dispute to a higher level or to lawyers rather than take responsibility for resolving the problem at the source.

Most importantly, Omotosho (1999) stated that labour only contract is faced with a lot of management problems arising from improper definition of duties and responsibilities at the implementation stage. The contractor finds it difficult to harness the other production resources provided by the building owner with the labour resources provided by him for the execution of the project. His site operational plan is always shrouded with the quest to at least break even through the relatively low overhead and profit occurring from the labour. For a labour only contractor to make any headway in his operations his appraisal/analysis of the labour resource has to be very thorough and sound. He must be able to properly determine the number of operations for a particular activity, the duration and cost. Above all, he must have on in-depth knowledge of vital management functions.

According to Cooke (1984) at the pre-contract planning stage, it is necessary to assess for effective management the contract requirements regarding: the provision of labour requirements; key material supplies; allocation of plant and equipment and key commencement date for subcontractors and nominated suppliers. Also, Wilson (1982),

"today's construction project is a complex effort requiring the support of many design professionals along with a variety of construction talent. The construction disputes which can develop from such a complex project are no less complex and require a battery of attorney, and consultants to resolve the issues".

One of the causes of conflict in building construction project is professional negligence. When a professional holds himself out as qualified in a particular professional discipline, he hereby indicates that he is competent to render a service commensurate with his skill and expertise. Hence, failure to meet this performance criterion, which occasions any loss, renders the professional liable for a breach of contract or negligence, which causes dispute. An in- experienced contractor (due to poor training or lack of experience) will have some problems, dealing with the owner and may not be able to satisfy the owner's construction requirements. The lack of construction experience will make the construction process inefficient and will lead to improper project execution.

2.2 Conflict prevention techniques in labour only contracts

Prevention techniques are more useful than resolution techniques because their successful application renders resolution techniques unnecessary. Diekman and Girard (1995), stated that three prominent conflict prevention techniques used in labour only contracts are Equitable contractual risk allowance; Use of contractual incentives and Use of long term partnering/project partnering.

2.3 Conflict resolution methods in labour only contracts

Kangari (1995) explained that despite growing criticism arbitration is becoming more preferred alternative to litigation for resolving disputes in the labour only contracts between the client and the contractor. Other alternative dispute resolution methods such as negotiation, conciliation (Mini trial) and mediation are equally gaining ground. Keinfield (1989) and Taiga (1998) defined Alternative dispute resolution (ADR) as "a broad range of mechanisms and non judicial procedures processes designed to assist parties in resolving differences". These alternatives mechanisms are not intended to supplant court adjudication but rather to supplement it. These include Arbitration, Negotiation and re-negotiation, Conciliation and mediation and Litigation.

3 Research Methodology

The population of the study is the construction firms, client's organization, and consulting firms domiciled in Lagos State but are involved in the execution of labour only projects in Lagos State, other parts of the country, Nigeria. Twenty (20) construction companies with qualified site/project managers were randomly chosen from both indigenous and multinational firms based on Federal Ministry of Works register, twenty (20) clients and twenty (20) consultants were selected for the study. Both primary and secondary data were used for this study. 18, 16 and 16 questionnaires were filled and returned by firms, clients and consultants respectively (see Table1). The information obtained covered the following variables: background information of the respondent; causes of conflict; techniques/strategies employed in preventing and resolving conflicts; consequences of conflict; and design.

To facilitate the research, the following hypotheses were formulated.

3.1 Hypothesis I (H_i)

Conflicts in labour only contracts are not caused by: Ambiguous contract documents; Poor communication between project participants; In-adequate contractor's management, supervision and co-ordination; Overly complex construction processes; Mistakes of the in- experienced contractor and client.

3.2 Hypothesis II (H_{ii})

The factors causing conflicts are not interrelated.

4 Method Of Data Analysis

The returned questionnaires were coded into a coding sheet and with the help of the SPSS package and the responses were analyzed. For Hypothesis 1(One): Inter correlation matrix and Multiple regression analysis were used. The dependent variable was Conflict while the Independent variables were poor communication between project participants; Ambiguous contract documents; Mistakes of inexperienced contractor and client; Overly complex construction processes; Inadequate contractor's management, supervisor and co-ordination. For Hypothesis 11(Two): Inter-correlation matrix; Multiple regression analysis and Anova were used.

4.1 Data Presentation, Analysis And Discussion Of Findings

The data computation was carried out using the Statistical Package for Social Scientists (SPSS) and the following presentation shows the background and characteristics of the respondents.

3.2.1 Respondents Characteristics

Out of the sixty (60) questionnaires administered on the respondents, that are twenty (20) for the contractors, twenty (20) for the clients, and twenty (20) for the consultants, a total of fifty (50) completed set of questionnaires could be-retrieved. This represents a total of average of 83% of respondents which is good enough to draw inference on this study.

Table 1 Respondents characteristics

Respondent	**Questionnaires served**	**Questionnaires received**	**Percentage % received**
Contractors	20	18	90
Clients	20	16	80
Consultants	20	16	80
Total	60	50	83

The above Table 1 shows that 90% of the contractors returned the questionnaires and 80% response from the clients and consultants respectively. The average total is 83%. This is a very high response.

3.2.2. Educational Attainment

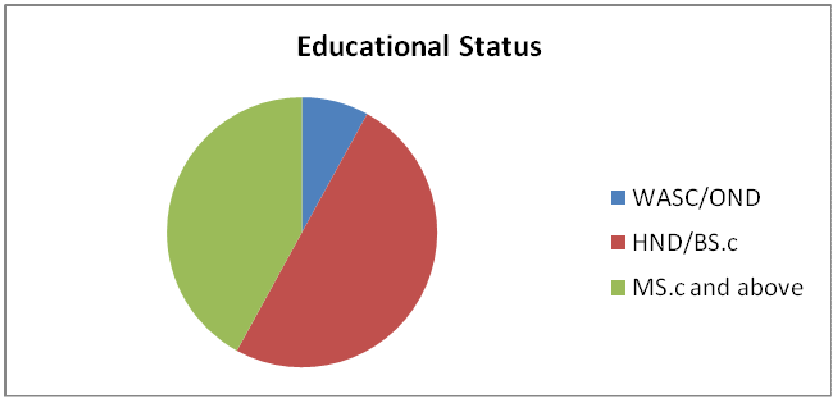

Figure 1: Educational attainment of the respondents

The figure1 above shows that twenty five (25) respondents have at least HND/BSc, twenty one (21) respondents have Msc and higher qualifications, while only four (4) of them possess WASC/OND. It shows that most of the respondents are highly qualified educationally.

3.2.3. Years of experience of the respondents

Table 2 Years of experience of the respondent

Period	**Number of Respondents**	**Percentage (%)**
1 – 10 yrs	14	28
11 – 20 yrs	26	52
21 – 40 yrs	8	16
40 yrs and above	2	4
Total	50	100%

The above table 2 shows that seventy-two percent (72%) of the respondents have more than ten years of working experience in the construction industry and twenty percent (20%) have more than twenty years of experience. It can therefore be assumed that the respondents have good understanding of construction processes.

3.2.4 Staff strength of the respondents firms

Table 3 Staff strength of the respondents firms

Employed	**Number of Respondents**	**Percentage (%)**
1-50	32	64
51 – 100	12	24
101-200	3	6.0
>200	3	6.0
Total	50	100%

3.2.5. Categories of projects undertaken by the respondents firms

Table 4: Categories of projects executed by respondents

Project type	**Number of Respondents**	**Percentage (%)**
Building	24	48.0
Civil	15	30.0
Mechanical/Electrical	7	14.0

Heavy Engineering	4	8.0
Total	50	100%

The Table 4 above indicates that respondents are mostly involved in building projects (48%) and civil engineering projects (30%) while the remaining respondents (22%) are involved in either mechanical or electrical (44%) or heavy engineering projects (8%).

3.2.6 Types of procurement methods employed by the companies

Table 5: Types of procurement methods

Procurement	**Number of Respondents**	**Percentage (%)**
Traditional method	11	22.0
Design and build	3	6.0
Management contracting	2	4.0
Project management	2	4.0
Direct labour	2	6.0
Labour only	29	58.0
Total	50	100

Table 5 above shows that most of the respondents (58%) use labour only procurement method to execute their projects, while very few respondents (4%) use management contracting and project management respectively. The remaining (6%) use direct labour.

3.2.7. Categories of project executed using labour only

The nature of projects executed by the respondents using labour only shows that out of all the projects executed by the respondents using labour only 50% were new projects, and the rest were 26%, 24% respectively for refurbishment and both respectively.

3.2.8. Contract sums of labour only projects

Table 6: Categories of labour only projects

Contract sum	**Number of Respondents**	**Percentage (%)**
N1m – 20m	30	60.0
N21m – 40m	14	28.0
N41m – 60m	6	12.0
N110m – 200m	-	-
N201m and above	-	-
Total	50	100%

Table 6 above shows that labour only contracts executed by the respondents less than N20m are 60% and those contracts above N20m are 40%. It means that labour only is commonly used for small size projects.

3.2.9. The intensity of conflict experienced in labour only contracts

Table 7: The intensity of conflict

Intensity	**Number of Respondents**	**Percentage (%)**
Less intense	12	24.0
Intense	26	52.0
Most intense	12	24.0
Total	50	100%

The above table 7 shows that conflict is intense in (52%) of the projects executed by labour only while 24% of the projects are most intense in conflict. There is 76% cumulative percentage in the degree of intensity.

3.2.10. The nature of conflict

Table 8: The nature of conflict

	Number of Respondents	Percentage (%)
Between client and contractor	30	60.0
Between contractor and consultants	13	26.0
Between client and consultants	7	14.0
Total	50	100%

The above table 8 shows that the conflict between the client and the contractor is the highest (60%) while the conflict between the client and the consultant (14%) is the least.

4.2 Testing Of Hypotheses In Respect Of Stated Objectives

The data obtained are arranged and discussed in sequence with the manner in which the specific objectives have been presented.

4.2.1 Objective one:

To find out the causes of conflicts in labour only contracts.

Research Question:
What are the factors causing conflicts in labour only contracts?

Hypothesis 1
Null Hypothesis (Ho): Conflict in labour only contacts are not caused by the following factors: Ambiguous contract document; Poor communication between project participants; Inadequate contractor's management supervision and coordination; Overly complex construction process; Mistakes of inexperienced contractor and client;

Alternate Hypothesis (H_1): Conflict in labour only contracts are caused by the following factors: Ambiguous contract document; Poor communication between project participants; Inadequate contractor's management supervision and coordination; Overly complex construction process; Mistakes of inexperienced contractor and client;

The descriptive statistic below shows the ranking of the factors causing conflict in their order of significance.

Table 9: Ranking of causes of conflicts
(Source: fieldwork 2007)

Factors	Mean Item Score (MIS)	Rank	Comment
Lack of communication	4.26	1	Strongly agree
Ambiguous contract document	4.15	2	Strongly agree
No Alternative Dispute Resolution	4.03	3	Strongly agree
Lack of trust between client and contractor	3.97	4	Strongly agree
Delay in procurement of materials	3.34	5	Agree
Poor communication between project	3.24	6	Agree

participants			
Improper management of site resources	2.80	7	Agree
Late payment for work	2.75	8	Agree
Low bidding by contractor	2.66	10	Agree
Unrealistic contract duration	1.53	11	Disagree
Clients who cut corners in design	1.28	13	Disagree
Project construction complexity	1.26	14	Disagree

The above Table 9 shows that the most significant factor is lack of communication between client and contractor (4.27), delay in procurement of materials for the contractor by the client is important(3.34), while the least important factor is Project construction complexity (1.26) in labour only contracts.

It means that complex construction process is the only factor among the above listed factors in the hypothesis one that is not significant enough to cause conflict. This is in agreement with Null hypotheses (Ho), while the remaining factors are in agreement with the alternate hypothesis (H_1).

4.2.2 Objective two:

To investigate the interrelated nature of the causes of conflicts in labour only contracts.

Research Question:
Are the factors causing conflict in labour only contracts interrelated?

Hypotheses H(ii)

Null Hypothesis (H_0): The factors causing conflicts are not interrelated.

Alternate Hypothesis (H_1): The factors causing conflicts are interrelated.

Table 10 Correlation matrix on the factors causing conflict.
(Source: fieldwork 2007)

Variables	Code	Lack of communication (S20A)	Project construction complexity (S20B)	Ambiguous document (S20 C)	Inadequate contractor's management (S20D)	Inexperienced contractor (S20E)
Lack of communication	S2OA	1.0000				
Project construction complexity	S2OB	-.1471	1.0000			
Ambiguous contract document	S2OC	.3273	.2935	1.0000		
Inadequate contractors management	S2OD	.0289	-.3340	.3311	1.0000	
Low bidding contractor	S2OE	0.245	-.0607	.0748	.0231	1.0000
Inexperienced contractor	S2OF	-.0530	.1241	-.0607	-.1126	.2908
Late payment	S2OG	-.1686	.5059	.0341	-.1927	.2164
Clients who cut corners	S2OH	.1463	.2041	.0271	-.1147	.5036
Poor communication	S2OI	-.1051	.4030	.1204	.1116	-.0390
Delayed procurement	S2OJ	-.0941	-.0791	.0958	.1142	.6471
Improper site management	S2OK	.0349	-.2178	.2132	.5365	.0478
Lack of trust	S2OL	-.0560	.2407	.1650	-.0097	.0786

No provisions for alternative dispute resolution	S2OM	.1909	.0761	.3750	.2649	.1371
Failure to deals with changes promptly	S2ON	.0180	-.3924	-.1509	.3379	-.2523

The above table 10 shows some negative values, meaning that the factors are negatively significantly related. For example S20D and S20B are. -3340 i.e S20D (the inadequate contractor's management supervision and coordination) is negatively significantly related to the S20B (complex project construction process). Whereas those positive values mean that the factors are positively significantly related. For example S20k and S20D value is 0.5365. It means, S20k (Improper management of site resources by the contractor) is positively significantly related to S20D (Inadequate contractor's management supervision and coordination).

4.2.3 Objective three

To determine methods of preventing and resolving conflicts in labour only contracts.

Research Questions:

- What are the methods used in preventing conflict?
- Are the prevention and resolution techniques employed able to eliminate conflict in labour only contracts.

The prevention strategies and resolution techniques were analyzed by the use of descriptive statistics and the result are presented in table 11 and table 12 below.

Table11: Conflict prevention strategies

Conflict prevention strategy	Mean In Score (MIS)	Rank	Comment
Equitable contractual risk allocation	3.91	1	Strongly Agree
Use of contractual incentives	3.35	2	Strongly Agree
Prequalification of contractors	2.54	3	Agree
Long-term partnering /project partnering	2.53	4	Agree

The above table 11 shows that the most effective strategy for preventing conflict is the use of equitable contractual risk allocation (3.91) while the least is the use of long-term partnering/project partnering (2.53).

Table12: Conflict resolution techniques

Conflict resolution techniques	Mean In Score (MIS)	Rank	Comment
Negotiation	4.12	1	Strongly Agree
Conciliation and mediation	3.75	2	Strongly Agree
Arbitration	3.33	3	Agree
Litigation	2.75	4	Agree

Table12 above shows that conflicts are most easily resolved by negotiation (4.0) than by the use of conciliation (3.75) arbitration (3.33) and litigation (2.75) being the last resolution technique when others fail.

4.2.4 Objective four

To determine the consequences of conflicts in labour only contracts.

Research Questions:

- What are the consequences of conflicts in labour only contracts?
- What is the effect of conflict in duration (time) and cost of the project?

The consequences of conflicts in labour only contracts are analyzed below by the use of descriptive statistics.

Table18: Consequences of conflicts

Variables	Mean In Score (MIS)	Rank	Comment
Project abandonment	4.06	1	Strongly Agree
Cost overrun	3.87	2	Strongly Agree
Time overrun	3.82	3	Strongly Agree
Loss of cohesion among project team	2.80	4	Agree
Poor workmanship	2.51	5	Agree

Table 18 above shows that project abandonment (4.06) is the most severe consequence of conflict while poor workmanship (2.51) is the least consequence of conflict in labour only contract.

5 Discussion Of Findings

5.1 Factors causing conflicts in labour only contracts

From the analysis and the result of hypothesis one (1), in Table 9, The most important factor is lack of communication between the client and the contractor while delay in procurement of materials by the client is equally important as delay in procurement of materials by the client for the contractor will make his labour force redundant and consequently erode his profit margin. This may lead to conflict and dispute between the client and the contractor .Most of the respondents interviewed also agreed that all the factors earlier stated in the hypothesis one (1) are significantly important except for the Project construction complexity.

5.2 To investigate the interrelated nature of the causes of conflicts in labour only contracts

The result of hypothesis two (II) in Table 10 revealed that some factors are positively significantly related e.g Improper management of site resources by the contractor is positively significantly related to inadequate contractors management supervision and coordination while some factors are negatively significantly related e.g. Inadequate contractors' management supervision and coordination is negatively significantly related to complex construction process. The fact that some factors are significantly related and others are not significantly related, explains why conflicts exist in one project and not in another.

5.3 To determine the methods of preventing and resolving conflicts in labour only contract

The result of descriptive statistics used in determining the methods of preventing and resolving conflicts shows that equitable contractual risk allocation, contractual incentives, prequalification of contractors and long-term partnering can prevent conflict provided the client and contractor are willing to abide by the conditions of the contract. Also the introduction of Alternate Dispute Resolution (ADR) mechanism in the contract can be used to resolve conflicts when they occur during and after construction but cannot totally eliminate conflicts. The interview conducted also showed that conflict in any human endeavour is inevitable but it can only be minimized but not eliminated.

5.4 To determine the consequences of conflicts in labour only contracts

The results of the descriptive statistics revealed that conflicts can lead to project abandonment, time overrun and cost overrun depending on the severity of the conflict. The most severe consequence of conflict is project abandonment while the least severe consequence is poor workmanship.

6 Conclusions

The investigation on the conflict resolution in labour only contracts revealed the following:-

1. That the major causes of conflicts in labour only contracts are Lack of communication between the client and the contractor; Ambiguous contract documents; Inadequate contractor's management, supervision and coordination; Poor communication between project participants; Lack of trust between the client and the contractor; Delay in procurement of materials by the clients; Late payment for work and the contract, which does not provide for Alternate -Dispute Resolution (ADR) mechanism for resolving conflicts during and after construction.

2. That the factors causing conflicts in labour only contracts are significantly inter-related either positively or negatively. This explains why conflict and disputes occur in some projects and not in others of the same procurement method.

3 That the onus of purchasing materials is now on the client, there could be increased cases of cases of theft. It could also create logistics problems for the client which may lead to delays and consequently conflict between the client and the contractor.

4. That conflicts may lead to increase in project duration (time overrun) and increase in Cost (cost overrun) depending on the severity of the conflict which is in agreement with the recommendation of Adenuga (2003).

5. That project abandonment is the most severe consequence of conflict in labour only contract. It can therefore be concluded that conflicts have serious consequences on labour only contract

6.1 Recommendations

The problem of conflict and dispute in the execution of labour only contract is inevitable, it can however be minimized by the following recommendations: -

1 The client should proactively endeavour to Limit or reduce contract incompleteness and attenuate the opportunistic inclinations of the contractor.

2 Experienced, reputable and capable design consultants should be selected (particular attention should be paid to the design and coordination of the building services)

3. Contractors should be selected based on quality including reputation and experience as well as price and From the sociological point of view, any procedure such as Partnering and Value Engineering, which brings people together at the early stages of the project will have a positive effect on the working relationship and teamwork.

4 That contract documents should be prepared by a team of professionals including a lawyer and Alternative Dispute Resolution (ADR) mechanisms should be introduced into the contract to minimize the incidence of conflict during and after construction

5. Government should enact a law that will forbid quacks from engaging in the execution of building projects, most especially, in labour only projects and also enact a law that would facilitate early settlement and resolution of conflicts and disputes in the court of law. For labour only contracting system to be more successful workers welfare should be should be given utmost priority.

5.3 Suggestion For further studies

A study should be conducted on the causes of conflicts between the contractor and the nominated supplier in the labour only contracts.

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Project scheduling a review through literature

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Abstract:
Project scheduling is very attractive for researchers and has recently attracted considerable attention because of the high cost of capital and the significant effect of the time value of money. There has been a vast majority of the project scheduling methodologies developed with the objective of minimising the project duration subject to precedence and other constraints. Recent efforts have focused on the maximisation of the net present value (NPV) of the project. If financial aspects taken into consideration of particular interest to project management, the maximisation of project NPV then decided as the more appropriate objective. In this paper we review the fundamental approaches for scheduling the problem as well as to summarise and categorise the model that have been proposed and presented in the literature. It was found that many researches focus has been on metaheuristics such as Genetic Algorithms and Tabu search which have been the most popular strategies for both objectives. It was also observed that the new propose techniques contain more components than earlier procedures.

Keywords:
project scheduling, NPV maximisation, project duration minimisation, Net Present Value

1 Introduction

This paper will focus on *project scheduling* that is the subset of project management. Project scheduling is the process where the various activities that need to be undertaken during a projects lifetime should be scheduled. Project scheduling is concerned with the techniques that can be employed to manage the activities that need to be undertaken during the development of a project. It is primarily concerned with attaching a timescale and sequence to the activities to be conducted within the project. Materials and people needed at each stage of the project are determined and the time each is to take will be set. There are ranges of activity management tools that are commercially available. Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM) are helpful scheduling techniques only when the project deadline is not fixed and the resources are not constrained by either availability or time.

Constructing a feasible project schedule that satisfies the above constraints is an easy task. The difficulty, however, arises when improved schedules are desired to optimise or nearly optimise a stated objective function. These objectives include minimising project completion time or duration. levelling the mean resource usage, and maximising project net present value(NPV). When significant levels of cash flows are present in the project, in the form of expenses for initiating activities and progress payments for completion of parts of the project, the NPV criterion is a more appropriate measure of project

performance. This criterion generates a cost-critical path and schedule of activities, in contrast to the time-critical path and schedule obtained by the make-span objective.

Net present value (NPV) is being used in many investment-planning problems. Some people might think that the time value of money is not an important issue for evaluating such ‘‘short’’ projects. For instance Six Sigma projects which are typically targeted for 6 to 12 months for implementation. However, this would be an erroneous conclusion because, even though the implementation time may be short, the useful project life can be much longer. The financial analysis of projects should be based on the useful life or a long-term view of the project. This is why it is important to apply expected NPV analysis even to ‘‘short’’ projects (Flaig, 2005).

2 Literature Review

The vast majority of the projects scheduling methodologies presented in the literature have been developed. Past research has examined various objectives. These objectives include minimising project completion time or duration, levelling the mean resource usage, and maximising project NPV. Although different objectives have been examined previously, the primary goal of undertaking any commercial project is to maximise the monetary value of the project (Yang *et al*, 1995).

While majority of the past research has focused on minimising project completion time, the primary goal of undertaking any commercial project is its potential profitability. The most pragmatic project objective is, therefore, to maximise project NPV (Yang *et al*, 1995).

Scheduling problem can be distinguished into two categories; the unconstrained project scheduling problem, which occurs when no constraints on resource usage are imposed such that the activities are only subject to precedence constraints, and the resource-constrained project scheduling problem (RCPSP). However, this paper focuses more on project scheduling problem subject to NPV maximisation.

2.1 Unconstrained resource

2.1.1 Project duration minimisation

This problem can be solved by a simple forward recursion procedure, where each activity is assigned its earliest precedence feasible start time (Kolisch *et al*, 2006).

2.1.2 NPV maximisation

A.H. Russell (1970) was the first to introduce the objective of maximising the NPV of cash flows in a network. Russell deals with the unconstrained problem where both positive and negative payments occur as events in the project are completed.

Russell's objective function is to

$$\text{maximise NPV} = \sum_{i=1}^{n} CF_i \exp(-\alpha T_i) \qquad (1)$$

where $exp(\alpha Ti)$ = β, the discount factor.
CF = Cash Flow

For uniformity of expression, the criterion Eq. (1) is sometimes rewritten as:

$$\text{maximise NPV} = \sum_{i=1}^{n} CF_i \beta^{-T_i} \qquad (2)$$

Russell transforms the nonlinear objective function from Eq (2) into a linear one by approximation using the first term of the associated Taylor series expansion.

He does not report computational results with his procedure apart from two small example problems, although reference is made to a computer programme being developed to solve this problem. Because of the development of fast and efficient network computer codes since the publication of this paper, there do not seem to be any theoretical obstacles to implementing his approach. His research showed that the cost-critical path is quite different from the time-critical path when monetary objectives are considered.

Grinold (1972) transforms the unconstrained problem formulated by A. H. Russell into an equivalent linear programming problem. This problem is exploited by the solution procedure that determines the optimal solution by exploring the set of feasible trees on the project network such that all activities have zero slack. This procedure is also used to illustrate, with an example, the trade-off between NPV and project duration He does not provide extensive computational results for his procedure.

Elmaghraby and Herroelen (1990) critique both Russell's and Grinold's formulations to develop a simplified algorithm that gives the optimal schedule for the project scheduling problem with NPV objective. They show that, in general, it is optimal to schedule events with associated positive cash flows as early as possible, and events with net negative cash flows as late as possible subject to restrictions imposed by network structure. They also illustrate that net cash flows are dependent on the time of realisation of cash flow nodes and in the absence of a project deadline, if the NPV is less than zero, the project will be delayed indefinitely.

Demeulemeester *et al.* (1996) have proposed a new optimal algorithm that performs a recursive search on partial tree structures that utilise the concept of scheduling activities early if they bring in payments and delaying those activities that incur expenses. Computational tests report encouraging results in comparison to the Grinold procedure.

2.2 Resource constrained

The RCPSP, which as a generalisation of the *job-shop* scheduling problem is *NP-hard*, has been extensively studied in the literature.

To solve RCPSP, previous research is categorised the procedures as either an optimisation or heuristic solution method. Optimal procedures have been termed *exact* or *analytical* procedures because they usually involve some form of mathematical programming or other rigorous analytical procedure. Heuristic procedures involve the use of some rule-of-thumb or *heuristic* in determining priorities among jobs competing for available resources. However, these two methods consist of procedures which aim at producing the best possible schedule.

2.2.1 Project duration minimisation

Optimisation approaches

With optimal procedures, an initial sub-categorisation can be made according to the

type of mathematical technique employed in the search for the best possible solution. Existing procedures are divided according to whether they ultilise some form of integer linear programming, a variation of some enumerative or other technique. Examples are *branch and bound* (Davis and Edward, 1973). The methods applied so far for the exact solution of the resource constrained project are dynamic programming, zero–one programming, and implicit enumeration with branch and bound.

Heuristic approaches

Heuristic procedures can be broadly classified into Priority rule based scheduling and metaheuristic approaches; Genetic Algorithms; Tabu search; Simulated Annealing. The idea behind heuristic algorithms for resource constrained project scheduling is to rank the activities by some rule, this may be managerial priority, earliest start times, and to schedule the activities in that ranking order ensuring that the resource limits on the project are never exceeded. Thus activities considered to be important in some sense are scheduled as soon as possible.

From Kolisch's review, heuristic techniques for the resource constrained project basically involve four different solution methodologies: (1) priority-rule-based scheduling, (2) truncated branch-and-bound, (3) disjunctive arc concepts, and (4) metaheuristic techniques.

2.2.2 NPV maximisation

Optimisation approaches

Doersch and Patterson (1977) were the first to study in the context of the resource-constrained max-npv problem. They introduced a binary integer programming approach to the NPV project scheduling problem. This model included a constraint on capital for expenditure on activities in the project such that the available capital increased as progress payments were made. The objective function also included the cash flows associated with the completion of activities and any penalties incurred for late completion. The model was solved to optimality for projects involving 15–25 activities. The results indicated that at high cost of capital or long project duration, it is important to evaluate bonus/penalty and capital constraints while scheduling activities. However, detailed computational results are not provided.

Smith-Daniels and Smith-Daniels (1987) extend the Doersch and Patterson zero-one formulation to accommodate material management costs. The NPV of the project was maximised subject to material and capital constraints and solved to optimality on small problems. They concluded that not only do ordering and holding cost force activities with common requirements to start at the same time or close to each other, the additional constraints also result in lowering overall project cost even though they may cause activities, and hence the project, to be delayed.

Tavares (1986) proposed a new dynamic programming formulation and solution method, where the optimality conditions were derived using calculus of variations for a set of interconnected projects (Kolisch *et al*, 2006). The objective function to be maximised included a net of the discounted sum of the benefits generated along the programme, the discounted sum of the cost of project expenditures, and a term to penalise the variation in expenses over time. This programme was applied successfully to a large railway construction project in Portugal.

Patterson et al. (1990) presented a zero–one programming model and a backtracking algorithm to maximise the NPV of the constrained project scheduling problem. It is unique in that it can also be used to minimise project duration. The solution methodology utilised the fact that the minimum duration problem is easier to solve than the max NPV problem and used it as a heuristic to generate starting solutions on which right-shifting of cash flows was applied to improve NPV. 91 problems, ranging from 10 to 500 activities, were tested on both objectives using MINSLK and random rules, with optimal solutions found only for the smaller problems. The MINSLK rule generated higher NPV than the random rule.

Baroum and Patterson (1999) proposed a branch and bound procedure directly designed to solve the project scheduling problem with NPV objective.

Icmeli and Erenguc (1996) also developed a branch-and-bound algorithm for the RCPSP with cash flows which used the minimal delaying alternatives concept for branching.
Since optimisation techniques have not been successful in solving this limited resource problem and are impractical to compute for large-scale projects, another method is proposed.

Heuristic approaches

- Priority rule based scheduling

Smith-Daniels and Aquilano (1987) compared the duration and NPV of a late-start critical path schedule to that of an early-start critical path schedule. It was assumed that cash outflows occurred at the beginning of the period and a single project payment was received on completion of the project. Their assumptions were tested using the 110 Patterson problems. An improved average NPV and lower average duration can be found for late-start schedules than early-start schedules.

Smith-Daniels and Aquilano (1987) also considered the resource constrained max-npv problem. They concluded that a heuristically determined right shifted schedule yields a higher NPV and lower average duration than schedules derived with heuristics that schedule each activity as early as possible.

Ulusoy and Özdamar (1996) presented an iterative scheduling algorithm with the objective of improving both the project duration and NPV. The consecutive forward/backward scheduling passes made by the iterative algorithm result in a smoother resource profile, which, along with right-shifting of activities, improves both the project duration and NPV. In the cash flow model assumed here, activity expenditures occur at their starting times and payment is made on completion of the project. The algorithm was tested on two sets of problems from the literature. The results demonstrated that under the assumed cash flow model, the iterative scheduling algorithm improved both criteria.

Baroum and Patterson (1996) evaluated several heuristic approaches used by project and contract managers involving single- and multi-pass procedures. Their single-pass procedures used priority weights based upon cumulative future cash flows for all successor activities. Multi-pass procedures were enhancements to improve upon the

single-pass solution obtained. A full factorial experimental design was used to assess the performance of the heuristic procedures. The computational results demonstrated the efficiency of the discounted cash flow, positional weight heuristics over more traditional methods.

- Metaheuristics

Icmeli and Erenguc (1994) applied a tabu search procedure to a starting feasible solution generated using a simple single-pass algorithm. The initial solution was improved over several iterations by moving each activity one time unit early or late from its current completion time, with the restriction that the resulting completion time should not violate earliest and latest completion times for the activity. They also investigated the use of long-term memory within tabu search to further improve the results. Computational results on 50 problems from the Patterson set indicated that these procedures were both efficient and close to optimal.

Zhu and Padman (1999) applied distributed computing concepts to the RCPSP through the use of an Asynchronous Team (A-Team) approach. An A-team is a software organisation that facilitates cooperation amongst multiple heuristic algorithms so that together they produce better solutions than if they were acting alone. They embedded several simple heuristics for solving the RCPSP within the iterative, parallel structure of A-Team which provides a natural framework for distributed problem solving.

3 Findings and Discussion

Past research (Baroum and Patterson, 1996; Padman et al., 1999; Russell, 1970) has developed many different deterministic, single-pass heuristic decision rules for maximising project NPV. A limitation of these single-pass rules is that they only generate a single solution or schedule for a problem. Many researches focus has been on metaheuristics. Genetic Algorithms and Tabu search have been the most popular strategies for both objectives. The activity list has been the most widely used representation. It has usually been employed in its classical form, while a few researchers have extended it. A general observation is that the new propose techniques contain more components than earlier procedures (Kolisch *et al*, 2006). Considering the advantages of representations like the activity list, one may in fact wonder why some recent metaheuristics still employ the direct schedule representation with operators that are very likely to produce infeasible solutions. Hence, even if a good solution has been found, a more intensive search around the proposed solution is likely to yield an improved solution. Investigating the use of an improved solution procedure for the project scheduling problem is, therefore, a worth while endeavour.

4 Conclusion and Further Research

This paper has summarised approaches of the project scheduling problem. Conclusion and further research directions are indicated as following. First, while minimising project duration and maximising NPV have been the dominant objectives of much of the research to date, there are considerable opportunities in investigating other objectives that combine these with cost, leveling resources, and so on. Many of these problems, being difficult combinatorial optimisation problems, require heuristic approaches for solving problems of practical size and optimal approaches for validating, comparing and benchmarking the solutions given by heuristics.

Second, considering the development during the past years, metaheuristic approaches have recently attracted more intention than priority rule-based methods.

Third, new techniques tend to more components than earlier one. Many methods consider both scheduling directions instead of only forward scheduling, more than one type of local search operator, or even more than one type of metaheuristic strategy.

Finally, recombining merely existing ideas occasionally seems to be less creative than developing new ideas, some of the integration efforts have put well-known techniques into a new and promising context, and the results have often been encouraging (Kolisch *et al*, 2006).

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Property and place management

Improved snag reporting in new residential buildings in New Zealand

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Abstract:
Snagging is common practice for new and existing buildings in the housing sector in the UK. However the snag reporting process is yet to be fully developed in New Zealand. Whilst inspections for defects and repairs are mostly carried out for old and existing residential buildings, very little is being done to capture snags in new builds in New Zealand.This paper reports on research which is being undertaken in New Zealand to investigate the magnitude of the snagging problem and to identify means by which snag reporting can be introduced within the house building production process. The primary source of data will be the record of defects collected from well established developers and building inspectors and a semi-structured questionnaire administered to new homeowners. The results from the data analyses will be validated through a verification exercise involving subject matter experts. It is hoped that the result of the research investigations will be beneficial to homeowners, developers and the wider construction industry in New Zealand and thus serve to improve quality performance in residential housing construction.

Keywords:
defects, New Zealand, quality, residential building snagging

1 Introduction

Quality and its achievement continue to generate interest in the building sector and the wider construction industry. This is because the building and construction sector is crucial for economic performance and prosperity. The housing sector is one of the most important sectors in the national development agenda of every country (Mohd and Buang, 2010). In New Zealand, the sector contributes 5% of Gross Domestic Product (Building and Construction Sector Productivity Taskforce, 2009). The residential property sector alone has a total market value of between NZ$450 and NZ$500 billion making it the largest asset class in New Zealand (DTZ New Zealand, 2004). Because of the importance of the residential sector and how it supports the economy, the current study is motivated by the belief that improving quality achievement levels in new residential buildings will impact positively on the performance of the overall construction sector. This study hopes to improve quality performance by first capturing

the magnitude of snags that occur before or after handover of new buildings and the effect it has on new homeowners. Then an investigation will follow to determine the potential for introducing snag reporting into the New Zealand building production and house buying process.

Snagging items are quality failure items that are identified near the completion stage of a construction project by an individual who could be termed as 'the snag identifier', while the process of identifying and rectifying these quality failures is known as snagging (building inspection) (Sommerville, Craig, and Bowden, 2004). Snagging is a modern term for a quality failure which is not commonly used within the New Zealand construction environment. The common terminology for 'snags' is 'defects' while a 'snag identifier' will mostly likely be referred to as a 'building inspector' in New Zealand. Building inspection appears to be common practice for new and existing buildings in the housing sector in the UK although in New Zealand at present, inspections for defects and repairs are mostly carried out for old and existing buildings and inspection has become almost a standard pre-sale clause for older residential buildings. However this practice is uncommon for new residential buildings, thus capturing defects that occur before or after handover on new residential buildings is rare in New Zealand. This study therefore intends to create awareness for improved snag reporting in new residential buildings in New Zealand.

2 Literature Review

2.1 The quality problem in residential buildings

The design and construction of new housing is today becoming more complex partly due to project owners' increasing demands and expectations. Consequently building products and systems are becoming more innovative (e.g. complicated elevations, cladding types, parapets and balustrades, and innovative resource inputs) to meet the demands of owners. Newer and innovative procurement processes bring about challenges which constructors need to manage effectively while delivering value to the project owner. On another hand, the time taken to build an average house has decreased in spite of these complexities and invariably this may mean that quality achievement could be compromised on construction projects.

Sommerville's (2007) study of the UK construction industry showed that its residential construction sector is continually experiencing low quality performance with a significant record of defects in new builds. Several studies have shown that the quality failure problem exists in other countries as well (Auchterlounie, 2009; Craig, 2008; Ilozor, Okoroh, and Egbu, 2004; Mills, Love, & Williams, 2009; Sommerville and McCosh, 2006). Sommerville and McCosh (2006) studied defects in 1700 new homes in the UK and they found that the scale of snags peaked at 389 for a single property. Their study showed further that there is a direct relationship between the size of properties and the number of snags identified. Another study conducted by Sommerville and Craig (2005) on 2202 new buildings in the UK over a period of four years had observed similar quality failures. The initial analysis of 55,000 out of 130,000 snagging items captured in Sommerville and Craig's study estimated that 68% of the defects were attributable to poor workmanship and 14% due to omission. Sommerville and Craig therefore concluded that there is a gap between a buyer's expectation and what the industry delivers in the way of functional quality. In the same vein, Auchterlounie (2009) confirms that customers' satisfactions do not correlate with technical defects and performance issues.

Similar poor quality achievement is reported in the Australian construction industry. An unpublished Masters thesis by Georgiou (2000) analysed 1772 houses constructed between 1988-1996, of which 1002 were houses built by their owners and 770 by registered builders. Georgiou's data was used to determine the severity of defect occurrences and the location of the defects within each house type. The results reveal that a mean of 2.74 defects per house was recorded in houses built by owners while a mean of 2.3 defects per house was recorded for those executed using registered builders. Georgiou's research shows that houses that were less than one year old were found to have a significant proportion of defects. Further, there is no significant difference in the quality of homes built by the two types of builders. Ilozor *et al*., (2004) conclude that framing and roofing were major defects that complicate other quality problems in new residential buildings, which could be mitigated by focussing on these two major defects. More recently Mills *et al.*, (2009) reveal that one out of eight residential buildings have defects in Australia, and that the estimated cost to rectify these defects was 4% of the construction contract value.

From the foregoing, it would seem that quality failures are rampant in new residential buildings in other countries. Examining the situation in New Zealand is therefore relevant. Particular emphasis is given to the magnitude of defects that are recorded at handover of new residential buildings to their owners.

2.2 Current quality situation in New Zealand

As observed, defects are common features of most new residential buildings, and there is evidence to suggest that New Zealand has similar quality problems. The common quality failure in New Zealand housing sector is the weather tightness problem. This problem is mainly confined to buildings constructed with monolithic external cladding installed over untreated timber framing and without a drainage cavity between the cladding and the external wall (PWC, 2009). Studies that have been carried out on the weather tightness problem in New Zealand are extensive. For example, the overview group that was commissioned in 2002 by the Building Industry Authority, New Zealand, to examine the problem of weather tightness, had amongst its terms of reference, the following: (a) to determine the nature, extent, and effect of the weather tightness problem, (b) to evaluate the potential contributing causes of regulatory systems and (c) to determine if failures could be attributed to deficiencies in the Building Act. The report of the overview group (referred to as the Hunn report) concluded that though the extent of problem is not fully known, urgent, corrective and preventive measures were needed to solve the problem. The Hunn (2002) report came up with a series of recommendations which contributed to the review of the 1991version of the Building Act. Of note is the mandatory inspection regime for all new buildings at different stages during construction work. The inspection regime varies for different building types but is specified in the development consent that is issued before any building can be constructed.

Conservative estimates for the annual cost of rectifying the weather tightness problem was put at between NZ$12-24 million by the Hunn report. The report confirms the result obtained by an earlier study by Porteous (1992) that evaluated and classified building failures in New Zealand. Porteous found that about 1% of 25,000 new houses constructed annually fail within the first few years of their commission and these failures are mostly due to water ingress.

The water ingress problem affects between 22,000 to 89,000 dwellings, with a consensus forecast of 42,000 PWC (2009). The repair cost for this consensus forecast of 42,000 buildings is estimated to be NZ$11.3 billion (in 2008 dollars). New residential buildings are particularly vulnerable with homeowners having to bear the burden of snags and latent defects. The weather tightness problem is not the focus of the current study, nevertheless it is a useful reference point to quality problems in buildings in New Zealand.

Page (2011) in a more recent survey, found that 60% of new homeowners have had to call their developers back for defects rectification in New Zealand. This is the most recent evidence that new homeowners are still faced with quality failures in their new homes. These abysmal quality performances continue to bring disrepute to the construction industry, particularly its residential building sector. One would expect that, when a new home is purchased, it will be of the highest quality, considering the inspection regime introduced by the Building Act in 2004. Thus an effective and efficient quality management process that will identify and rectify defects is required to improve quality achievement levels in new residential buildings in New Zealand. The quality management process will impact building production and the house buying process. Snag reporting (building inspection) is proposed as a quality improvement system in the current research programme.

This research will provide an insight into the problem of defects in new builds in New Zealand with a view to suggesting means by which the problem can be minimised or eradicated. It is anticipated that the research would provide data that could be compared to trends in related construction industries such as the UK and Australia (highlighted previously). Advanced knowledge on defects identification and rectification held by the UK residential sector could become a benchmark for quality improvements in New Zealand. Similar improvements in the New Zealand house construction sector will be encouraged; and may well be a solution to the weather tightness problem that pervades this local industry.

2.3 Protection mechanisms for homeowners in New Zealand

To purchase a home has always been at the heart of the New Zealander's dream and it is often the largest investment in their lifetime. Unfortunately these dreams are not completely fulfilled when their quality expectations are not met. Quality assurance should be the top priority considering the scale of investment and personal commitment involved in home ownership (Pfahlert, 2002). Because the ordinary homeowners are not so well informed, they rely on the provisions of the building code and the diligence of the Building Act (BA) when defects arise (CIC, 2009). This has traditionally led to claims against the BA when defects are evident. But homeowners find the state system restrictive, bureaucratic, flawed and under-resourced while the court system is perceived as being too expensive, benefiting lawyers mainly and resulting in little money being left for rectification works (Gibson, 2010). Homeowners are therefore not fully protected.

There are initiatives in the Building Act 2004 to support homeowners' quality expectations through the provision of statutory warranties that are implied in all building contracts for household units (Section 396-399). These warranties cover technical items that could affect the structural integrity of buildings. However the warranties are only useful where there is someone who is responsible to make good any

breaches and is prepared to rectify the building work to the quality levels originally anticipated (Kaye, 2011).

The Consumer Guarantee Act 1993, the Fair Trading Act 1986, the Sales of Good Act 1903, and the Companies Act 1993 also provide some form of protection to new homeowners. However these Acts have limited application in the house building sector. For example the Consumer Guarantee Act 1993 does not apply to a contract for the sale of a whole building attached to land which is designed for residential purposes, while the Fair Trading Act does not offer much protection in the case of a newly built home (Laxon, 2002). The Sale of Goods Act is also limited to consumers who had particular contractual agreement with builders and subcontractors.

There are other protections available to new homeowners in New Zealand. For example those provided by registered Master Builders. This is in the form of guaranties to cover residential building work with a contract price of above NZ$25,000. The three types of guarantees provided by the registered Master Builder in New Zealand are the 10 years premium guarantee, 10 years classic guarantee and 7 years guarantee. It is worth mentioning that these guaranties only take effect when the correct documentation is completed and that the guarantees are not automatic upon hiring a Registered Master Builder. The Master builder guarantees are limited to defects occurring within 2 years of construction (and 5 years for structural elements) and are capped to a maximum of $100,000 (Kaye, 2011).

Some further amendments are being proposed to the Building Act 2004, which could provide more incentives for builders to 'build right, first time'. For example it is suggested that homeowners commissioning building works of NZ$20,000 or more are to have a written contract with their builders, which will specify performance expectations, warranties, and remedial measures. Builders would be expected to rectify any defect reported by the homeowners within 12 months of commission on top of existing obligations to put things right for up to 10 years (Williamson, 2010). These amendments will help homeowners to be able to hold their builders to account and get defects to be rectified more quickly and cheaply though defect warranty periods may be ineffective if the developer/builder goes bankrupt. Homeowners may still have to fix the defects themselves, except if the developer/builders are members of a professional body (Ong, 1997).

The fundamental issues, as the authors see it, is being able to get the builders back to rectify defects and for the buildings to have been checked by qualified building inspectors at handover, so that any rectification can be done within these guarantee periods. Although the proposed revisions to legislation and policy documents could encourage quality achievement in house building production, engaging the service of building inspectors to identify defects could ensure that owners' expectations are met and consequently enhancements to their satisfaction levels.

2.4 The house buying process and inspection regime in New Zealand

There are three common ways by which new houses can be purchased in New Zealand. The first is to buy a completed building that has been built by a developer or builder who may or may not be professionally registered. Another way by which new houses are purchased is by negotiating and buying a house that is under construction. In this case, the purchaser enters into an agreement to purchase the house upon its completion. In this house buying process the potential homeowner could influence the design and

construction, depending on the construction stage reached. Thirdly houses could be purchased as what is referred to as a complete package (land and house) from a developer/builder. The designs may be bespoke using the owners own designers or from prototypes offered by the developer/builder. Management of the building production could be by the designer (on behalf of the owner) or by the developer/builder. Early involvement of the homeowner in this process may allow for performance that meets the owners' quality needs.

Whichever of the above processes are used, it is important that the quality needs and expectations of the homeowner's are met. The more the checks and inspection on building performance, the more probable the final build will meet the required quality standards. More so with the growing number of new residential buildings in New Zealand, a good quality management system is required to cope with these demands. Performance improvement schemes are needed within the residential sector to ensure that the sector maintains its capability to build better quality homes. In this light the building consents granted by an approving authority (Building Consent Authority), before the commencement of construction works, contain compliance requirements which are necessary for the proposed building work.

Building consents specify the inspection requirements for building works based on the submitted plans and specification. The purpose of the inspection is to ensure that building works comply with consent documentation. If the council inspector finds work that does not comply with the building consent during the inspection regime, a notice will be issued to rectify all defects. The inspection regime concludes with a final inspection of the completed build after which a Code Compliance Certificate (CCC) is issued. The CCC confirms that the work has been done in accordance to plans and specifications approved in the building consent. Sales and purchase contracts are often conditional on the issuance of a CCC (Gibson, 2010). Building inspection is usually carried out at specific stages corresponding to building progress but typically, council inspectors' inspect residential buildings at six 'key stages' of construction. Council inspectors may not visit the construction site for a number of weeks between stages and random spot checks during the building process are rare.

It is common for new homeowners to carryout visual inspection before finalising the purchase of their new homes, although this visual inspection may not identify all defective works because of the homeowners' lack of construction knowledge. It is therefore reasonable to engage an expert (building inspector) to undertake in depth inspection on behalf of the homebuyer. Holder (2002) advocates quality audits (snagging) by homeowners that will enable the identification of defects that may not be visually detectable and for which ordinary council inspections may not highlight. Similarly Cossar (2003) encourages checking and inspecting buildings before any decision to buy. Craig (2008) asserts that high quality builds cannot always be achieved by relying on the performance of construction parties. Although inspection is variously suggested, it is rarely carried out, especially with new builds in New Zealand.

3 The Research

3.1 The research questions

From the literature reviewed it is clear that there is a current and indeed pressing need to examine quality performance of new builds in the residential building sector in New Zealand. It is in this light, that the research on which this paper is based asks the

important question: *How could zero snags and defects be achieved so that the quality of new residential buildings is enhanced in New Zealand?* Addressing this research question will help to improve the quality of new residential buildings in New Zealand, and subsequently improve the confidence that new homeowners can have in their developers.

Some of the research sub-questions that relate to snag reporting are listed below. These sub-questions were formulated in order to achieve the main research objectives which are outlined in the next section.

What is the magnitude of snags/defects in new residential buildings?

What are homeowners' views on snagging as a means of ensuring quality achievement in new residential buildings?

Can snagging be encouraged for quality achievement in residential construction?

3.2 The research objectives

Specific objectives which relate to the itemised research questions above, to be pursued include the following:

a) To identify and categorise snagging problems in residential buildings in New Zealand through an analyses of developer's and building inspector's defect records.

b) To determine the importance of snag reporting from a homeowner perspective. This will be achieved through an opinion survey administered to new homeowners within three major cities in New Zealand.

c) To suggest improved quality achievement processes that will be beneficial to residential homeowners, developers and the wider construction industry.

3.3 The research design and methodology

The methodology for data collection and analyses that will lead to suggestions for improving existing house building practice in New Zealand is explained in the research framework presented in Figure 1. The research framework contains four key phases. The first phase covers problem recognition and research scoping. This is achieved by an extensive review of relevant literature and the researchers' interaction with external faculty (located in the UK) to gain knowledge on the research area. Clearer research objectives will be formulated based on new levels of understanding in the subject area

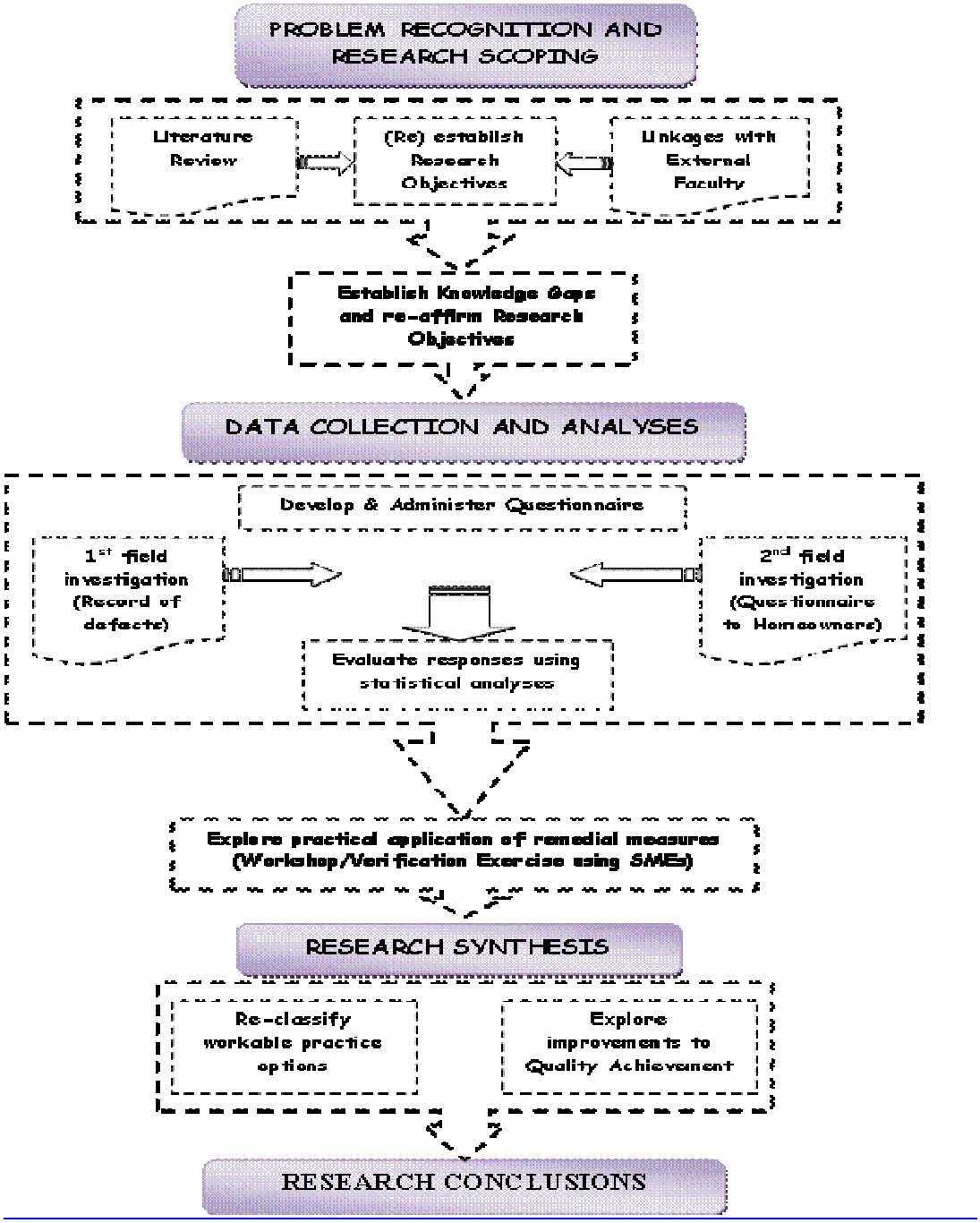

Figure 1 - The Research Framework

The second phase is the data collection and analyses phase. Two data collection tools will be developed, to collect information from two key research participants. The first set of information will be extracted from developers' and building inspectors' defects records, to capture the magnitude of defects in new residential buildings in New Zealand.

While the second set of information will be obtained through the administration of a semi-structured questionnaire to new homeowners. This will determine their satisfaction levels with their new homes and their experiences with quality performance by their developers. The survey will also determine the prospects for snagging new residential buildings for defects before or after handover. Data collected will be analysed using

simple statistical tools. A verification exercise involving subject matter experts will be conducted to validate the results from the analyses.

The third phase involves the synthesis of the research findings, re-classification of workable practice options that could improve quality achievement levels. While the last phase will conclude the research and give necessary suggestions for improving the house building process in New Zealand.

Given the nature of the current research problem and the different research methods available, it is appropriate to employ a mixed method approach. Mixed research method is chosen for the study because the research objectives and questions will benefit from a combination of different approaches for the purposes of triangulation, complementary, development, initiation and expansion. Methods to be used include content analyses, surveys, and interviews to establish the current quality performance in the residential building sector and to suggest improvements that will benefit every stakeholder in the house building sector in New Zealand. The chosen methods will utilise the strength of both the qualitative and quantitative research method. According to Amaratunga *et al.*, (2002) the combination of the strength and weaknesses of both the qualitative and quantitative research approaches can focus on the relevant strengths.

The analysis of the data will be via coded entry into SPSS and Excel as appropriate, and thereafter with its manipulation utilising ANOVA and correlation testing. The analysis would aim at determining the significance of snags; differences and correlates of information amongst research participants. It is fully expected that other highly useful measures of performance will emerge during this analysis phase, along with discontinuities and irregularities that will have to be addressed through other means. Simple interpretive and descriptive methods of presentation will be adopted so that the findings could be communicative and understandable to readers. McQueen and Knussen, (2002) explain that descriptive statistics are used to describe, illustrate and summarise information in three ways viz: forming numbers into tables, generating charts and diagrams from the numbers, and then calculating general statistics.

4 Potential Benefits of the research

At present insufficient data exists regarding current New Zealand quality performance in order to take forward the driving down of quality failures and defects rectification costs. The research will provide essential data for future industry improvement initiatives in reducing residential building defects at handover. This study contends that the snag reporting methodology would provide to companies participating in the research survey, and the building industry some significant benefits. The main likely benefits include:

Comparison and benchmarking of performance – improved snag reporting processes will allow more detailed assessment and auditing of quality achievement within the building industry. The result of those assessments will indicate high, medium and low performers and may provide a benchmark for good practice. It is anticipated that there will be substantial scope for international benchmarking of performance, since preliminary contacts have been made with organisations in the UK who have already undertaken this type of research and are willing to share data.

Improved image and reputation – the building industry is highly competitive and survival may be dependent on a good image of quality achievement by a firm. Quality

differentiates a firm from its competitors. It is not unlikely that long term players in the construction industry are those who have acquired a reputation for meeting their clients' needs for quality through consistently lowering numbers of snags. Companies developing their capabilities on the back of the data generated will be able to significantly increase their performance.

Improved service delivery – A quality conscious firm with reduced defects and less cost of rectification is likely to benefit from increased efficiency in its operations and ultimately the product/service that it delivers.

Growth in turnover – An expanding client base will follow from an increase in the satisfaction rate of clients. Turnover therefore increases and an organisation's financial profile is enhanced.

Increased profit margins - A good quality management system should reduce the 'cost of non-conformance' while the 'cost of conformance' stabilised or reduced in the long run.

Overall the research will benefit the wider construction industry through increased productivity coming from a reduced labour cost compared to the value of the constructed product.

5 Conclusions and Further Research

The pursuit of quality should be a never ending journey of continuous improvement. Improved quality management systems should help the constructor to look at the right ways of delivering buildings to facilitate doing the right things right, rather than simply doing things right. Doing the right things require a system that monitors the production process so that defective works are quickly identified and rectified. Presently snag reporting (building inspection) is mostly carried out for old and existing residential buildings, but little is being done in new builds in New Zealand. As a key objective of the research (reported in this paper), the magnitude of the defects at handover is investigated and the means by which snag reporting can be introduced within the house building production process will be identified.

It is hoped that by the completion of this research, mandatory building inspection will be incorporated into the house buying process in New Zealand. New homeowners can therefore fully utilise the 12 months defects warranty period proposed as an amendment to the Building Act 2004. Checking new builds for defects before or after handover would enable developers to rectify potential defects before they become burdens for homeowners. Homeowners want completed products that are defect-free and worth the utmost value for their investment. Builders should make these a performance criterion and should view the meeting of customer requirements a way of gaining competitive advantage in today's harsh market environment. Ultimately there would be increased confidence on developers by new homeowners on the quality of their new homes. If new builds are to stand the test of time, it is important that the production process do it once and do it right.

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Property Law

A pub, a field and some signs – a case study on the pragmatics of proprietorship and legal cognition.

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Abstract:

This paper uses a case study on the management of the grounds of a city-fringe pub to explore land and premises owners' perception of, and responses to, the legal requirements and risks of public access to their property. The paper examines how an *approximate* lay notion of occupiers' liability is acquired and used from an actor's 'internal point of view' (Hart 1994).

The study set out to empirically explore the suggestion (e.g. Jones 1984; Bennett & Crowe 2008) that landowners' expressions of concern about potential occupiers' liability for visitor injuries may function as a polite and acceptable proxy for a more visceral (and less publically expressible) sense of proprietorship but actually found something more prosaic. In the case study the 'liability risk' theme was invoked through copious cautionary signage by a premises manager who showed little overt anxiety about liability or safety and no strong proprietorial orientation towards his land.

To make sense of this conundrum the paper develops a theoretically informed interpretation of the case study which draws upon Bourdieu's notion of the guiding hand of 'habitus' (2005), Mutch's (2000, 2001 and 2003) and Pratten's (2007 a, b and c) work on the constancies and changes within UK pub management, Berger & Luckmann's (1971) concept of the 'sedimentation' of knowledge, Delaney's (2010) call for holistic, multi-disciplinary, 'nomospheric investigations' when studying spatio-legal behaviour, Sack's (1986) notion of the 'space clearing' function of territoriality and Altman's (1975) highlighting of the importance of express normative declarations for ambiguous 'secondary territories' that are neither wholly public nor private.

Through this synthesis insight is given into how a form of thinking and acting about law, liability and proprietorship can become embedded and replicated without needing at any stage a consciously developed self-understanding of that action. The paper considers the implications of this for land and premises management and the study of legal cognition within lay professional communities.

Keywords:

habitus, occupiers liability, land management, legal cognition, public houses

1 Introduction

This paper is a continuation of my recent research projects (Bennett, 2009, 2010, 2011, Bennett & Gibbeson, 2010) in which I have sought to examine the processes by which the abstract conceptual doctrines of the law are translated by lay communities such as cemetery managers or tree owners and applied into their day to day management of their physical environment. These studies have centred upon investigating the 'common sense' lay interpretation of the Occupiers Liability Acts 1957 and 1984 and specifically, how important that legal cognition actually is in land and premises management practice.

This journey started in the summer of 2008 when my colleague Lynne Crowe and I were commissioned by member agencies[1] of the Countryside Recreation Network[2] to conduct a scoping study to identify any existing research on the question of whether landowner anxieties about public liability towards recreational visitors affected the extent to which they allowed (or tried to curb) public access to their land. The study also involved 21 semi-structured interviews of predominantly public sector landowning bodies.

The literature review found only a few existing studies on this issue, and these mostly related to the North American experience (e.g. Teasley et al (1997), Gentle et al (1999), Wright et al (2002) and Henderson (2007)). Our interviews suggested that, for large pro-access public landowners at least, the risk of liability for any injuries sustained by recreational visitors was something viewed pragmatically, and to be taken 'in their stride' by those managers and their organisations. Our scoping study (Bennett & Crowe 2008) thus found no direct evidence of a withdrawal of access to private land as a result of fears of Britain's so called "compensation culture" (Williams, 2005).

In our report we conjectured that the strength of, and effect of, such fear might be greater for smaller organisations, particularly those with no vested interest in facilitating access. We wondered whether away from the calming influence of the mutual support bodies like the Visitor Safety in the Countryside Group (VSCG, 2005) anxieties and misperceptions about the risk of liability for any eventualities that might afflict recreational visitors to their lands might have more power and effect.

This conjecture chimed with commentators who had previously noted that whenever changes are proposed to the legislative frameworks by which access rights are imposed upon property owners (most recently in England in the form of the coastal path right of access under the Marine and Coastal Access Act 2009) anxious landowners and their representative associations raise the spectre of civil liability towards injured recreational visitors as a key concern, and justification, for opposing the legislative change as presented to them. We found ourselves in agreement with Jones (1984), who, writing on the eve of implementation of the Occupiers Liability Act 1984[3], surmised that:

> "The refusal of access by country landowners probably has more to do with the depredations inflicted by the uncaring public, or an unbridled sense of proprietorship, than the fear of potential liability for accidental injuries" (726).

[1] The Forestry Commission, the Scottish Government, Sport Northern Ireland, and the Northern Ireland Environment Agency.
[2] http://www.countrysiderecreation.org.uk/
[3] Which introduced a qualified duty of care to be owned to trespassers, in addition to the duty imposed by the 1957 Act for the protection of lawful visitors.

This paper reports on some of the further steps that I have taken to explore the relationship between landowners' perceptions of their duties and liabilities and their approach to public access to their land and premises. In doing so it will touch on the related themes of territoriality and proprietorship and delve deeper into the pragmatic and performative aspects of lay legal cognition. After briefly reviewing existing studies I will turn to consider a single-site case study warning signage at an urban-fringe pub. This empirical example raises some counter-intuitive questions (and possibly insights) into these processes.

2 Existing studies of occupiers' liability perception and exclusionary territoriality

The North American studies alluded to above (e.g. Teasley et al (1997), Gentle et al (1999), Wright et al (2002) and Henderson (2007)) centred their empirical enquiry around why, given that legislative concessions have already been made in order to insulate landowners against occupiers' liability for injuries sustained by recreational trespassers upon their land, landowners continue to express high levels of fear about potential liability. I do not have space to review this research in detail (see Bennett & Crowe 2008 for more), however Gentle et al's (1999) investigation of whether the different political and cultural heritage of various US States influenced landowners attitudes towards provision of access can help in summary. Gentle et al found no clear patterns other than a general finding that:

> "Landowners are much more comfortable with the use of their land by friends and family, rather than by strangers." (Gentle et al 1999, 57)

and that a history of "unpleasant experiences with recreationists"(62), rather than socio-economic differences or differences between rural and urban fringe settings, were the most important influencing factor in landowners' decisions on whether or not to prohibit access to their land. Meanwhile Teasley et al (1997) found respondents giving a variety of reasons for prohibiting access to their land, many of which could be grouped under a collective heading of "keeping land private", with only 28% agreeing that their decision was in whole or in part "to protect me from lawsuits".

There has been little research in the UK upon the role of fear of liability in shaping landowners' attitudes to access and the ways in which they express their proprietorship. The limited UK research evidence found did suggest that fear of liability may be a much lesser influence than perceptions of privacy and control, for example a study of woodland owners' attitudes to access in the South East of England for the Forestry Commission (2005) found that one third of private non-forestry business owners felt that their woodlands were important for personal privacy, with over 75% of this group reporting a perceived "loss of control" if public access was allowed. These privacy and control issues (which I take to be the core of 'proprietorship') showed more strength of feeling than whether liability for visitors was perceived as a factor of significance. In this regard none of the respondents reported "insurance claims" as a "very severe" problem, with 77% of the respondents reporting "no problems" in relation to this factor.

Our 2008 study explored the apparent disconnect between a prevailing public discourse that claims landowners to be fearful of the alleged compensation culture and landowners failing individually to rate fear of liability as a significant influence upon their land

management practices in these studies. It appeared from the US studies that a more general anxiety related to proprietorship was being presented in public as a fear of liability, because that was a more publically acceptable discourse. Furthermore, we noted that the existing studies and anecdotal examples from access policy changes in the United Kingdom and New Zealand all suggest that expressed anxieties about landowner liability risk appear to amplify at times where the landowner community is experiencing the threat of change to access regimes (and/or other uncertainties).

Our study also highlighted the *approximateness* with which liability issues are perceived and invoked by landowners, and the ways in which other preoccupations and anxieties appeared to weave into their stances on access control. Understanding landowner liability perception therefore appears to require an understanding of this wider fear/anxiety and the circumstance specific nature of each landowner's understanding of, and response to, his legal obligations.

A number of commentators (for example Landry (2005), Bauman (2006), Philippopoulos-Mihalopoulos (2007)) point to the contemporary dominance of what might be called 'anticipatory fear' – a future focussed, risk assessment shaped, attempt to prescribe for the adversities of the (near) future. Commentators also note the ways in which such anxieties are (at least in part) constructed by those who suffer them (Wildavsky & Dake, 1990). For example, whilst a landowner may describe that which he fears as external to him and (and imposed upon him) there is a willed, selective, dimension, at least as regards the actor having decided either *"this is what I need to worry about"* or *"this is how I will explain my feeling of unease about public access"*. In short, the likelihood is that if you get a landowner to think about access issues he will do so within a narrative framework that makes sense to him in terms of his wider anxieties and tends towards telling you what he thinks you want to hear.

Accordingly, it may be no surprise that respondents to a survey by the Country Landowners and Business Association (CLA, 2007) aimed at raising landowners' concerns about the feared impacts of the Marine and Coastal Access Act's coastal 'right to roam' paraded the following colourful illustrations of contemporary folk devils: feared liability for burglars, doggers (and also dog walkers), paedophiles, vandalism, unexploded bombs, errant golf balls and the perils of coastal erosion. This list of worries testifies to the diversity of rural (and coastal) landowners and the myriad ways in which anxiety about a change in access legislation may be expressed in, amongst other things, the language of safety and liability fears.

The majority of our 2008 interviewees were large, pro-access landowners. A minority of bodies representing small and/or private landowners were included. The respondents largely said (in effect) *"we're not worried about liability; we take it in our stride. We manage the risk"*. They then volunteered the following suggestions on what might make smaller landowners more susceptible to liability fears and consequential access restricting behaviours:

1) **Isolation and fear of liability**. It was felt that the more a landowner was connected into a support network in which a 'reasonable' approach to the understanding of liability risk could be collectively set and defended, the less the level of anxiety likely to be stirred up by sensationalist sources (e.g. the general media and its 'compensation culture' focus);
2) **Marginal survival.** That liability anxieties might be expected to be at their greatest where the business was (due to other pressures) struggling to survive,

and access would be seen as 'something else to worry about'. In particular landowners with single site operations may be particularly vulnerable as they will not have the experience of adapting abstract legal requirements and applying them to the (inevitably) different physical circumstances;

3) **No gain from access.** That landowners with no direct (or indirect) benefit from the public and their access to their land might be less likely to feel comfortable;
4) **Something valuable to protect.** That landowners would be more concerned about access control in situations where the land or premises comprises valuable assets which could be stolen or damaged by visitors; and
5) **A prior history of bad experiences with public access.**

In the case study that follows I will refer to these collectively as 'the Five Traits'.

Scholarship to date has observed a fairly rigid distinction between rural and urban investigations, with empirical studies of the control of recreational access to the countryside on the one hand and more theoretically inclined studies of urban enclosure processes on the other. In contrast to the land management focus of the countryside research, the urban studies have tended to focus either on "bunkerization" (Trigg 2008: 554) by homeowners or the grievances of those excluded from the land in question. The urban studies have not directly enquired into the legal cognition of non-residential landowners. Such studies have tended to focus on 'gated' residential communities and access control to shopping malls with these studies pointing towards that enclosure being driven by urban fears of crime and 'others' (see for example Low (2003), Sandercock (2005) Minton (2005; 2009) and Layard (2010)) rather than an owners' fear of potential liability for the injury of members of the public who may access his land.

In reality much land lies between the extremes of rural idyll and dense city block. Indeed, as Farley and Symonds-Roberts (2011) note, the greatest level of contestation over day to day access to land may actually lie in the ambiguous "edgelands" – the car parks, urban-fringe fields and woodlands, wastelands and ruins at which neat and stable classification of such spaces as unquestionably 'rural' or 'urban' or exclusively 'public' or 'private' will often prove unworkable.

This paper therefore seeks to contribute towards breaking down this polarisation by studying a city-fringe premises, part of the grounds of a pub, as its case study point of focus and by drawing from both from the empirical tradition of the rural studies and the theoretical sophistication of the urban investigations in the following analysis.

3 Is there actually any story to uncover? – a case study

Our 2008 report recommended further research to specifically enquire into the ways in which individual landowners interpret occupiers' liability law and apply that interpretation to their day to day management of their land. This work is ongoing, focussed around individual sites and their owners.

The remainder of this paper will present a case study of one urban/rural fringe plot of land and its owner. The case study appears to question the Five Traits conjectured above. Whilst this paper cannot postulate rules or generalisations from one case study, an attempt will be made to interpret (and theorise) the case study's findings.

Looking back on our 2008 study I was conscious of the limitations of interviewing senior executives about their organisation's land management practice and decided that the follow-up work needed to be more 'micro' level and interpretive in its empirical focus. I need to understand how lay individuals come to understand the principles of occupiers' liability law and render them workable for themselves. In my view this (for present purposes at least) requires an open, exploratory research methodology, essentially a hermeneutic approach in which the researcher tries to see the world through the respondent's eyes, at least in so far as that is relevant to understanding how his perception of risks, liability and recreational visitors shapes his land management practices.

As part of my search for case studies in this vein I decided to approach and interview the owner-manager of an urban-fringe countryside pub which I have been aware of for eight years, and which during that time has passed through a number of different owners. This pub has a grassed area (which I will call "the Field"[1]). It comprises a small wooden fenced plot bordering the pub car park. It is generally level and contains a couple of old but functional wooden picnic tables. There are no obvious hazards in the Field. Yet I have observed that over the years each successive owner has sought to discourage the pub's clientele from using this area. During this time I have noticed ever-more cautionary signage appearing on the fence and gate that demarks the boundary between the pub car park and the Field beyond (Figure 1).

Through my existing observational knowledge and face to face exploratory interview I hoped to explore with the current owner-manager (hereafter "the Landlord") why had he adopted the cautionary access strategy, his own understanding of occupiers' liability risks and what he based those views on.

[1] It was described by the Landlord as "the Paddock", although no horses have been there for at least 10 years.

Figure 25 - entrance to the field showing six cautionary signs affixed to fence and gate (April 2009)

Having regard to the 'Five Traits' I thought that the Landlord would be able to provide a conscious explanation of the signage – perhaps by recounting a previous accident in, or complaint about, the Field area which had set the whole process off. I also thought there might be some indication, in the Landlord's account, of safety/liability fears presenting as a proxy for a deeper set of proprietorial concerns (e.g. privacy and/or fear of loss of 'control'). I also anticipated that his approach towards the management of space at his pub would be consciously conditioned by external requirements derived from law (in particular premises licence, planning and insurance requirements).

4 So what was the story of the Field?

Well, there didn't appear to be a clear cut story so far as the Landlord could account. Whilst he echoed contemporary 'common sense' discourse about the self perpetuating nature of safety regulation and by expressing the view that we live in an era of increasing (and spurious) compensation claims he did not appear fearful of any such claims. He had had no personal experience of such regulatory intervention or claims, and appeared confident in his ability to manage people and situations through his own 'good host' nature (rather than stating an affinity for forms, barriers or notices). Neither 'insurer requirements' nor even the requirements of his premises licence appeared to have much effect upon how he shaped his approach to management of the Field. The Landlord did not appear to be haunted by a fear of his patrons and what they might get up to around his pub. Indeed he appeared to have a particularly optimistic worldview, appraising the likely behaviour of those who may come into the vicinity of his pub by reference to his own behaviour and dispositions.

Figure 26 - customer's eye view of fence signage (April 2009)

Yet despite all of this the Field was plastered with cautionary signs and disclaimers and gave every appearance of it being a place into which the public was not invited (Figure 2) and the

Landlord's best account of his actions in 'closing' the Field was that the area was "untidy" and not somewhere that he would use himself at the moment. The signs were "just a risk assessment…just health warnings".

The following extract from my interview with the Landlord shows the inchoate nature of the Landlord's vague exclusionary territoriality over the Field. After describing the picnic tables in that area and its occasional use for themed events like Halloween and Bonfire night (the interview took place in February 2009), the interview continued thus (the numbers in brackets denote length of pause):

Interviewer	so - you haven't got a problem with people going into that area?
Landlord	well I do have, at the moment, because it's, erm (0.2), it's (0.1) it's not how I want it (0.2)
Interviewer	in what sense?
Landlord	it's a bit untidy...because it's overgrown (0.2) and there's like pieces of wood about and it's not really ideal for, especially from this, especially from this time since Bonfire night, in the Winter, it's not really - I probably wouldn't use it...
Interviewer	so what about your signage up there, you've got quite a lot of signage up there?

Landlord yeah, it's just a risk assessment, it's just health warnings, 'cause I don't really want like (0.2) anyone on there really, 'cause it's not (0.3) it's not ideal, I don't think, at the moment, well it's untidy, and it's not really ideal, I don't feel (0.1) and I'd rather use that, as and when it's like (0.2) as everything's perfect (0.2).

5 Interpreting the story

It became clear in the interview that the Field is an area of the Landlord's pub that is not at the forefront of his mind or the forefront of his plans for his business. He would turn his attention to that area someday. Until then he'd written it off in his mind as "untidy" and not somewhere that he would want to go if he were visiting this pub as a customer. I felt that he regarded it as a "non-place" (Augé, 1996), in his mind, focussed as it is on building a viable business at this rather marginal location, it was (or at least he wanted it to be) 'out of mind', and because it was meaningless space to him he could not comprehend that anyone else might properly find that space desirable *at the moment*. Yet, for some unarticulated reason he felt compelled to reinforce the abandonment of that space by recourse to signifiers of risk and liability.

How can we account for this behaviour? If we reflect on the 'Five Traits' mapped out above the Landlord does not score particularly highly. The Landlord presented himself as a relatively laid back landowner, someone confident in his 'people skills' and steeped in the publican's service ethos. He had had no unpleasant experiences with public access in the past and the Field is of little current use to him (so his actions are not seemingly borne of a defensive urge). Yet, without conscious sense of exclusionary purpose, the Landlord has been routinely adding ever greater layers of cautionary signage to an unremarkable small grassed field.

I believe that the answer to this lies in the power of what had become *conventional* at this place. At a number of points in the interview the Landlord mentioned the inevitability and/or the business advantage of taking things on as they are - and not seeking to change everything from the start; for example:

> "…Here you've got to be kid friendly where we are, in like the Tap Room you've got to be dog friendly: because **that's how it's always been**…so it's easy for me to come and say "I'm not having any dogs in there" - but it's not; **its part and parcel of this, the history of the pub I suppose"** (emphasis added)

This, in the spirit of Bourdieu (1987; 2005), suggests a form of *habitus*, an embedded physical manner of use of a place by its owner and its patrons which it is difficult - or unadvisable - to change. In business parlance this could be called 'goodwill', it is embedded history and knowledge that makes the place what it is. In that sense it is *cultural,* laying down a normative order to a place and encounters within it.

The story of the Field, such as there is one, may well be that the signified conditions of the Field (the signage and appearance of exclusion) have been inherited circumstantially from previous owners via the existing manner of physical arrangement of the property. There is no great thought behind it. It exists, remains and is added to because there has been no event or cause to alter that status quo or challenge its appropriateness.

At this pub this habitus appears primarily encoded and transmitted between successive owners through the physical arrangement of the place, for there was minimal induction of the Landlord by the previous owners on hand-over). The Landlord thus appears, via a process of "sedimentation'" (Berger & Luckmann 1971, 85), to have added his extra layers of signage, recycling, repeating or adapting phrases inherited from his predecessors' notices (see Figures 3 & 4).

Figure 27 – Sept 2007 (before the Landlord's reign)

Figure 28 – Nov 2008 (during the Landlord's reign)

In this regard it is worth noting that the signs observed in 2007 (before the Landlord took over) are worded remarkably similarly to those installed in the era of the Landlord and furthermore that those signs, in 2011, still remain at the entry to the Field despite the departure of the Landlord and the arrival of yet another owner, who – presumably because he also has other more pressing things to think about – passively perpetuates the exclusionary effect of this accumulated layers of warning signage (Figure 5).

Figure 29 - May 2011 (after the Landlord has gone)

6 A pub's habitus; a publican's habitus

For Bourdieu habitus can reside in both places and people, and in both cases habitus is at least partially external to the local situation. Wider socio-economic (and other normative) influences will play their part in setting the *appropriate* dispositions for those people in that place.

If we return to the 'Five Traits' for a moment we can find in the socio-economic (and normative) context of the pub some potential pointers to factors that may have contributed towards this Landlord's dispositions regarding signage and the Field.

The recent history of the pub industry is one of rapid (and externally imposed) structural change as Mutch (2000, 2001 and 2003) and Pratten (2007a, b & c) show. In 1913 95% of licensed properties were brewery owned (Pratten 2007a, 336) but during the twentieth century this domination progressively declined. The process accelerated following a Monopoly & Mergers Commission investigation in 1989 (MMC 1989) that led to large brewers being forced to cease brewing or release from purchasing tie half of the pubs that they owned over a national allowance of 2,000 each by November 1992.

This wave of divestment prompted the creation of new, smaller pub portfolio owning groupings ('Pubcos'), many funded by investors from outside the brewing industry. As Pratten (2007c, 614) notes, since the early 1990s the pub sector has been subject to multiple waves of ownership change as banks, venture capitalists and entrepreneurs have regularly traded Pubco portfolios. The rising market share of supermarket alcohol sales and waves of legislative change such as the 2007 indoor smoking ban and the

liberalisation of the hours of pub opening over the last decade have also contributed to the atmosphere of constant change within the sector.

Set against this sea of externally imposed change publicans have struggled to keep their pubs open. The restructuring of the 1990s and first decade of the present century saw marginal pubs either close or float out into independent, owner-run, 'Free House' status[1].

We may conjecture that the co-ordination offered by an area and regional management structure for brewery owned or tied pubs may have operated in the past to reduce anxiety about liability risks within their outdoor zones and/or that, based on experience, publicans and their patrons did not need to be told what was and was not safe or acceptable use of the pub's environs. However due to the intercession of Pubcos and increased Free House ownership, owners and managers drawing from their prior experience outside the pub industry may have imported standards (or a sense of liability anxiety) characteristic of other industries, culminating in the installation of warning signs like those now visible at the case study pub and now embodied in this pub's ongoing habitus.

Mutch's work can also help us to think about the ways in which a *publican's* habitus is formed. Mutch's work confirms the Landlord's own biography and viewpoint – namely that publicans tend to come from publican families, they are likely to have little if any formal training for the job, some supervision may be exercised where the pub is owned by a brewery or similar but even in those parts of the trade the degree of directional supervision has been in decline. The modern way is to control (and incentivise) employed managers via their financial accountability rather than mandating controls over the spatial arrangement of the pub and its surroundings. Thus the trend has been towards leaving managers to make their own sense of what they must do to manage their pub.

However, the publican's freedom of action is tempered by the habitus of the pub itself. As Cavan (1966) and Pratten (2007 a) each show, a pub is a complex set of ordained spaces – often with distinct designated bar areas (the 'public bar', the 'tap room' and the 'lounge') each customarily assigned different decor, physical arrangement, customer expectations and behavioural norms. Add to that the temporal and activity-regulating aspects of the Licensing Acts and it becomes clear that running a pub is all about knowing how to respect and reproduce the 'expected' designation of times and spaces, and the control of activities and uses, within that place. Perhaps not surprisingly, the first place a new manager will look for guidance on what he must do, is the material culture and existing arrangement of the pub itself, as an embodiment of those normative codes and expectations.

So, in terms of the Five Traits, we find an industry sector built firmly upon habitus. An industry framed in unwritten tradition and an expectation of the publican 'learning on the job' yet now under siege from cumulative waves of recent externally imposed change and competition. Once understood in this light it will come as no surprise to reveal that the Landlord spent a lot of the interview alluding to difficulty he was facing in making his business venture a success. Talking about the Field, and asking him to account for how he was perceiving and managing liability risk for this 'non-place' must

[1] A 'Free House' is an establishment that is not 'tied' to a brewer and contractually obliged to purchase stock only from that sole brewer. The pub featured in this case study was, at the time of the interview, a 'Free House'.

have felt perplexing to him. Despite my dogged line of questioning the economic pressures and uncertainties continually irrupted during the interview. Within months of the interview the Landlord's venture was at an end, and the pub had new owners.

However, and in testament to the inertial power of the pub's habitus, this change of ownership wasn't easy to spot. The incoming owners made no changes to the physical arrangement of the place, the brasses, the games box, the tables, the ancient photos of the pub in times past, along with the Field's signage, all remained there, unaltered. In this pub, the owners come and go but the place, courtesy of its habitus, lives on unchanged.

7 What can this case study tell us about legal cognition?

Both the 2008 interviews and case study presented here were intended to illuminate the extent of (and techniques by which) landowners acquire and apply their lay understanding of occupiers' liability law. The outcome of these studies suggests that it would be dangerous to assume (as lawyers might well by training be tempted to do) that all landowners have a coherent understanding of occupiers' liability law and/or base their action upon it.

H.L.A. Hart (1994) sought to promote a 'sociological jurisprudence' which would pay serious attention to the effect of law as internalised by those subjected to it, an approach which sought an understanding of law's interpretation from the actor's internal point of view. This case study leaves me wondering whether Hart's rationalist view of the role of legal cognition in the shaping of lay pragmatic action in 'the real world' is too optimistic. For upon empirically enquiring into legal cognition and the law's subjectively received 'internal aspect' it becomes something rather nebulous, approximate and – to the lawyer's consternation – not as important as we like to think in the shaping of spatial activity.

As Andrews (2000) has noted (in relation to the ritual behaviours comprised in company directors' compliance with their disclosure duties under UK Company Law) what may actually be driving apparent compliance is a learned performativity, a ritualised behaviour, rather than an internalisation of the law itself. Thus just as company directors learn how to remember to fill in the appropriate forms, so landowners learn how to perform adherence to the conventional behaviours of territorial demarcation and risk management, but this is borne more of ritual than deep understanding of the law's conceptual doctrines.

Thus, when we look, we may find that law's concepts and symbols are deployed in day to day discourse in a distinctly approximate and incidental way. I find support for this viewpoint in two related strands of socio-legal scholarship.

First, the study of 'legal consciousness' in the work of Ewick & Sibley (1998) and Sibley (2005) which emphasises the dangers of assuming too close a correspondence between the law as extolled in juridical concepts and textbooks and the public appreciation of, adaptation to and application of, 'the law' in the everyday world. For them, law is an available schema, likely to be drawn upon pragmatically by citizens in order to make sense of their everyday lives, but it does not present a singular controlling code of living. Upon investigation law is commonly encountered as subordinate to other normative (and situational) influences shaping conduct.

Secondly, recent work within the 'Law and Geography' collaborative field, influenced as it is by the socio-spatial theorising of de Certeau (1988), Lefebvre (1991) and others, emphasises that 'the legal' and the spatial (and the socio-cultural milieu) are co-productive and that the focus of that production is pragmatic action. Thus territorial behaviour is a co-production of the actor's engagement with (and constraint imposed upon him by):

i) the physical reality of the specific space;
ii) the habituated and/or expressly known legal and other normative structures available to govern that space; and
iii) the purpose of that action – it's circumstances and contingencies.

Delaney (2010) in support of this 'intertwined' reading of the production of places within human action, calls for "nomospheric investigations"(48) that strive to read the factors contributing to this co-production in a way that does not (through the conventions of rigid disciplinarity) privilege one contributory factor over any other. In short, the role of the law in this is important, but not omnipotent. It is in this spirit that I have sought to make sense of this case study. Hogg (2002, 34) encapsulates the required reorientation of the angle of analysis thus:

> "if we were to take the spatiality of legal practices seriously ...we should cease to look upon law as a closed, formal and acontextual system and see it instead as an assemblage of heterogeneous elements, discursive, social and technical. These elements include distinctive physical structures, spatial arrangements and rituals as well as texts and rules."

8 Why do the signs invoke the language of risk and danger?

This paper has sought to focus upon understanding the landowner's role in restricting access, and the possible ways in which the discourse of liability, risk or danger may be being invoked as a publicly acceptable proxy for proprietorship. The case study has taken us away from that question and has suggested that, in this pub at least, neither fear of liability nor proprietorship are the main drivers of this behaviour. We can, though find some insight into the role of a risk and liability discourse within the chosen signage.

Scollon & Wong Scollon (2003) and Delaney (2005; 2010) both seek to show the indexicality of expressions of territoriality. Delaney (2005, 30) shows how a 'no trespassing' sign alludes to, draws upon, and "implicate[s] complex relations of power" in that the sign invokes the apparatus of legal rights to which the landowner may potentially have recourse (not necessarily cheaply or with certainty) in order to control access to that territory. Yet the widespread persistence across the UK of exclusionary signs incorrectly declaring that '*Trespassers will be prosecuted'* (trespass is not generally a crime in the UK and thus is more commonly a civil wrong for which the transgressor might be sued in the civil courts, rather than prosecuted in the criminal courts) is testimony to the approximateness of that invocation of the formalities of the law. Such signs create (and defend) territory as much by their normative appeal to moral and habitual (i.e. learned) notions of public and private space than to those signs' (correct or incorrect) appeals to the authority of the law.

Such signage (and the appearance of exclusionary intent) also has an inferential dimension for the public. For signage to work successfully as an access control the public in the vicinity of such land must choose to take the warning signs in a conventional way, and not put the landowner to proof of their legal efficacy. The sign's audience must have either a habituated pre-understanding of how it is appropriate to respond in the face of such signs or alternatively those signs must spell out the rules explicitly. Thus the habitus of pubs shapes the way in which these places, and encounters in and about them, are likely to play out. The signs will be noticed, but not normally read. In that sense it often doesn't matter what the signs actually say. Such notices are probably only attentively read by 'nomospheric technicians' (Delaney, 2010, 158) such as legal scholars with an over developed interest lay understanding of occupiers' liability law or claimant lawyers following an accident (Figure 6).

Figure 30 - How many customers would actually read this sign? (June 2008)

But why do the signs not simply say "keep out"?

Well, this may seem too brutal (or total) a prohibition given the 'welcoming' context that a pub will generally be expected to provide. Moore & Bottomley (2007) note the trend away from physical exclusion within city centre 'privatised' spaces, towards a more collaborative 'governance' based approach. Governance here is a term derived from Foucault (Lupton, 1999), which notes that the modern way of governing subjects is increasingly less achieved through barriers, official violence or even direct imposition of law, but rather relies upon processes by which subjects are conditioned to respond to

ever more subtle cues of control. The discourse of risk is a particularly ascendant 'disciplining' discourse (Landry, 2005). In short, using the language of risk and danger may be a particularly contemporary, polite and effective way to achieve access control.

The fundamental point with the Field is that the landlord cannot currently conceive of any *other* usage for that space. He would not want to go there (as a customer), he is not currently 'providing' that space (in the sense of offering it as part of his commercial realm). It is presently meaningless to him (but has the potential for meaning in the future). He needs to symbolically nullify it, to take it out of the picture and to deal with it 'later'. Yet he expresses that in the 'modern way' via the language of risk allocation and the persistence of inappropriate or mutated signs, that testify to a general deterrence, rather than a specific warning / thing of danger or an outright foreclosure of this space.

This process reveals an aspect of territoriality that may not seem obvious – something that Sack (1986) describes as 'space clearing'. Sack describes this form of territoriality in rather abstract terms, but with the case of the Field we can see that territory can be a willed nullity. The Landlord has no current use for the space. Perhaps he can see some potentiality in it, but for the time being it is surplus to requirements.

As Sack (1986) notes, territoriality may be a relatively cheap and effort free approach to managing a spatial problem (in this case a spatial surplus). It is easier to deter the public from an area by affixing a few mildly unwelcoming signs than spending the time to render it "tidy". And to extend the analysis here, it is easier to for the Landlord to deter via a sign that invokes law, risk and danger (because people are more likely to take notice of that sign) than it would be to erect a sign that says (as might have been more accurate):

> *"Please don't enter this area because I've not had chance yet to get it how I want it to be, and I'd prefer it if you would use and enjoy the other parts of the pub that I have spent time and effort getting to a state that I'm proud of and I want you to enjoy"*.

Remember here that the Landlord appears not to have any particular danger in mind other than 'untidyness'. For him (if conscious at all) the role of the signage is to help keep the Field off his list of things to worry about. It needs to be symbolically declared a 'non-place' *for the time being* whilst he focuses on trying to develop the pub's core spatial zone (the pub's bar rooms and its contiguous courtyard). The Field now lies beyond that spatially shrivelled core, it's ageing picnic tables a legacy of a previous expansionist era at this pub, an era during which – these remnants would suggest - an unsuccessful attempt was made to commercially colonise this marginal zone.

Here we see the creation of *waste*-land, a process of neglect underscored by a low-thought, low-cost, low-effort technique for declaring it empty and (in a commercial sense) not currently part of the pub. Yet, all the Landlord has to do is declare it a temporary 'Beer Garden' on special occasions and it springs back into being as a willed part of the pub. Moore & Bottomley (2007) have noted the increasing blurring of any rigid distinction between 'public' and 'private' space – instead spaces become multifunctional. Thus the Field is neither 'private' nor 'public' in any static sense, instead it fluctuates and the borders that it sets up are porous because of the commercial imperative (and potential of the Field on occasion, and perhaps more so in some

indeterminate future) to be a space of commerce. In such situations the Field can become (both physically and symbolically) 'opened for business'.

Altman (1975) defines such places as 'secondary territories', places characterised by the ambiguity of their access status, due to their being neither for all time nor in all circumstances unequivocally 'private' nor 'public' space. These are places into which the public may enter *sometimes*. The rules of *sometimes* are complex and may need spelling out in notices and declarations of express conditions of access if the habitus of the place does not create clear normative guidance. Yet, perhaps ironically (as we have seen) the signs themselves can – via sedimentation - subsequently become 'locked' within the pub and publican's habitus, they become part of the 'normality' of the pub and its physical arrangement.

Significantly, at this place, the local habitus does not appear to provide a clear framework for the *removal* of this signage. Instead it is left to accrue and the visitor must make their own sense of these notices. Most will vaguely notice these ambiguous signs, but will not stop to read them. They will ascribe to them a general prohibitory intent and not venture into the Field. This seems to be consistent with what the Landlord wants – but (as we have seen) his sense of proprietorship over this area is currently weak and this space is controlled by circumstance, rather than by conscious direction on his part. There is no cynical exclusionary strategy here. Instead the process plays out by default. Here these signs themselves control space, control visitors and – in the sense of habitus explored above – also appear to exert some control over the successive owners of this place.

My best guess is that this process was set in hand a number of years ago under an earlier owner's initiative. When I first became aware of the Field in 2002 there were vestiges of a rather rudimentary 'adventure playground' in the Field. The 'take care for your children in this place' trope may have been, at that time, specifically directed to then non-standard feature of this space (and reflect the anxiety and legal interventions around child safety in playgrounds that was at the fore in the late 1980s as chronicled by Ball (2002)). The sign shown in Figure 7 may therefore represent the 'root' meme (Dawkins 1989: 192) of this now rather self-perpetuating semiotic rash, for this (long broken) printed sign suggests a more specific and slightly institutional origin than the 'home-made' paper offspring now accompanying it.

Figure 7 - The root meme? (Nov 2008)

9 Conclusion

My experience of trying to interpret this case study has forced me to examine the limitations of a traditional 'legalistic' approach to investigating both proprietorship and legal cognition.

A visit to the pub would give the impression that the Field is a small area in comparison to the footprint occupied by the pub building and its courtyard. But in preparing this paper (and trying to find out what had happened to the Landlord) I obtained a copy of the title plan from the Land Registry and was surprised to see that the Field is almost exactly the same size as the pub and its courtyard. As Korzybski (1933: 58) has noted in a different context: "The map is not the territory" but it does usually capture at least part of its essence. The title plan shows that both areas are held under the same registered land title, and subject to the same covenants. Yet for the Landlord one part of the title (the pub building) is the anxious commercial focus of his working life whilst the other (the Field) is a surplus, 'non-place' barely noticed by him. A conveyancer reading these title documents would get no sense of the differential level of dwelling with which these two parcels are currently invested. The symbolic manipulations of the Field and its flip flop in and out of an actively possessed and enjoyed state registers little, if at all, at this formal level of title.

Yes, physical possession via occupancy and use is an important feature of proving and sustaining ownership, but as Gray and Francis-Gray (1998) and Grear (2003) note, the notion of ownership at common law is conceptually muddled and the legal rules of possession would pay little heed to the subtle totems of nullification and non-place

making identified in this case study. For these are matters of something non-legal: differential degrees of dwelling (in the sense of a space being loved and thought about, or not).

To understand proprietorship – and its effect upon access control - we have to take a more holistic approach and follow Delaney (2010), Hogg's (2002) and Trigg's (2005) exhortations, and move away from interpreting land use solely through the disciplinary gazes of either law or spatiality, because focus on only one dimension will miss some of the story. Instead, Delaney recommends a holistic scholarship that should seek to study how:

> "...nomic traces are provisionally inscribed and anchored to segments of the world. Participants in social situations, whether routine or extraordinary, avail themselves of such traces as they see pragmatically relevant to the tasks at hand (the right to exclude *in order to...* the right not to be excluded *in order to ...).* Traces such as rules or rights are not simply free-floating bits of discourse. They are spatialized signifiers that may be deployed as reasons or justifications for acting this way or that, one way or another." (Delaney 2010: 60 – emphasis in original)

The accumulated signs at the perimeter of the Field are such "nomic traces" (Figure 8). In part they perpetuate because of the inertial effect of the pub's habitus and the dispositions that that engenders in successive publicans (and patrons) who come to the site (and this may be amplified by structural adversity such as recent history of the pub industry). On occasion they are the results of actively willed behaviour, whether deployed pragmatically towards specific ends by the landowner (e.g. declaration of Beer Garden events) or are imposed by some external event or requirement (e.g. playground safety standards or the indoor smoking ban).

But in all of these circumstances the shaping influence of the law is enacted (it is performed by a succession of owners and their respective patrons) via approximate and intertwined notions of law and liability, territoriality, proprietorship, embodied custom (i.e. habitus of the place, its owner and patrons) and feelings and dispositions about a place. This is a complex cocktail that requires us as lawyers[1] to step into a wider frame of analysis if we are to understand lay perception (and pragmatic use of) the law and the contribution of the law in shaping how premises are used and managed.

Clearly, a single case study cannot prove or disprove that a conscious anxiety about liability haunts other landowners, or that such behaviour is really a mask for a rawer sense of proprietorship, but it is hoped that the analysis set out in this paper offers some pointers to techniques, levels of analysis and disciplines to be engaged in the pursuit of this question.

[1] Similarly (and following Delaney 2010) the geographer (or other social scientist) reader should equally take heed not to ignore the important constitutive role of the law in the construction of the pub, the publican and his patrons via matters of title, leasehold and planning obligations, premises licences, brewery ties, anti-monopolistic restructuring, public health controls, fire ordinances, occupiers' liability, insurer requirements and employment legislation to name but a few.

Figure 8 – Decaying signs left as nomic traces, legacies of prior action yet still operative (May 2011)

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Politics of Property Law in India

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Abstract:
The right to property has often been derided as the "least defensible" right in a socialist democracy. It is very absorbing to note that Right to Property has induced the most number of amendments to Indian Constitution and has formed the core from which some commendable and historic decisions have emerged from the Indian judiciary. It delves into the intricacies of the transition of "the right to property" from a "fundamental right" to a "legal right". The research shall be grounded in numerous cause célèbre; landmark decisions as well as large number of amendments shall also be analyzed. The researchers would strive to critically examine the development and interplay between important articles like 14, which states the rule of equality before the law and other important articles such as 19(1) (f), 31 and 300, which are critical to the debate on property rights in India. The study highlights the importance of property rights in a person's life as well as the extreme and innovative means he/she could come up with to defend it. The second part of the paper discusses the social restrictions placed on the right in the form of Land Acquisition Act and its controversial provision dealing with "public purpose". In conclusion, the researchers suggest mechanisms to counter the gross violation of fundamental rights in this field of property rights by analyzing different bills.

Keywords:
constitutional aspect; Indian perspective; Right to Property.

1 Introduction

"*One will excuse the murderer of his own father but not the person who will take away his property"* said the great Machiavelli. These words best describe the poignant state of affairs of landless masses of the nation. 'Property rights' expose the bedrock of Indian socialism propounded by the great Jawaharlal Nehru, the first Prime Minister of the nation. The conflicting views of the legislature and the judiciary over this subject led to the experience of judicial review during the last fifty years and the vicissitudes of judicial activism in the realm of property. The colonial Land Acquisition Act, 1894 (hereinafter referred to as 'the Act'), a legal instrument devised to acquire land, stipulated only monetary compensation at market rate[1], ignoring local self-governments, communal property rights and the environment. It allowed the government to forcibly acquire land from private landholders for projects of 'public purposes'[2].

[1] Land Acquisition Act 1894, s 23
[2] Land Acquisition Act 1894, s 3(f)

This paper delves into the transition of the status of right to property from that of a 'fundamental' right guaranteed by the state to its citizen, to that of a 'statutory' right where land could not be acquired save by authority of law. It traces such transition and its outcome which led to the 'tragedy of commons'[1] in the form of mass displacement of the poor and illiterate under the garb of acquisition of land for the purposes of 'development'. The unique economic policy of liberalization caused a furor as the government permitted acquisition of land based on the archaic Act. The Amendment Bill[2] proposed by the government contains the skewed 70:30[3] ratio of acquisition. It shall persist to aggravate the poor living conditions of the hapless farmers and landless laborers as the government shall continue to 'grab' their land for industrial purposes. The existing Act has witnessed maximum litigation by the poor asserting their right to property and demanding the restoration of the original status of the right to property. Needless to say, those evicted were deprived of their basic human right and social security.

2 Tracing the historical background of Land Rights in India

2.1 Pre-Constitutional Position

The Constitution of India derived its foundation largely from Section 299 of the Government of India Act, 1935. It secured the right to property and contained safeguards against expropriation without compensation and against acquisition for a non-public purpose. In "Constituent Assembly of India, Constitutional precedents (Third Series)" (1947), it is stated, "Broadly speaking, the rights declared in the Constitutions relate to equality before the law, freedom of speech, freedom of religion, freedom of assembly, freedom of association, security of person and security of property. Within limits these are all well recognized rights."

2.2 Post- Constitutional Developments

A scrutiny of the relevant provisions of the Indian Constitution as they stood on January 26, 1950 is necessary for a holistic understanding of the developments to this controversial right. They are Articles 14, 19(1)(f), 19(5), 31, 32, 39(b) and (c), 226 and 265. The gist of the said provisions may be briefly stated thus: *Every citizen has the individual right to acquire, to hold and dispose of property. A duty is implicit in this right, namely that it should be so reasonably exercised as not to interfere with similar rights of other citizens. The exercise of it, therefore, should be reasonable and in accordance with public interest.*[4] The Directive Principles of State Policy[5] laid down the relevant principles through which the State was directed to secure the ownership and control of the material resources of the community for the common good. It also specified that the operation of the economic system should not result in the concentration of wealth and means of production to the common detriment.

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[1] Fikret Berkes, *Common Property Resources* (London: Belhaven Press, 1989)

[2] Land Acquisition (Amendment) Bill 2007

[3] Land Acquisition Case For Three Categories Resettlement And Rehabilitation Bill < http://articles.economictimes.indiatimes.com/2010-11-10/news/27612678_1_ > accessed 29 May 2011

[4] Sushanth Salian, 'History of the Removal of Fundamental Right to Property' (May 2002) <www.ccsindia.org/interns2002/25.pdf> accessed 30 May 2011

[5] The Constitution of India 1950, Part IV

The conflict between the citizen's right and the State's power to implement the said principles were reconciled by putting limitations both on the right and the power. The said fundamental right was not absolute.[1] It was subject to the law of reasonable restrictions in the interest of the general public. The State's power was also subject to the condition that the law made by it in so far as it infringed the said fundamental right should stand the double test of reasonableness and public interest. Thus, it vested in the State the power to acquire the land of a citizen for a public purpose after paying compensation along with the power to impose taxation on a person for his property. We rejected the Russian theory of Socialism[2] but accepted the doctrine of individual right to property subject to the laws of social control. These laws of social control were restrictions imposed on the absolute "right to property" of individuals. The Government implemented these laws through the Land Acquisition Act, when dealing with cases of public purpose. The right to property was conditioned by the social responsibility. The higher judiciary was made the arbiter to maintain the just balance between private rights and public interests. After the Constitution of India came into force, the following agrarian reforms[3] were introduced as follows:

(1) *Intermediaries were abolished*
(2) *Ceiling was fixed on land holdings*
(3) *The cultivating tenant within the ceiling secured permanent rights*
(4) *In some states, the share of the landlord was regulated by the law*
(5) *In one state, the tiller of the soil secured cultivating rights against the absentee landlord, and in some states, the rural economy was re-adjusted in such a way, that the scattered bits of land of each tenant were consolidated in one place by a process of statutory exchange.*

Thus, these reforms implemented the Directive Principles of State Policy and socialist Nehru enacted the aforementioned ceiling legislations to confiscate lands following the socialists' objective to attain economic equality by robbing Peter to pay Paul.

2.3 Judiciary v. Legislature: The Trouble Begins

Parliament and the Supreme Court clashed on their interpretations of the provisions on the right to property. Although the Constituent Assembly had taken utmost care to avoid judicial interference in the program of economic reforms to which the Congress Party had been committed since the days of the National Movement, the courts did hold the laws authorizing changes in property relations unconstitutional. The First Amendment Act, 1951 introduced Article 31-A and Article 31-B which spawned the saga of legislative manipulation of right to property. Article 31-A defined ″Estate″ and continued by further amendments to extend its meaning so as to include practically the entire agricultural land in the rural area including waste lands, forest lands, lands for pasture or sites of buildings. Under the said amendment, no law providing for acquisition by the state of an estate so defined or any rights therein of the extinguishment or modification of such rights could be questioned on the ground that it

[1] Constitution of India Assembly Debates (Proceedings), Volume III <http://164.100.47.132/lssnew/constituent/vol3p5.html> accessed 31 May 2011
[2] Mark Thornton, ' A Theory of Socialism and Capitalism' (October 2009) < https://mises.org/daily/3780/A-Theory-of-Socialism-and-Capitalism> accessed 31 May 2011
[3] M L Dantwala, ' Land Reforms in India' 66 Int'l Lab. Rev. 419 (1952) < http://heinonline.org/HOL/LandingPage?collection=journals&handle=hein.journals/intlr66&div=34&id=&page=> accessed 31 May 2011

was inconsistent with or took away or abridged the right to equality contained in article 14, right to various freedoms contained in article 19, and the right to property contained in article 31[1].

The subsequent amendments introducing Article 31-B and the Ninth Schedule were an attempt to usurp the judicial power. It was an innovation introduced in the Indian Constitution which was unheard of in any other part of the democratic world. The legislature made void laws offending fundamental rights and included it in the Ninth Schedule, which were later extended from time to time as per the whims and fancies of the ruling political party. Article 31-B declared that none of the acts or regulations specified in either the Schedule or any of the provisions thereof shall be deemed to be void on the ground that they are inconsistent with Part III, notwithstanding any judgment, decree or order of any court or tribunal to the contrary. A further amendment disclosed a cynical attitude towards the rule of law and autocratic power of legislature was thus sustained by democratic processes. The amendments in the realm of property substituted the Constitutional ideology with totalitarian ideology. This totalitarian ideology was articulated by the deliberate use of amendments to add more and more laws to the Ninth Schedule. Originally 64 laws were added to the Ninth Schedule and more acts were added by the 4th, 17th and 29th Amendment Act; the 34th Amendment added 17 more Acts. The 66th Amendment added 55 Acts raising the total number of laws excluded from the purview of judicial review to 257. The 76th Amendment Act, 1994 added the Tamil Nadu Act[2] providing for 69 percent reservation for backward classes under the Ninth Schedule. This was a clear misuse of the Ninth Schedule for political gains as the object of the Ninth Schedule of the Constitution was to protect only land reform laws from being challenged in court.[3]

The Supreme Court held in a series of decisions viz. *State of West Bengal* v *Mrs. Bella Banerjee*[4], *W.B* v *Subodh Gopal*[5] and *State of Madras* v *Namasivaya Muralidar*[6] that Article 31, clauses (1) and (2) provided for the doctrine of eminent domain[7] and under clause (2) a person must be deemed to be deprived of his property if he was "substantially dispossessed" or his right to use and enjoy the property was "seriously impaired" by the impugned law. According to this interpretation, the two clauses of Article 31 dealt only with acquisition of property in the sense explained by the court, and that under Article 31(1) the state could not make a law depriving a person of his property without complying with the provisions of Article 31(2).

It was the decision in the *Bella Banerjee* case which induced the government to resort to the Fourth Amendment. In this landmark case the Apex Court insisted on payment of compensation in every case of compulsory deprivation of property by the state. It was held that clause (1) and (2) of Article 31 dealt with the same subject of deprivation of private property. Further the court held that the word "compensation" meant "just compensation" i.e. just equivalent of "what the owner had been deprived of."[8]

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[1] The Constitution of India 1950
[2] Tamil Nadu Panchayats Act 1994
[3] Supra Note 8
[4] *State of West Bengal v Mrs. Bella Banerjee* [1954] SCR 558
[5] *W.B v Subodh Gopal* [1954] SCR 587
[6] *State of Madras v Namasivaya Muralidar* [1964] 6 SCR 35
[7] International Environment Law Research Centre, *A Word on Eminent Domain: Displaced by Development – Confronting Marginalization and Gender Injustice* (New Delhi: Sage, 2009), p. 133
[8] S.P.Sathe, *Constitutional Amendments, 1950-1988: Law and Politics* (first published Bombay: N M Tripathi 1989)

Such form of judicial activism was met with attempts to curb the power of the courts as well as access to them.[1] Various indirect methods, adopted by the legislature to discipline the judiciary included the supersession of judges[2] and the transfer of inconvenient judges[3].

2.3.1 The 'Locus Classicus' that saved the Constitution but murdered the right to property

Keshavananda Bharti v State of Kerala[4] has been a milestone in the history of Indian legal jurisprudence. The judgment was handed down by a panel of thirteen judges, the largest panel created for any judicial hearing in India. This cause célèbre had the petitioners challenge the validity of Kerala Land Reforms Act 1963 during the pendency of the which the impugned Act was amended in 1971 and placed under the Ninth Schedule by the 29th Amendment Act. The question that arose was the extent of the amending power conferred by Article 368 of the Constitution.[5] The Government of India claimed that it had the right as a matter of law to change or destroy the entire fabric of the Constitution through the instrumentality of Parliament's amending powers. Ironically, seventy years earlier, Hitler had asserted and exercised such a right by invoking the amending power of the German legislature, and there were no judicial pronouncement to restrain that dictator. Such was the emotive power of this case that the judgment witnessed the retirement of six senior judges of the Supreme Court (Chief Justice S M Sikri, a day after the judgment was delivered; Justices J M Shelat, K S Hegde and A N Grover who were superseded to the office of the Chief Justice of India for choosing to abide by their conscience and Justices P Jaganmohan Reddy and A K Mukherjea) who had held as follows:

Firstly, the Parliament's amending power was limited. While Parliament was entitled to abridge any fundamental right or amend any provision of the Constitution, the amending power did not extend to damaging or destroying any of the essential features of the Constitution. The fundamental rights are among the essential features of the Constitution. Therefore, while they may be abridged, the abridgment cannot extend to the point of damage to or destruction of their core. *Secondly*, article 31C was void since it took away invaluable fundamental rights, even those unrelated with property.

Whereas Justices A N Ray, D G Palekar, K K Mathew, M H Beg, S N Dwivedi and Y V Chandrachud held the power of the Parliament to amend to be unlimited and article 31C to be valid. Out of the thirteen judges six decided the case in favor of the citizen and the other six in favor of the state. Justice H R Khanna did not completely agree with any of these twelve judges and held that (a) the power of amendment is limited; it did not enable Parliament to alter the basic structure of the Constitution[6]; (b) the substantive provision of Article 31C, which abrogated the fundamental rights, was valid on the ground that it did not alter the basic structure of the Constitution; and (c) the latter part of Article 31C, which ousted the jurisdiction of the Court, was void. He went a part of

[1] S.P.Sathe, *Curbs on PIL: UF Governments Evil Designs' Economic and Political Weekly* [1997] PL 441
[2] N.A.Palkhivala, *Judiciary Made to Measure* (first published 1973)
[3] *S.H.Sheth v India* [1976] 17 G.L.R 1017
[4] *Keshavananda Bharti v State of Kerala* [1973] AIR SC 1461
[5] Upendra Baxi, 'The Constitutional Quicksand of Keshavananda Bharti and the Twenty-Fifth Amendment' [1974] 1 SCC 45
[6] Venkatesh Nayak, 'The Basic Structure of the Indian Constitution' <http://www.humanrightsinitiative.org/publications/const/the_basic_structure_of_the_indian_constitution.pdf> accessed 31 May 2011

the way along with judgment in favor of citizens and thus this constituted the majority view of the Supreme Court. It became law of the land.

Khanna J, spelt catastrophe to 19(1) (f), when he held that Right to Property could not be a part of the basic structure of the Constitution. Thus, this demonstrated to the people of India that their Parliament was in reality *property friendly* and not *people friendly*[1].

2.3.2 The Forty-fourth Amendment Act, 1979: the final blow

The Janata Party which attained majority at the Centre sought to remove the contentious property rights by introducing this act. The Forty-Fourth Amendment Act removed the right to property from the Part III (Chapter on "Fundamental Rights") by deleting Articles 19(1) (f) and Article 31[2] along with subsequent amendments, and inserted in Part XII the following new chapter: "Chapter IV (Right to Property), Article 300A which stated: "Persons not to be deprived of property save by authority of law—no person shall be deprived of his property save by authority of law." It is pertinent to note the contents of the aforementioned amendment:

3. "In view of the special position sought to be given to fundamental rights, the right to property, which has been the occasion for more than one Amendment of the Constitution, would cease to be a fundamental right and become only a legal right. Necessary amendments for this purpose are being made to Article 19 and Article 31 is being deleted. It would however be ensured that the removal of property from the list of fundamental rights would not affect the rights of the minorities to establish and administer educational institutions of their choice.
4. Similarly, the right of persons holding land for personal cultivation and within ceiling limit to receive market compensation at the market value will not be affected.
5. Property, while ceasing to be a fundamental right, would, however, be given express recognition as a legal right, provisions being made that no person shall be deprived of his property save in accordance with law."[3] This controversial amendment witnessed the 'right to property' being asserted not by the rich but by the poor. Now it is being asserted by the evictees whose lands have been acquired by the State in the garb of 'development' by using the archaic Land Acquisition Act, 1894.

3 Land Acquisition, the law of social control

Land acquisition, the core of politics of property in India is the process by which government expropriates private property for public purpose, different from just market purchase of land.[4] The discretion of the state to forcibly acquire land is expressed as "eminent domain"[5].Conventionally it denoted that the state was permitted to use the property of the citizens only in cases of extreme necessity and in furtherance of public utility. Thus, legitimizing sovereign intervention in relation to private rights, this principle evolved into Article 39 of the Constitution, in the Directive Principles of State

[1] Upendra Baxi, 'Judicial Activism: Usurpation or Re-Democratization?' vol 47 pp. 346
[2] The Constitution (Forty-Forth Amendment Act) 1978 , s 6
[3] Shanti Bhushan, 'Statement of Objects and Reasons' (*The Constitution Forty-Fourth Amendment Act*, 9 May 1978) < http://indiacode.nic.in/coiweb/amend/amend44.htm> accessed 31 May 2011
[4] ***Sanjeev Sabhlok, '***No property rights in India – its most potent indicator of lack of freedom' (*Bad Ideas!, India*,5 March 2011) <http://sabhlokcity.com/tag/property-rights-and-land-acquisition/> accessed 31 May 2011
[5] Supra Note 20

Policy, commanding the state to direct its policy towards securing ownership and control of the material resources of the community keeping in mind that distribution which best sub-serves the common good. Land Acquisition in India comprises three crucial features that allow the government to legitimately steal land from the poverty-stricken farmers. Firstly, the farmers that are forcibly evicted have no title over their land, secondly a feeling of insecurity permeates into the lower strata and finally the amount paid as compensation is meager and arbitrary.

3.1 Land Acquisition Act, 1894

The archaic Land Acquisition Act 1894, formulated in the British era, was meant to further their colonial commercial interests.[1] The primary complaint of the civil society against this legislation was that it allowed arbitrary acquisition in the name of 'public purpose' without clearly defining it, thus augmenting the scope of its misuse. The ambiguity of the phrase attracted political discord and litigation. The Supreme Court recently held that *"Public purpose is bound to vary with times and prevailing conditions in the community or locality and, therefore, the legislature has left it to the state (government) to decide what is public purpose and also to declare the need of a given land for the purpose. The legislature has left the discretion to the government regarding public purpose. The government has sole and absolute discretion in the matter."* [2]

The negative impact of such discretion can be exemplified by the 'Tata Motor-Singur' controversy. The Supreme Court had earlier admitted that the expression 'public purpose' was incapable of having a precise definition and had no rigid meaning[3] as the issue underlying each case was whether the acquisition was in the general interest of the community as distinguished from the private interest of the individual. As per the Apex Courts judgment in *Babu Barkya v State of Bombay*[4], public purpose is any purpose in which "*even a fraction of the community may be interested or by which it may be benefited."* Yet, in *Satya Narain v District Engineer*[5] it was elucidated that a pure business undertaking though run by the government cannot be classified as public service.[6] If the activity entailed the possibility of being carried on by a private individual, then it would not qualify to be termed as 'public purpose'. However some of the common grounds considered as 'public purpose' are the provision of land for planned development from public funds in pursuance of any scheme of the government, provision of land for a corporation owned and controlled by the state and provision of land for any other scheme of development sponsored by the government, or with the prior approval of the appropriate government, by the local authority.[7]

Initially the concerns were raised over the fact that citizens could not question the purpose of acquisition, only the compensation and the route taken to compute the market value fixed for the land. However, with time, increasing governmental interference and subjective compensation became the chief worry. Similarly in the

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[1] 'India / Land Acquisition Act: Imperial by nature' *Times of India* (Bombay, 18 December 2006) <http://internationalpost.blogspot.com/2006/12/india-land-acquisition-act-imperial-by.html> accessed 29 May 2011.
[2] *Daulat Singh Surana & Others v First Land Acquisition Collector & Others* 2007(1) SCC 641
[3] *State of Bihar v Kameshwar Singh* [1951] AIR [1951], Pat.91
[4] *Babu Barkya v State of Bombay* [1960] AIR 1203
[5] *Satya Narain v District Engineer* [1962] AIR 1161, [1962] SCR Supl. (3) 105
[6] M J Antony,'Public purpose in land acquisition' (*Business Standard Live Markets*, 29 November 2006) <http://bsl.co.in/results/news/bm-j-antonyb-%60public-purpose%60-in-land-acquisition/266257/> accessed 29 May 2011.
[7] Land Acquisition Act, 1894, s 3(d)

instances of Special Economic Zones[1] land had been usurped from property owners, using the Act, at prices lower than the alleged market value of the properties. This had snowballed into local protest movements against the State Governments. It was also argued that, even in the case of projects which were undertaken genuinely for public purposes, there was a considerable difference between the market value of the property and the value which the land acquisition officer ultimately paid the land owners.

Unfortunately projects for construction of golf courses and commercial complexes had also been termed as public purpose'.[2] The exasperating issue continues to be the extent to which the government shall continue to stoop in order to fulfill the objective of industrialization masked behind altruistic development policies? The case in example is the 'Tata Nano-Singur' project[3], a prominent controversy that garnered international media attention, when Tata Motors decided to construct a factory manufacturing $2,500 car at Singur. The Communist Party of India-Marxist ruled State Government of West Bengal used the doctrine of eminent domain to capture 997 acres of fertile farmland.[4] The justification offered by the government for acting as brokers for private companies was that West Bengal being an industrial graveyard, a morass of economic stagnation, needed fresh investment to revive its economic solidity. They conceived it as an immediate fulfillment of the electoral promises and an initiation towards an escalation in industrial growth rate. However the site allotted was the most fertile and agriculturally productive areas of West Bengal.[5] Thus law as a tool of legitimized oppression provided the state to take over land for public purposes in the guise of developing private businesses. Even though the Kolkata High Court declared the acquisition prima facie legal, it conceded to the illegality of purpose behind this acquisition. The land earmarked was fenced off by the state administration to prevent protestors from entering and the large contingents of policemen guarding the site were accused of raping and pillaging the villagers, burning them to death. Further the landless labourers and farmers were given inadequate compensation, evicted, and the housing facilities offered were delayed. The population of the subjugated was approximately 15,000 while only jobs for 1000 would be created, most expected to go to outsiders.[6] The suspicious behavior of the State Government came under scanner when the Chief Minister furnished false information in the Legislative assembly. The concessions given to Tata Motors were not publicly revealed, while false claims of land being acquired through voluntary consent of the owners without the use of force were made.

3.2 Land Acquisition Bill – Boon or Bane?

The Land Acquisition (Amendment) 2007 Bill, along with Rehabilitation and Resettlement Bill, 2007 was designed to address compensation and resettlement of the displaced persons and all such concerns associated with land acquisition. Superficially,

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[1] Ministry of Commerce & Industry Department of Commerce, 'Special Economic Zone' <http://www.sezindia.nic.in/about-introduction.asp> accessed 1 June 2011

[2] Sandhya Jain, 'Grabbing land from farmers' (*Sunday Pioneer*, 5 June 2011) <http://www.dailypioneer.com/340763/Grabbing-land-from-farmers.html> accessed 1 June2011

[3] Kenneth Bo Nielsena,'Contesting India's Development? Industialisation, Land Acquisition and Protest in West Bengal', (2010) 7(5) Journal of Norwegian Institute of International Affairs and Norwegian Association for Development <http://www.informaworld.com/smpp/content~db=all~content=a922044572~tab=content~order=page> accessed 31 May

[4] 'Nano Wars' *The Economist* (US edition, 30 August 2008)

[5] Amitadyuti Kumar, 'Headline Singur' (*Countercurrents*,30 December 2006) <http://www.countercurrents.org/ind-kumar301206.htm> accessed 28 May 2011

[6] Shantanu Guha Ray ***and*** Avinash Dutt, (*Tehelka*, 3 March 2007) <http://www.tehelka.com/story_main27.asp?filename=Ne030307Bengal_CS.asp&id=2> accessed 28 May 2011

the Bills seem to be advantageous, *but on further examination* the numerous fallacies and uncertain provisions in the Bills that needed to be rectified are identified.

In the case of the Land Acquisition Amendment Bill, the erasure of all references to companies creates a false impression that any acquisition by the state for private parties is being abolished. The original Act is worded "*for a public purpose or for a company*"; the new bill has omitted the words "*or for a company*" from the long title as well as the preamble of the act but the definition of "*public purpose*" itself has been changed to include an (ancillary) acquisition for "*a person (including a company, association of persons incorporated or not)*".[1] Thus making the modification seem insincere as the rationale behind it was to make the law more public oriented.[2] If a private party purchases 70 per cent of the required land through negotiation, the balance 30 per cent can still be acquired by the government from unwilling owners, for that party. This implies a sovereign compulsion being enacted on those not inclined to sell their land, and consequently the show of state sponsorship for industrial houses can be maintained.[3] This is definitely an improvement from the current legal provision, wherein 100 percent of the land required for a private project can be acquired by the State. Critics of the Bill like Mamata Bannerjee("TMC"), an ally of the ruling party and Rashtriya Lok Dal leader Ajit Singh, have emphasized that allowing the government to acquire 10-15 percent of the required land after the rest had been brought through free market ought to serve the purpose.[4] Nevertheless the definition has been widened to include projects for defense purposes and infrastructure.[5] However, it does not provide any provision that ensures that rural communities are not taken advantage of by corporate bodies in unequal negotiations. It contains a provision for compensation if the land is acquired under urgency without defining the term 'urgency'.[6] The proposed Land Acquisition Compensation Dispute Settlement Authority dealing with compensation issues is a reasonable solution yet maybe not at the cost of a bar on the jurisdiction of the civil courts in these matters.

The objective of the Rehabilitation Bill is to prevent or minimize forced displacement of people by promoting non-displacing or least displacing alternatives. The provision for a Social Impact Assessment ("SIA") seems acceptable, but the calculated impacts have been narrowed down to physical assets like buildings, temples, institutions, etc only. Whereas, social impacts like identity loss; the disappearance of a lifestyle; the breakdown of communities have been ignored. The SIA planned to be reviewed by an independent multi-disciplinary expert body, must also be prepared by a similar body.[7]

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[1] Ramaswamy R. Iyer, 'Land Acquisition (Amendment) Bill: A slow but sure step forward', **The Hindu** ***(Bangalore, 7 August 2009)***

[2] D. Bandyopadhyaya, 'Why We Must Oppose the Land Acquisition (Amendment) Bill, 2009,'(*Mainstream*, 15 August 2009)
< http://www.mainstreamweekly.net/article1586.html > accessed 2 May 2011

[3] Subodh Ghidyal, 'Even Golf Courses have been built by forcibly acquiring land' *Times of India* (Delhi, 16 May 2011) 3

[4] Ibid

[5] PRS Website, Why is Land Acquisition so controversial? < http://prsindia.org/theprsblog/?s=why+is+land+acquisition+so+controversial%3F> accesses 31 May 2011

[6] Administrator, 'Land Acquisition laws to further Colonial Interests' < http://blog.propertynice.com/land-acquisition-laws-meant-to-further-colonial-interests/?>accessed 31 May 2011

[7] 'A Critique of India's Draft National Rehabilitation Policy, 2006' (*Asian Indigenous and Tribal People Network*) < http://www.aitpn.org/IRQ/vol-II/story07.htm> accessed 30 May 2011

To avoid its misuse cases of displacement of people must get clearance from an independent statutory authority and not from the bureaucracy. The clearance must be conditional and revocable in the event of non-compliance or lapses. The perturbing issue remains that implementation of terms like 'minimum displacement' and 'non-displacing alternative' are entrusted to the bureaucracy and are to be used only as a last option.[1] On reviewing these bills, it can be safely said that opposition to the bills is warranted and that continues to be the rationale for it not emerging into a reality.

3.3 Arbitrary Compensation

Arbitrary compensation has been a cause of much grief and the motive behind local protests. The judiciary has more often than not, locked horns with the government over this issue. The first instance[2] of challenge was seen in 1951, when the Patna High Court upheld the objection that the differential rates of compensation provided under the land reform legislation, whereby the rates of compensation tapered down as the value of the land went up, were discriminatory. The judiciary extended the definition of amount of compensation to that equivalent to market value of such property, as provided in the Act.[3]Even when the property was not vested in the state but was merely regulated or its use restricted, thereby depriving the owner of full enjoyment of his property, adequate compensation was to be paid.[4] While in England, it was held that private property could not be acquired without compensation[5], the same principle was reiterated in India.[6] According to the much critiqued Act, Section 23 emphasizes that the market value of the property must be considered while determining compensation. Section 34 of the Act ensures an interest of 9% per annum if the compensation is not paid before or on possession of land. The interest is calculated from the date of possession till the compensation is paid. If the delay exceeds a year then an interest rate of 15% per annum will be calculated payable from the date of expiry of one year on the amount of compensation or part thereof which is due. It is unfortunate that even with the affirmation of the letter of law and the overt favor by the judiciary, the government and local authorities have managed to deny men their rights of adequate compensation, thus grossly violating basic rights of life, dignity and livelihood of people.

4 Conclusion

Rajiv Kumar, the current Secretary General of Federation of Indian Chambers of Commerce and Industry ("FICCI") observed that, "*Politics on Land Acquisition*

[1] Supra Note 52

[2] Supra Note 13

[3] State of West Bengal v Bella Bannerji AIR [1954] SCC 170

[4] State of West Bengal v Subodh Gopal AIR [1954] SC 92

[5] Attorney General v De keyser's Royal Hotel [1920] AC 508

[6] *R.C .Cooper v. India*, AIR [1970] SC 564

amendment may affect the development of the country."[1] A more accurate statement cannot be made.

To escape the clutches of greed, corruption and blatant disobedience of rules, certain alternatives suggested can be experimented with. *Firstly,* the issue should be discussed with the different sections of society, especially those affected. An Ombudsman, as was provided in the Rehabilitation and Resettlement Bill, 2007[2] is a good option. However the term "grievance" that has been narrowly defined to encompass those that are not being offered the benefits, should be widened to include various other factors. For instance non-participatory project decisions taken, failures of consultation, non-compliance with the minimum displacement condition, non-inclusion of a person affected in the 'affected' category, etc. Hence, effective appointment of Ombudsman and its functionalities must be prescribed in both the bills.

Another sound proposal that had been made in the Land Acquisition (Amendment) Bill, 2007 was the provision for the state government to offer sellers a compensation package in two parts: a minimum lump sum amount related to the recent average market value of the agricultural land and an annuity or a monthly pension for the farmers retirement, from an all India trust fund where some shares of the new company are vested. *Additionally*, the authors believe that jobs for members of the displaced families or at least training or skill development that would enable them to earn a livelihood must be considered.

Further, complete rehabilitation should precede submergence, and the recommendation by the present Rehabilitation and Resettlement Bill, 2007 of "adequate progress in rehabilitation" prior to displacement of thousands, is not acceptable or satisfactory. The vagueness of the word "adequate" will prevent actual progress in rehabilitation thus empowering the bureaucracy with the scope of its misuse. In the event of deliberate or inadvertent lapses or non-compliance or deviations, certain sanctions must be enforced, to prevent future exploitation.

Another unique solution is 'land titling', also known as '*Torrens Title*'.[3] Most dislocated farmers do not possess a title over their land, thus facilitating "land grabbing" by the greedy. Establishing a "titling system" is taxing as the title has to be traced back to its original roots, with absolutely no guarantee of final ownership. But the Rural Development Ministry's 'Department of Land Resources' has drafted '*Land Titling Bill 2010*'[4] to bring uniformity across the country and replace the existing deeds system fraught with excessive litigation due to inaccuracies in property records. There is no deficiency in agencies involved in such maintenance but the lack of interconnectivity leads to differing processes of updating of property records, resulting in inaccuracies in

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[1] 'India Inc express displeasure over politics on Land Acquisition' *Jagran Post* (New Delhi, 25 May 2011) <http://post.jagran.com/india-inc-express-displeasure-over-politics-on-land-acquisition-1306262313> accessed 26 May 2011.

[2] PRS Website, 'Rehabilitation and Resettlement Bill < http://www.prsindia.org/uploads/media/Rehabilitation%20and%20Resettlement/1197003987_Rehab_20and_20settlement.pdf>accessed 31 May 2011

[3] 'Torrens Title'< http://www.aussielegal.com.au/informationoutline~nocache~1~SubTopicDetailsID~795.htm>accessed 31 May 2011

[4] PRS Webite, 'Draft Land Titling Bill 2010' <http://www.prsindia.org/index.php?name=Sections&action=bill_details&id=6&bill_id=1206&category=44&parent_category=1> accessed 31 May 2011

the ultimate records. 'Bhoomi project' is an example of implementation of this bill, it is an attempt made by Karnataka State Government for computerization of land records. This project funded by the Ministry of Rural Development, Government of India and State Government of Karnataka ,is accountable for 20 million land records of 6.7 million land owners in 176 taluks of Karnataka that have been computerized.[1] Some of the chief components include – the computer centre responsible for the mutation (change in land title) and updating, using tools like finger print authentication and scanning of important documents to ensure vigorous and secured system.[2] Lastly, one of the other major objectives of this program is to aid farmers to pursue land concerned litigation in courts. As the government has received much censure for the definition of the term 'public purpose', the Land Acquisition (Amendment) Bill 2011[3] proposes to let the matter be decided by the States.[4]

Also often, projects are abandoned once the land is acquired. This has been illustrated in the case of Birla's when 750 acres of land had been acquired by the West Bengal Government in the 1950s for an automobile project. But since then only 300 acres have been used. [5] Under the 2011 Bill, if the private project for which the land is acquired is unused for 5 years, then the land reverts to the State[6]. Moreover this will not stop private persons from starting the project to avoid the implementation of this provision and then abandoning it at a later stage. The Bill generously permits the original owners to buy back the land at compensation rates if no progress on the project has been made for five years. [7] But one wonders if that is really possible. Thus to conclude, optimism prevails as, the government is contemplating the formation of a rehabilitation law and amending the Land Acquisition Act which is an achievement for the landless masses. It has taken more than two decades for the debate to reach this stage. Any opposition made towards the Bills should be cautiously moderated so that there is only progress ahead. Thus even with the demise of Fundamental Right to Property, the hope for the survival of Right to Property continues.

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[1] Bhoomi Project, Revenue Department, Government of Karnataka <http://www.bhoomi.karnataka.gov.in/> accessed 1 May 2011

[2] 'Digitisation of Land Records: Bhoomi Project' <http://www.it.iitb.ac.in/~prathabk/egovernance/egov_success_stories_bhoomi.html> accessed 1 May 2011

[3] 'Centre plans to introduce bill on Land Acquisition: Chidambaram', (*The Statesman*, 12 May 2011) < http://www.thestatesman.net/index.php?option=com_content&view=article&id=369305&catid=35> accessed 27 May 2011

[4] K. Balchand, 'Get Land Acquisition Bill Ready, Manmohan Tells Deshmukh', (*The Hindu*, 12 May 2011) < http://www.hindu.com/2011/05/12/stories/2011051267652200.htm> accessed 3 June 2011; Saubhadra Chatterji, 'New land Bill allows states to script own role',(*Business Standard*, 3 June 2011) http://www.business-standard.com/india/news/new-land-bill-allows-states-to-script-own-role/437739/ accessed 3 June 2011

[5] D. Bandyopadhyaya, 'Why We Must Oppose the Land Acquisition (Amendment) Bill, 2009,'(*Mainstream* 15 August 2009) <http://www.mainstreamweekly.net/article1586.html> accessed 30 May 2011

[6] Ibid

[7] 'Major Changes in Land Acquisition Policy', (*Indian Urban Infrastructure Review*, 13 May 2011) <http://www.indianurbaninfrastructure.com/?p=2045> accessed 30 May 2011

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Property valuation

Formulating an equitable pro-development compensation model – lessons from the Pacific

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Abstract:
Many Pacific Island countries are challenged by aspirations for development and western commercialism that conflict with the desire to maintain the best of custom and traditional land stewardship. In this paper, we explore the development of an equitable compensation approach that applies the principles of marriage value (or synergistic value) to recognise the reliance that island communities have on customary fishing grounds. Waterside tourism ventures are a marriage between a hotel development and associated infrastructure on the land, and the need to access and use the adjoining lagoon or ocean for recreation activities. Likewise, mineral exploration and development in the interior requires access to waters edge wharf facilities for export purposes, which impacts ecologically on customary fishing grounds.

We use an example where property rights over the customary fishing ground are sometimes held by traditional groupings from the interior rather than the waterfront landowning group on whose land, for example, a lease may have been granted for a resort development. Building on a detailed analysis of both the institutional arrangements and stakeholder interpretations, we combine these insights with lessons from other jurisdictions to explore and analyse five potential compensation models. We engage scenario analysis to allow the interests of the various stakeholders in a potential development to be reconciled, and this in turn allows for a discussion and elaboration on the appropriate valuation methods that can be applied, drawing on international best practice, through the integration of current International Valuation Standards.

Keywords:
compensation, synergistic value, custom, development, International Valuation Standards

1 Introduction

The growing influence of globalisation and modernity is impacting on the South Pacific, most notably in Melanesia through the potential economic benefits associated with resource exploration on (or below) customary land. The developing countries of the South Pacific region, spread over 11.5 million square miles of ocean, share a combination of geographical, biological, sociological and economic characteristics. Importantly, they all have enduring, traditional systems of customary land tenure (with 83-100% held in customary ownership), that conflict with Western notions of land ownership (Hann, 1998, Paterson, 2001) .

Our focus in this paper is on the resource rich countries of Melanesia, namely Papua New Guinea, Vanuatu, the Solomon Islands and Fiji. At the time of writing, significant reserves of bauxite, copper and gold have been identified in Fiji, whilst some $60 billion seabed reserves of nickel are promised in the Solomons. Meanwhile, the more developed exploration of minerals in Papua New Guinea is an ongoing source of conflict between customary landowners, the government and offshore exploration companies.

Our purpose in this paper is to explore how an equitable compensation model can be formulated for resource rich developing countries, like those in Melanesia, where the principles of customary land ownership are protected by Constitutions and traditions alike. Currently, the approaches taken to compensate customary landowners for the loss of access to their traditional subsistence and spiritual recognition to the land is somewhat *ad hoc*. We have previously argued that the customary nature of land ownership and control in the region does not preclude the optimum use of land – in its many forms – for development (Boydell, 2010). Rather, there is a pronounced disconnect between indigenous values and capitalist interests, which we elaborate on in this introduction. In the next section, we provide a review of the literature and law relating to compensation on native land. This provides the requisite background for our inquiry into compensation approaches, using scenario analysis to present a hypothetical (but common) compensation issue. We interrogate international valuation standards for potential solutions to the compensation challenge, and conclude the paper with a discussion on why synergistic valuation may be part of the optimal approach.

The disconnect that exists between indigenous values and capitalist interests goes beyond legal pluralism (for example, on legal pluralism see Hooker, 1975, Griffiths, 1986), as we are not just concerned with the interaction of customary and western law. Rather, our plurality extends to notions of identity. As Hughes (2003, 346) argued, modern constitutionalism clouds the issue of identity as the state cannot be merely conceived of in abstract institutional terms, as assumptions of uniformity under a coherent body of law is at odds with the social and cultural reality of these countries. However, we do share the view of the von Benda-Beckmann's (von Benda-Beckmann and von Benda-Beckmann, 2006, 12) that 'along with many anthropologists, we think that the term *law* can be used as an analytical concept'. They go on to articulate law in both cognitive terms (how things are, and why they are) and normative terms (how things could or should be). We have developed the concepts of self and identity creation (the literal meaning of autopoiesis) further in our research on complexity epistemology (the study of emergent levels of knowing) and complexity axiology (the study of emergent levels of valuing) (McDermott and Boydell, 2011). We apply these interpretations to what we refer to as the *Pluarility of Registers* when attempting to articulate the disconnect of worldviews between indigenous values and capitalist interests (see Figure 1).

What the *Plurality of Registers* highlights are discrete conceptions of knowing and valuing, with different social relationships, behaviour, permissibility, consequences – some of which are categorical (typified general rules) and some are ideological (more generalised). 'Law in this sense is a generic term that comprises a variety of social phenomena (concepts, rules, principles, procedures, regulations of different sorts, relationships, decisions) at different levels of social organisation' (von Benda-Beckmann and von Benda-Beckmann, 2006, 13). Simply stated, the customary value of land that is used for subsistence purposes and which retains strong spiritual ties to the ancestors whilst providing sustainable stewardship for future generations is intangible.

Yet in western economic terms, which ground notions of value as economic rent, or surplus of production, the value of such customary subsistence land is effectively zero dollars. There is no problem with these different worldviews… until they meet. And where they meet, the inalienable notions of land held by the customary stewards are very much at odds with the commodification of western understandings of ownership.

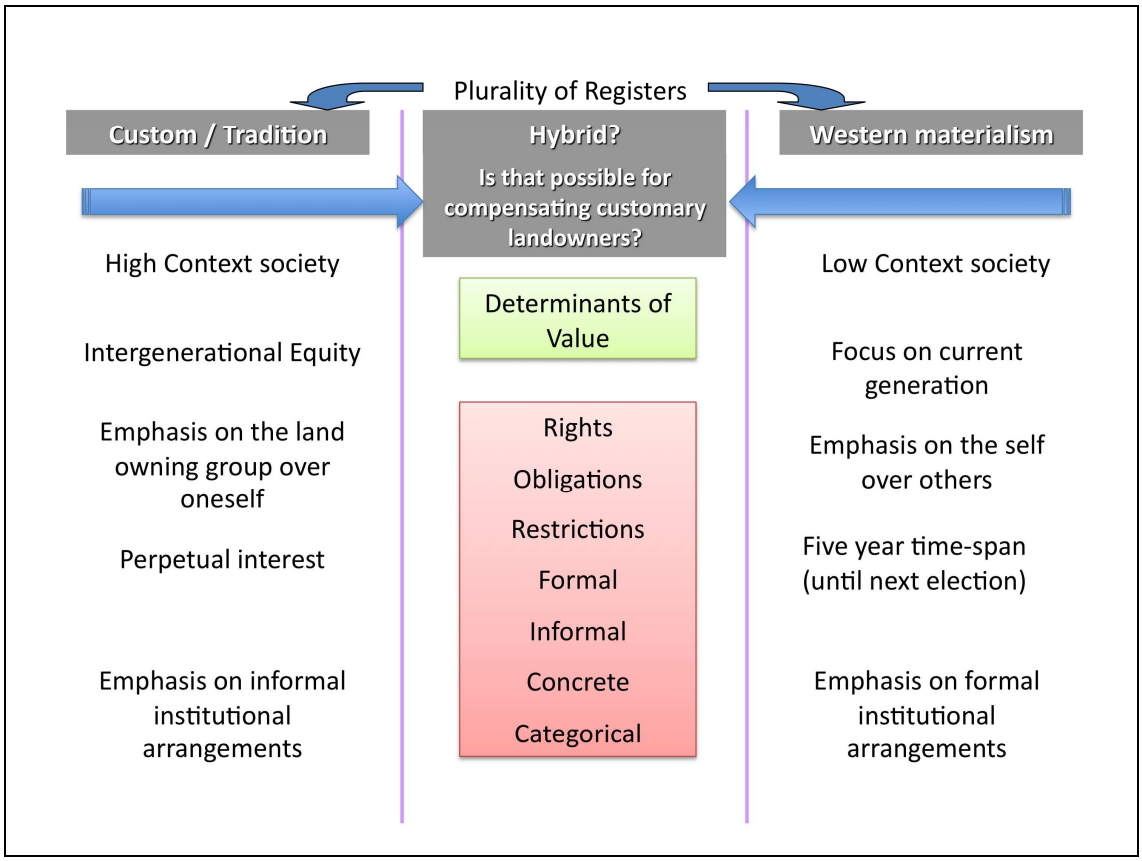

Figure 31: Plurality of Registers
(source: Boydell & Baya for this research)

These issues highlight our *Plurality of Registers* (or institutional arrangements) and Figure 1 provides a simplified graphic of these, which allows the relative extremes of custom / tradition and western materialism to be elaborated. A distinction has to be made between low-context and high-context cultures in land dealings and conflict management (Burgess and Burgess, 1997). There are major challenges to conflict management when a straightforward low-context (US, Canada, Western Europe, Anglo-Australian) approach is applied to a culturally sensitive high-context society (traditional, collectivist, honour based cultures e.g. Japan, China, Latin America, and Pacific Islands). The western approach identifies conflict as a struggle between competing interest and something to be addressed in a businesslike way. Language is explicit and the conflict is tackled head-on, adopting competitive (positional) bargaining or integrative (problem-solving) negotiation. This brash approach contrasts harshly with the high-context identification of conflict as a problem of relationships as well as interests. In such circumstances, a relationship-oriented process must encompass indirect and non-verbal communication to protect relationships and face. Accordingly, traditional societies often prefer locals to act as intermediaries, even though they may be party to the conflict and partial to one or other side, based on community trust and

respect. Such individuals are seen to have a longer-term interest in enduring solutions for the greater good of the society than impartial outsiders do.

Continuing the polarity of customary and western perspectives, such differences also exist in terms of timescale. The whole notion of time is different between the two worldviews. Land ownership from a customary perspective, and for indigenous people in general, is grounded on intergenerational equity. This can be explained as guardianship - to respect the spirits of the ancestors - and stewardship – to protect the land, applying what we know understand as sustainable principles, so that it will be able to be used and enjoyed for subsistence purposes by generations still to come (Boydell and Holzknecht, 2003). In contrast, western approaches under modernity have tended to focus more on the nuclear family and the current generation, as witnessed by unsustainable land practices, negative reaction to climate change policy proposals if it is to impact on an individuals lifestyle, and the urgency with which the earths natural resources are being extracted / exploited.

In making broad generalisations, high context societies, like those in Melanesia, place emphasis on intergenerational equity, in contrast to the western focus on the current generation. This is similarly demonstrated in the emphasis of the group over oneself, whereas the western model of possessive individualism prioritises the self over others. Our ongoing work with stakeholders in the region highlights (in this context) that, in some cases, chiefs utilise custom and tradition to maintain their cultural control and powerbase, and yet are cited as misusing that power for self-interest and personal benefit. It follows that a perpetual view is adopted when the emphasis is on custom and tradition. Conversely, in the western model, the time-span is often limited to a five-year outlook; in other words liberal democracies act in such a way as to allow the incumbent government to heighten their chances of re-election, assuming a three to five year election cycle. Custom and tradition emphasise informal institutional arrangements, and these are often devalued or challenged by the power / authority of formal legal institutions that are guaranteed by the State.

The conundrum is that frequently one or more stakeholders cannot comprehend the complexity inherent in the worldview of other stakeholders. In related work (McDermott and Boydell, 2011) we have attempted to identify the hierarchies of understanding between different parties (Beck and Cowan, 2003), and whilst such understanding can be abstracted theoretically the challenge can effectively mean that parties are operating at different vibrational (for want of a better word) levels such that they cannot comprehend the others perspective or worldview. The reality is that there is some overlap between the extremes we demonstrate in Figure 1. It is this overlap between worldviews that we have to address if we are to seek equitable compensation when, supported by governments relying on their constitutional right to mineral resources, mining interests seek to exploit the resources in, on or under land that has been held by custom owners.

Discussing property rights (be they customary, constitutional or mining) is made more complex because discourse on property rights has emerged within a broad range of disciplines. These include, but are not limited to, archaeology, anthropology, ethics, sociology, history, psychology, law, geography, biology, philosophy, economics, and planning. The most influential Western theorising about property is underpinned by what Hann (2007, 290) refers to as the ‘standard liberal model’, yet property is ‘much broader than the liberal tradition recognizes, and that the political, economic and social functions of property are in continuous flux’. Many of these disciplines draw heavily

on legal traditions, and in particular have been influenced by Henry Maine's (1861) metaphor of 'a bundle of rights'. The importance of the 'bundle' metaphor is that it highlighted the common circumstance that different individuals or groups may hold differing rights, obligations and restrictions over the same parcel (or piece) of land. The understanding and articulation of property rights, obligations and restrictions influence property relations in all human societies (Boydell and Searle, 2010). As Cole and Grossman (2002, 318) highlight, 'divergent conceptions of property rights can lead to differences in analysis and to confusions in cross-disciplinary scholarship'. Caution needs to be taken when research into property rights, like our own approach, strives to be transdisciplinary (Nicolescu, 2006, Max-Neef, 2005), and navigates the boundaries of diverse disciplines. As Bromley (1991) highlights, there are few concepts in economics that are more central, or more confused, than those of property, rights and in particular property rights. Yet as we demonstrate later in the paper, when we come to deal with valuing compensation, it is the valuers role to place economic value on these rights, even if such rights are indeed intangible.

Having provided an introduction and overview of the complex challenge, in the next section we provide context for the rights we propose to value by exploring compensation experience and practice from other jurisdictions.

2 Literature Review

There is no standard way in which the topic of equitable compensation of native / customary title is operationalised under comparative jurisdictions in the Pacific (Boydell and Baya, 2010). Existing compensation regimes in Melanesian States, with localised variation of application, share similar common law origins: one founded on the sanctity of property, forbidding deprivation of property rights without fair and just compensation. Common law influences include landmark developments in the area of native title jurisprudence amongst the indigenous peoples of neighbouring New Zealand and Australia, with similar progress from Canada. These developments are augmented by advances in a number of provisions of international instruments that obligates island States under International Law, such as *The Declaration on the Rights of Indigenous People of 2007*[1] relating to central matters such as customary title. Collectively, these obligations recognise the ownership of lands, territories and resources by their traditional owners that encompasses a wide gamut of legal relationship from property to use, including compensation (see Article 26(2) and Article 28(1)).

In the case of Australia, the *Native Title Act, Cth*. (1993) protects native title from extinguishment by adverse government action under s.48. Where it is sought to extinguish native title, this is usually facilitated by way of an *Indigenous Land Use Agreement* (ILUA). One of the few Australian decisions to discuss extinguishment simply is *Jango v Northern Territory* (2006) FCA 318 where, to demonstrate entitlement to compensation, the claimant group were required to establish as a threshold issue that they had native title rights and interests over the area at the time the compensation act occurred.

In Canada, aboriginal titles / rights are protected under the imprimatur of the Constitutional provision of s.35(1) of the *Constitution Act 1982*. In some

[1] Declaration on the Rights of Indigenous Peoples, UN GA 2007, see: http://www.ohchr.org/english/law/ccpr.htm

circumstances, however, aboriginal titles / rights can be regulated and compensation may be payable for allowable acts as in *R. v Van der Peet* (1996) 137 DLR (4th), 289.

Up until the *Attorney General v Ngati Apa* (2003) 3 NZLR 643, there were effectively no native / customary title claims in New Zealand (except for potential foreshore and sea bed claims), as all customary title to land had been effectively extinguished by the end of the nineteenth century through government purchases and the investigation and conversion to freehold effected post 1862 though the Native Land Court (now the Maori Land Court).

As we elaborate later in the paper, an analysis of contemporary practice indicates that negotiated settlements are the preferable compensation mechanism. Negotiated settlements are utilised in Canada, New Zealand, Australia, Papua New Guinea and Fiji. Whilst the process and outcomes may take different legal forms in each jurisdiction, they have in common diverse approach towards compensation packages in which lump sum payment is only one of several ways of delivering redress. This allows for a flexible approach of tailoring recipient needs to be met, through facilitating for intergenerational equity, environmental and resource decision-making powers, employment and cultural acknowledgement amongst others (see for example the $2bn deal between Rio Tinto and five aboriginal groups where only $3,500 p.a. will be paid to individual customary owners, the rest being in terms of scholarship, infrastructure, employment opportunities: http://www.abc.net.au/news/stories/2011/06/03/3234490.htm?section=business). Such compensation packages add time and complexity to the legal arrangements.

As our synergistic valuation approach elaborates later, it is important to also consider native title rights to the offshore and sea-bed, which have been litigated in a number of common law jurisdictions such as Australia, Canada and New Zealand. Similar rights has also been enunciated pertaining to the First Nations Peoples in the United States per *Native Village of Eyak v Trawler Diane Marie Inc*. (1998) 154F 3rd 1090(9th Cir). As the doctrine of native / customary title functions as a recognition system, each jurisdiction has a different legal test that claimants must satisfy in order to show that they have native title rights and interests. Once established the question of compensation for extinguishment or infringement of rights may arise.

The New Zealand Court of Appeal decision in *Attorney General v Ngati Apa* (2003) determined that the Maori Land Court has jurisdiction to investigate customary title to the foreshore and sea bed, a process that could result in a conversion of the title to freehold title. This confirmed that Maori customary/native title to the foreshore and sea bed has not been extinguished. Whilst the decision did not determine the nature and content of the customary / native title right, the legislative response by Government to the decision acted to define the content of these rights. In so doing, the Government is believed to have anticipated what the nature of the rights in the foreshore might be, if litigated, prescribing legal tests for territorial and non territorial rights based largely on the Canadian experience married with some Australian law (Boydell and Baya, 2010). As such, the threshold of proof was set higher than in any Commonwealth jurisdiction - thus failing to accord any status to the customary owners. The Act was replaced in September 2010 by the *Marine and Coastal Area (Takutai Moana) Bill*, specifically acknowledging the need to consider culturally appropriate test for the recognition of customary/native title rights. Clause 63 specifically acknowledges customary marine

tenure as an exclusive possession right to foreshore and sea bed and is an in alienable interest in land.

Canadian doctrines of aboriginal rights and titles have been largely influenced by the operation of s.35(1) of the *Constitution Act* of (1982), which recognises and affirms existing aboriginal rights as unextinguished at the time of its commencement. To the extent that extinguishment of rights and interests can occur prior to 1982, the test is one of clear and plain intention to extinguish as in *R. v Badger*. There is little substantive litigation on extinguishment as the overall purpose of s.35 saw the need to protect the distinct cultures and recognise their prior occupation of North America reconciling this with sovereignty of the Crown. This results in a distinctive body of jurisprudence with the overall purpose of reconciliation in mind. A recent decision by the BC Supreme Court in *Ahousaht Indian Band and Nation v (AG) Canada* [2009 BCSC 1494] asked the Court specifically define the content of their Aboriginal title only to the extent necessary to establish harvest rights and sell fisheries resources incident to that title. Whilst this action encompassed an area below low water mark and extended into the Pacific Ocean, it did not asked the Court questions of title that could potentially give rise to an exclusive right, but instead asked of a determination of a lesser right of the recognition to fish and the extent of its exercise in the area (see para 499.)

Australian native title in the offshore have been the subject of a number of major court decisions but this has largely influenced by the definition of native title in section 223 of the *Native Title Act 1993* (Cth.) [NTA]. Since the decision of *Wik Peoples v State of Queensland* (1996) 187CLR1, clarification on extinguishment and jurisprudential development has largely been dominated by the *inconsistency* model where its application was carried through in *Yarmirr v Northern Territory* [2001]HCA56 enunciating that where the continuing recognition of native title rights and interests to sea country was inconsistent with the common law itself, the common law prevails.

In the later case of the *Lardil People v State of Queensland* [2004]FCA298 the claimants asserted *inter alia*, ownership of seas, the sea bed, and the sub-soil below the sea bed and resources of the sea in their respective territories. The judge found that the concept of ownership held by the applicants was not one based on common law concepts of real property. Rather, it was a concept born out of the connection of peoples to each of the elements through their spirituality (see paras 115,147). As native title was earlier interpreted by the NTA in *Ward v Commonwealth* [2000]FCA191 requiring each individual native right and interests to be identified, this statement would mean that indigenous relationship to country including sea country must be translated into individual rights and interests. The NTA requires that the relationship between a community or claimant group and the land is to be expressed in terms of rights and interests in relation to that land. This means that a relationship that is essentially religious or spiritual must be translated into law. This would invariably require the fragmentation of an integrated view of reordering of affairs into rights and interests, which are considered apart from the duties and obligations which go with them (see para. 173).

The *Ward* judgment further observed that it is not useful to state native title rights in a broad way given the limitations pursuant to its definition at common law under s.223 of NTA and subject to common law rights of navigation, fishing and the international law right of free passage (para. 171). Nor was the non-inclusive right to occupy, use and enjoy the waters and land appropriate, because at common law the notion of possession and occupation involve notions of control and access. Applying earlier decisions in

Yarmirr, the *Ward* judgment found that control of access to the land and waters of the inter-tidal zone and the territorial seas as a right of exclusion even though as part of the traditional law, could not be recognised at common law. It is important to note that this decision is not a determination, that rights and control of the foreshore cannot be part of native title in the foreshore, rather the findings reinforces that they cannot be recognised by the common law in Australia because of the scope of native title definition under the NTA.

Further, the decision in *Akiba v Queensland* [2010]FCA643 saw some accommodation in that the claimants sea territory was viewed quite different in character than most of the mainland claimants and this difference impacted on the way the jurisprudence was to be applied. It was noted that the islander claimants in this instance were seamlessly attached and culturally associated to the claimed area that there is no sea-land dichotomy. Further it was emphasised that in determining the nature of customary title rights and interests of the claimants it is necessary to examine them from the perspective of the claimants 'because rights and interests of the islanders are those possessed under their traditional laws and customs, they must be at from the perspective of the claimants', see Neowarra at 364. The decision is important in that it makes it clear that offshore rights can include rights of a commercial nature.

As to the rights claimed *per se*, it was also emphasised that the description of what is theirs, what belongs to them, what they are entitled to, are for the above reasons fundamental to the ascertainment of those rights and interests. These, as it was observed, must be sourced in the society's laws and customs and such rights and interests do not for their vitality require recognition by someone other than the person who asserts them (Sundberg.J., para. 500). Particular rights found were, (i) the rights of access to remaining and use their marine areas, and (ii) the right to access resources (including sea water) and to take for any purpose resources from those areas (which include the right to trade in resources) [at para 540].

Issues of offshore native title are not addressed in Papua New Guinea to the extent that the nature of rights and interest therein are not properly articulated for the interpretation of the Courts (Tom'tavala, 2010). Whilst there is assistance by way of s.8 of the *Native Customs Recognition Ordinance* (1963) providing Courts to take into account customary considerations in relation to (i) the ownership by custom of rights on, in, over or in connection with the sea or the reef or in, on, or on the bed of the sea or rights of fishing and, (ii) the ownership by custom of water, or of rights in, over or to water. Further, Courts are not strictly bound by rules of legal procedure and hearsay rules in this regard, per s.2 and with consideration that must also be given to the weight of public interest, under s.3.

As reported, the determination of Court in leading cases relating to offshore native title claims is difficult to sustain given that any pre-existing customary laws on which the claim is premised cannot be easily identified. Whilst the reported cases were premised on what is genuinely believed to be customary property, the end game of achieving compensation was not realised given the absence of a framework of rights and interests that the Court could rely on (see *Ene Land Group Inc v Fonsen Logging (PNG) Pty Ltd* [1998] PNGLR 1).

Given the absence of a comprehensive compensation policy that clearly specify the nature and extent of the compensable rights and interests, any mining development is bound to run into problems given that customary owners believe that they own

everything above and below the land, including the minerals. Often, friction arises between the customary owners on one hand and the developer on the other, with the former feeling that fair compensation has not been paid (McLeod, 2000). Fiji has had a mixed history in this regard, in that it recognised that it had no comprehensive system of compensation and commenced work towards a policy in 1999. This resulted in the development of a *Compensation Policy for Fiji's Mineral Sector* in 1999, that was to be submitted to Cabinet for final legislative approval - some twelve years later this approval has still not eventuated.

The definition of compensable damage and compensation was a key consideration in the derivation of Fiji's compensation policy, including the award of damages for any loss in value or damage to land, water, foreshore or other resources as well as rights arising from prospecting, exploration and mining activities, to landowners, occupiers and the surrounding communities, in monetary or non monetary forms (Republic of Fiji Islands, 1999). This draft policy is explicit in listing all possible damages, including the loss of cultural rights. However, it failed to translate the possibilities of compensable rights and interests that are intangible but inherent to the body of culture of the landowning unit that forms part of their traditional estate.

Given what has transpired, landowners are back at the mercy of compensation regime pre August 1999. The most notable development since then has been loss of royalty payments to the landowners, which is now paid to the State by the Department of Mines as a result of a *Mining Decree* issued in 2010. Currently Fiji has three major mining projects underway and several other significant initiatives ranging from prospecting to fully operational schemes. Due to the lack of a comprehensive mining compensation policy, compensation for the land based aspects of the mines has been largely inconsistent, due to the *ad hoc* nature of the negotiations. Like most of the Pacific Island States, compensation thus far has been largely limited to surface damage and leasing of surface land for mining or access purpose.

The *Mining Act* 1992 in Papua New Guinea (PNG) is where the principle elements of the national mineral policy can be found, in conjunction with other legislation relating to, for example, Income Tax, Water and Health. In brief, mineral operations in PNG are always caught between the 'public interest' of the State and the interest that customary law concedes to the landowners relating to surface lands (James, 1997). As State ownership rights over minerals comes into conflict with landowners surface rights governed by customary law, the compensation provisions are an attempt to conduct a good working relationship between the landowners and the State.

Where the State intervenes to compulsorily purchase land for mining tenements, landowners must be compensated as must those landowners indirectly affected by the exploration. Regarding the heads of consideration for compensation, the *Mining Act* mandates that landowners must be fully compensated for damages to land relating to deprivation of surface use, loss of earnings, disruption to agricultural land and the like. At first glance this appears reasonably comprehensive, given the history of mining and hard learnt lessons by both the PNG government and the people. However, the approach favours a disjoint of surface and underground tenure, thereby quashing any intangible flow that is provided through its fusion.

Mining in the Solomon Islands accounted for 30 percent of its GDP at its peak before closure of its major mine in 1999, and will probably make a similar contribution for the next several years if restored to its former operating level and augmented by nickel

exploration. Administered under the *Mines and Mineral Act* 1990, the issue of compensation is peppered through s.32-35, ranging from the use or compulsory acquisition of land relating to mining, surface rentals and the acquisition of surface rights. Royalties are considered in s.45. Although there have been three amendments to the Act, compensation provision wording is general in nature, vesting authority in the (hoped for) dilligence of Government officials. Market value of surface lands is precisely described so as not to include the price of minerals underground, with heads of compensation limited to value of improvements, compensation for loss of trees and crops, and severance and disturbance. Compensation calculations for access rights are similarly routine, with the identification of the right landowning groups to be identified as a matter of priority, althogh compensation should not pay regard to the value of mineral underneath their land.

Whilst there is no intangible valuation consideration in the current compensation provisions, the Solomon Islands have the perfect opportunity to develop an exemplary mining policy given the current national rebuilding process may provide a chance for legislative reform of its main economic sectors.

Vanuatu has latent potential for mining according to the National Investment Policy (Government of Vanuatu, 2005). As there is currently no mineral extraction happening in Vanuatu, this provides an optimal opportunity for policy makers to formulate an equitable pro-development compensation model for its mining industry, to increase the contribution of private enterprise to economic development.

3 Research Methodology

This research reported in this paper forms part of an ongoing investigation into land resource compensation issues in Melanesia, which is a sub-project of our wider transdisciplinary collaborations on compensation, institutional arrangements and land trusts, and the financial management of inalienable customary land in Australia and the South Pacific.

Collectively, our research design is one of phenomenological transdisciplinarity, which implies our goal is to build models to connect theory to observed reality, allowing us to inform potential policy outcomes. 'Transdisciplinarity concerns itself with what is between the disciplines, across the different disciplines, and beyond all disciplines' (Nicolescu, 2006, 143). Methodologically, this research adopts what Creswell and Tashakkori (2007) refer to as a paradigm perspective. Our approach incorporates a breadth of sociological analysis, legal discourse, ecological and cultural sensitivity, and financial management activities. To achieve this we integrate an eclectic combination of research modes into history, law, social inquiry, theory, practice, and beliefs, with the attitudes of finance, finance providers, capital users, government organisations, NGOs, resource exploration companies, and indigenous property owners. These insights support our analysis of the existing institutional arrangements and provide important data that assists in the development of our integrated compensation model.

The paradigm perspective that we engage for our compensation research has its genesis in the classic definition of mixed methods research of Greene, Caracelli, and Graham (1989, 256), who defined mixed methods designs as 'those that include at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words)'. The application of this innovative approach has enabled us to

combine the legal discourse (words) surrounding indigenous property rights in the resource exploration context with the financial implications (numbers) pertaining to those rights in developing a compensation matrix.

As we highlighted in the previous section, there is a different scale between the extent of identified mineral resources in the four Melanesia countries that we have focused on, just as there are different physical land masses, land trust or incorporated land group development, genealogies and institutional arrangements. In some countries we have been able to undertake more fieldwork and community engagement, whereas in others our emphasis has either been with government agencies or NGOs. It is a work in progress, but having developed a compensation model we are testing its efficacy not just on mineral exploration, but also on resort development and other infrastructure schemes. In certain countries our involvement has extended to policy advice on the implementation of our suggested compensation modelling. This approach has enabled the researchers to assess the functionality of existing compensation policies, have broad access to government information and undertake extensive stakeholder analysis before offering recommendations on appropriate institutional processes that can be harnessed to assist in evolving change.

4 Findings and Discussion

Some of the agreement processes from other countries (e.g. Australia, New Zealand and Canada) outlined in our literature review are too complex for Melanesian needs. They point, however, to a trend towards framing agreements that are not designed to specifically compensate indigenous groups for extinguishment of customary title. Instead, they emphasise a structure of long-term relationships between indigenous groups and the Crown or State, including sharing of resource revenues and participation in decision-making affecting their lands. In part, this is the result of either the recognition of customary rights through court processes, or the anticipation by governments of such recognition. In this context, our subject countries have different levels of institutional arrangement. For example, Fiji has evidenced ownership for over a century and has had a Trust structure in place since the 1940s. In contrast, Papua New Guinea has some examples of Incorporated Land Groups but no centralised record system. Similarly, the Solomon Islands have only recently started evolving trust structures, and there are only two examples in Vanuatu (the Mele and Ifira Trusts, on the urban fringe of Port Vila). What is evident internationally, is that compensation has moved beyond a strict monetary sum, to a more complex tailored package of rights, almost always embedded in a contract, which is given statutory ratification.

We have analysed four compensation approaches, which we discuss in more detail in the following subsections, and then incorporate these into a hybrid model.

4.1 4.1 Model A – tailor compensation to the exact rights of custom landowners

Such an approach requires some kind of recognition system as a precursor to determining compensation, most likely a common law or statutory native title system.

Pros

- Tailors the compensation to the exact rights held – possibly providing a more nuanced quantum of compensation;

- It allows for western commodification of rights (which some Stakeholders seem to want); and
- It is likely to result in a lump sum compensation figure. Lump sum compensation avoids many of the complexities introduced by diverse (multi-criteria) compensation packages (e.g. how do you legally implement / enforce indirect payments?).

Cons:

- Sits very uncomfortably with those countries with a continued recognition of rights such as Fiji ;
- Complex;
- The establishment of rights on a case by case basis is costly, requires human resources and capacity that these Melanesian countries do not currently have;
- As a doctrine, native title (e.g. as applied in Australia) tends to exclude cultural, social and environmental factors, and can be a very blunt tool. Standard native title law will not encompass the rich nature of customary rights and hence will undervalue the non-physical facets of the relationship of holders to the their land or marine rights;
- This model does not allow for a meaningful transfer of profit or wealth sharing; and is likely to result in a single lump sum monetary figure, rather than a diverse compensation package.

4.2 4.2 Model B – assume a common set of property rights prevail and tailor compensation to these

Native title claims, be they derived from the common law or statute are lengthy, expensive, and require specialists in the form of lawyers, anthropologists and historians. It is doubtful that Melanesian countries have the current capacity to enter into a recognition process. Where land is compulsorily acquired under Anglo-Australian legal frameworks, apart from the package of compensation (heads of claim) derived from the addition of the (unimproved) land value, value to the owner, special value, injurious affection, disturbance and severance, a number of states provide for an additional amount which is a judicial discretion know as *solatium*.

Solatium is a discretionary payment to acknowledge hardship, inconvenience, trauma or other unspecified loss caused by the resumption. In a number of negotiated agreements applied to extinguish native title (for mining activities and related infrastructure) in Australia, the concept of solatium has been applied to what can be called Special Indigenous Value (SIV). Sheehan (2010) suggests that there is a strong argument that SIV should be adopted by the compensation assessor as a relevant head of compensation, drawing on its concepts of special value to the owner and solatium. In considering an award of solatium, circumstances such as the length of time the claimant has occupied the land, the inconvenience likely to be suffered by reason of removal from the land, and the period of time the claimant would have been likely to continue to occupy the land may be considered, although hitherto awards have tended not to extend to factors like emotional stress arising from the compulsory acquisition.

The focus in the Australian examples is on ‘extinguishment’ of native title. This is a controversial concept in Melanesia, where customary land is seen as inalienable. Rather the situation is more aligned to damage, disturbance, and loss of access and loss of connection (notionally for a time constrained period rather than in perpetuity).

Sheehan (2010) suggests that in negotiated agreements it is necessary to ensure the compensatory framework for native title is correct, so working within existing case law and statutory constructs is compelling – but disregards the pre-eminence of custom in Melanesian constitutions. Moreover, Sheehan places reliance on Unimproved Capital Value (which can often be more easily assessed on the basis of market evidence in Australia than in Melanesia, where there is effectively no market for inalienable customary land). As the Pacific Islands Forum Secretariat recommends, 'Administratively determined Unimproved Capital Value based returns to customary land must be avoided. Although these may seem uncomplicated, they do not facilitate a fair return to landowners' (PIFS, 2008, 17). In the Australian situation, where Special Indigenous Value has been treated as analogous to solatium, the largest level of judicial discretion available at present is in Western Australia, where it can be awarded at up to 10% of the total compensation sum (although there are strong views that is should be a considerably high quantum).

Pros:

- Assumes a simple base-line that customary rights are similar in all areas;
- Can include a component for cultural, social and environmental aspects (i.e. solatium / Special Indigenous Value).

Cons :

- This model does not take into account the nature of the infringement;
- It necessitates commodifying the property rights;
- It does not provide for any particular equality or distribution of resources;
- Inappropriately in the Melanesian context, it relies on Unimproved Capital Value as a component of the compensation calculation;
- It can be difficult to quantify the cultural, social and environmental aspects of the development and the discretionary allocation of Special Indigenous Value at a sum that equates to 10% of the other compensation does not adequately recompense the sense of loss; and
- The model assumes a single monetary figure, rather than a raft of compensation measures.

4.3 4.3 Model C – development driven quantification

This approach circumvents the need to determine the nature and extent of customary rights. Instead, compensation is assessed by reference to the benefits accruing to the developer, rather than the infringement on the rights of the customary owner(s). The benefits accruing to the developer are based on the 'marriage value' that is created by recognising, and combining, the interests in the various land and marine components from mine site to wharf and to the edge of the EEZ. Simply stated, a mining development has limited commercial value if there is no wharf access to export the minerals.

This marriage value is known in contemporary literature as synergistic value. The International Valuation Standards (API & PINZ, 2008, s.4.3.6, IVSC, 2010, 131) defines ***Synergistic Value*** (Synergistic Value may also be known as Marriage Value) as: 'An additional element of value created by the combination of two or more interests where the value of the combined interest is worth more than the sum of the original interests'.

In a development driven quantification, a standard compensation package could have a number of elements including, but not limited to:

- A financial component based on a share of the land at mine, land at wharf, and marine access marriage value, and associated synergistic value increase.
- Provisions need to clearly articulate the length of the arrangement (term), the process in the event of a change in user (such as premium for transfer based on a percentage of the increase in value between project inception and transfer), and the reversionary ownership provisions of the improvements (which should be returned in good and tenantable repair) at lease / licence expiration;
- A number of jobs for members of the various landowning and marine (or fishing ground) owning groups as well as the native landowners (number could be determined by reference to profit or some other changeable yardstick allowing for changes in business practice over time);
- The provision of housing or other community infrastructure;
- Schooling, health assistance, or whatever (to incorporate the minor cost of important trophy items that are often stated in leases over customary land, such as vehicles or boats).

Pros:

- Avoids the need to determine particular property rights;
- Provides for a diverse, flexible and index-linked compensation package;
- Encourages transfer of profits / adequate sharing of wealth;
- Can be set up to provide for intergenerational equity;
- Can distribute payments easily per year (or some other term) as occurs now; and
- Can be tailored to minimise / avoid some of the problems likely to ensue within the community when compensation is paid as a large, single, up-front lump sum (premium).

Cons:

- Much more difficult to legally implement.
- Raises questions of form (contract?) and enforcement.

4.4 4.4 Model D – negotiated agreement

Negotiated Agreements are emerging as international best practice, and are based around a negotiation that is determined on a case-by-case basis, with engagement of all stakeholders who have a legal / financial interest. This is a common Australian model. It is also a common way of doing business in New Zealand, although in that context it usually pairs recognition of rights with monetary compensation to redress past grievances. Negotiated agreements have been utilised in some resource schemes in Papua New Guinea, but are open to contestation as a result of uncertain genealogy. Negotiated agreements are confidential in nature, so there is little evidence available to reference.

Pros:

- Can lead to a quite diverse and sophisticated compensation package;
- Allows the customary rights owners to have a stake in what happens to their land – to 'own' the agreement; and
- Does not require precise identification of property rights.

Cons:

- Takes a long time – thereby holding up development significantly;
- Capacity is an issue, as the parties need to be fully advised and represented by independent legal and valuation practitioners, with the requisite skills to forecast future income growth and liabilities; and
- In the Australian and New Zealand application, the Crown (or State) needs to be a party, thereby complicating matters further.

4.5 Model E – the hybrid

As stated, international best practice is clearly moving towards negotiated frameworks. However, many of these are large-scale agreements, often taking years to negotiate, which embed compensation within an overall redress package. Both monetary and non-monetary forms of redress are given. The quantum of the monetary component does not always directly relate to market or non-market values of particular rights. In Australia, smaller scale arrangements are dealt with through Indigenous Land Use Agreements (ILUAs), allowing potential rights holders to contract (i.e. those who have claimed but not yet proven their native title rights), as the contracting does not depend on a precise identification of their rights. The compensation (composed of financial and non-financial components) does not therefore reflect a market value determination of their identified rights.

We have identified that any compensation mechanism should (i) be based on a rich understanding of the nature of the property rights, including the customary owners themselves as without such understanding any new mechanism may lack legitimacy; (ii) acknowledge the experience of other jurisdictions, whilst being appropriate to the given circumstances in a particular country; (iii) be sophisticated enough to ensure an appropriate transfer of wealth from developers to customary owners; (iv) not be limited to a singular monetary sum, but rather ensure ongoing social and economic improvement for custom owners; (v) respond to capacity problems; (vi) be embedded in a legal arrangement that provides certainty for all parties; (vii) determine how compensation will be held, managed, invested, accounted and distributed; (viii) ensure any development activity is undertaken sensitively and sustainably, prioritising cultural and ecological wellbeing; and (ix) provide for inter-generational equity.

The best way to contextualise a compensation mechanism is by exploring a hypothetical example (see Figure 2). In this example, we will assume that there may be several customary landowning groups impacted from mine to wharf. Indeed it is quite common in Melanesia for customary landowners living in the interior (or highlands) where mines are often found to have fishing rights over inner reef areas, such is the nature of traditional commerce and inter-clan arrangements. Our purpose in this example is to provide sufficient background to lead in to a discussion on synergistic value and a greater exploration of our hybrid compensation model.

The first stage of any disturbance of customary rights is to undertake a stakeholder analysis (see Boydell, 2008 for more discussion on this approach to stakeholder analysis).

Who are the potential beneficiaries:

- In terms of the marine and inner reef areas, these could be the custom owners of village A and village B, as well as those from other parts of the country with rights over marine and inner reef areas;

- Members of village B in terms of remuneration from the lease for the depot;

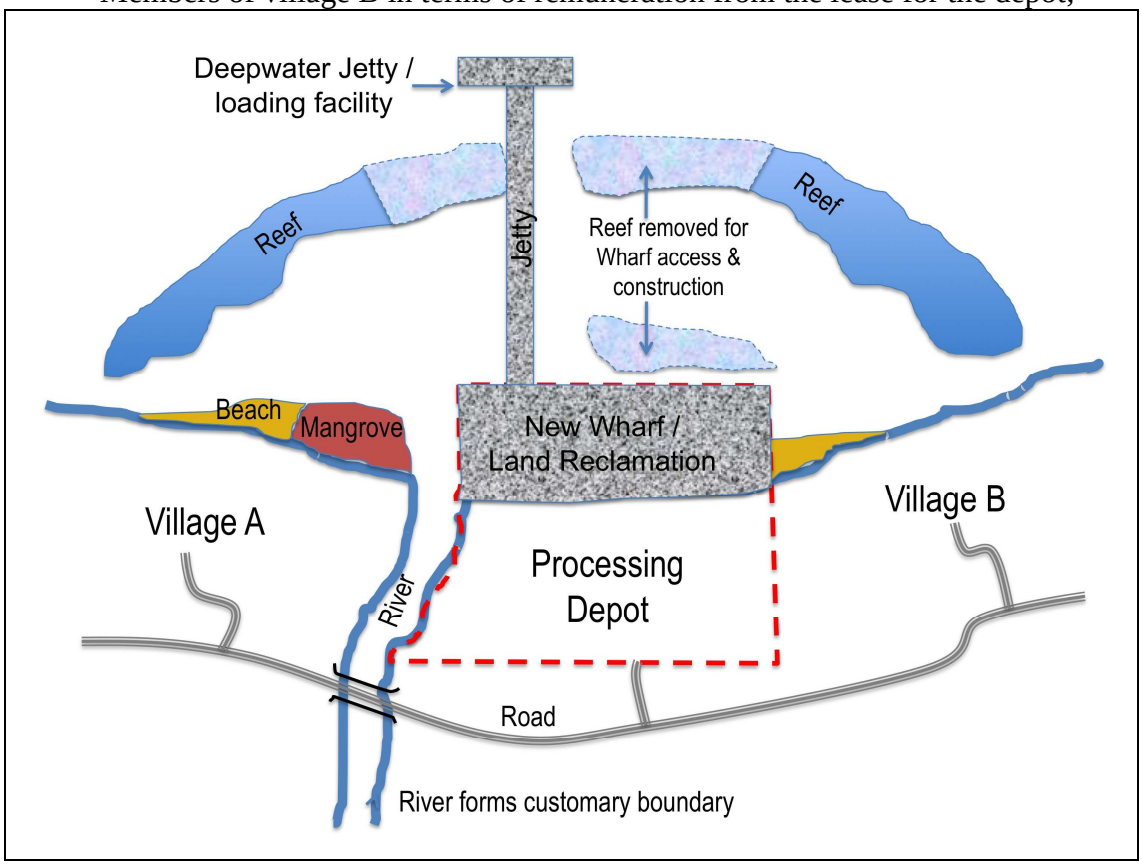

Figure 32: Wharf Scenario
(Source: Boydell & Baya for this research)

- Members of village B in terms of remuneration from indirect economic gain (employment at several levels). There is potential that members of village A will also benefit in the same way, but such provisions are unlikely to be written into the lease;
- This therefore creates a conflict between relating the land lease arrangement to the compensation for marine areas. So, village A should get both indirect and direct economic gain – and this is why there is a need for acknowledgement for the 'marriage value' (synergistic value) between the land component and water component. What this in essence means is that it is inappropriate to enter into a lease over the land without integrating access rights (and wharf construction rights, reef destruction compensation) to marine component, as fragmentation leads to social problems. Alternatively phrased, determining the calculation of compensation for the marine area has to acknowledge that remuneration from the land lease component has already benefited village B. Rather than changing the lease structures, you adjust the compensation to reflect that fact that there is a clear marriage value between the land interest held by village B and the marine interest jointly held by village A, village B and other rights holders;
- The Developer, and wharf / mine operator (who may also be the developer);
- Surrounding villages (other custom landowning groups)
- Public whose services may be called (food supplies through to banking ventures – i.e. local through to corporate)

- State, through tax (employee taxes, exploration licences and company taxes) and associated increase in GDP

Who might be adversely affected:

- Limitation of exercise of rights to village A & B (see next heading)
- Other members of the public who use the commons
- Fishing licence holders
- Marine environment from pollution

Who has existing rights:

- Village A
- Village B
- Any other customary interests in the waterway and marine areas
- Any existing fishing licensees

Below, we elaborate on these existing rights using a categorisation of rights model (Boydell, 2007, 117) that we have successfully engaged in a range of other projects.

Direct use: Rights to plant, harvest, build, access and similar, maybe shared rights

- Village A
- Village B
- Also, those to who the custom owners grant subsidiary and overlapping rights for fishing / sand and gravel

Indirect economic gain: For example through employment in mine/depot/wharf, transport, equipment, services and food

- Village A
- Village B
- Plus members of other custom rights holding groups

Control: Conditions of direct/indirect use, held by persons other than the user

- Village A
- Village B
- Subject to any licence, overriding of State

Transfer: Effective powers to transmit rights-by will, sale, mortgage, gift, or other conveyance

- Jointly through village A and village B in a customary sense

Residual rights: Remaining rights at the end of a term (such as lease, death, eviction), includes reversionary rights

- Jointly custom owners of village A and village B

Rights of identification (symbolic rights): Associated with psychological or social aspects with no direct economic or material function

- Primarily village A and village B
- And the wider clan group to which village A and village B are aligned in ancestral connection

Duration: Length of time property right is held, indicating profits and/or savings

- As agreed in any lease arrangement

Flexibility: Right should cater for modifications and alterations
- Developer in negotiation with village A / village B
- Plus State (should it apply overarching legislation/decree)

Exclusivity: Inverse of the number of people with shared or similar rights, more relevant to water property
- Village A and village B, as well as remote custom rights holders, for example, for a special traditional practice over that body of water

Quality of title: Level of security that is available as tenure shifts from the optimum
- How is the titled guaranteed by the state? The state guarantees by virtue of administrative authority, per the *Yanner v Eaton* example.

Divisibility: Property right can be shared over territories, according to season, etc.
- Village A and village B
- And developer
- Or State if they require

Access: Entry/ admission into the marine area
- Village A and village B
- The State
- Any existing fishing licensees
-

Withdrawal (extraction): Extraction of resources by owner despite leasing property
- Village A and village B
- The State (if seabed)
- Those to whom the custom rights holders grant withdrawal rights

Management: Be able to make decisions on how and by whom a thing shall be used
- Village A and village B, but ideally through a particular individual who has authority to speak for the custom owners
- Environmental Management overseen by the State

Exclusion: Disallowing others from entry and use of resources
- Village A and village B
- The State

Alienation: Transfer of an interest (right) in property to another, in perpetuity
- Village A and village B jointly
- Or developer on application to transfer current interest or create a subsidiary interest

Who is likely to be voiceless:
- Individual members who are not in the majority – so there is a need to make sure that everyone who has a right to speak has spoken (including young/old, male/female), so absentees may have limited rights
- Role of absent members (who may send remittances)
- Neighbouring custom landowners

- Historical associates and those who have connection
- General public who use the area (other than through formal planning approval channels)

Who is likely to resent change and mobilize resistance against it:

- Absent members, who may romanticise how the village 'used to be' with the passage of time
- Other custom owners seeking to entice a particular exploration company to use their land for processing, depot or wharf facilities
- Other members of the public who use the commons
- Fishing licence holders

We now need to integrate this analysis into the valuation considerations. There is a large body of international literature on economic valuation and resource management (see for example the comprehensive set of links provided by the World Resources Institute: http://www.wri.org/project/valuation-caribbean-reefs/references), and ecosystem valuation (see http://www.ecosystemvaluation.org/links.htm). Much of the resource valuation literature takes a *Total Economic Value* approach, where values are allocated to use values (direct and indirect) and non-use values (option value, quasi-option value, bequest value and existence, or psychic, value). These approaches are used by several of the contributors in Ahmed et al. (2005), and applied in the Fiji context by Korovulavula et al. (2008). The valuation techniques engaged in these use and non-use approaches are (as with the VFT) those applied by economists (as opposed to valuers), and include: Effect on Production; Replacement Costs; Damage Costs; Travel Costs; and, the Contingent Valuation Method. These have been variously applied on a range of international situations, with varying success. We consider that, because of the inputs required and the outputs desired, they all fall short of addressing valuation for land resource compensation in a Melanesian context.

We argue that the synergistic value approach, a valuation method more familiar to the valuation profession than mainstream economists, has more to offer in the context of land resource compensation in Melanesia. This marriage value approach takes a more holistic approach, engaging with the economic benefits that are gained from providing a mining infrastructure in multiple locations with access inner reef and marine areas (or, for example, providing a mineral exploration company access to reclaim an area for a wharf facility with associated jetty). It has the ability to be adapted and expanded to also include items that relate to both the positives (e.g. partnership, employment, service sector and food supply, environmental conservation and cultural heritage), as well as the negatives (e.g. potential loss of access, environmental contamination, sedimentation, eutrophication, reef degeneration, loss of amenity / privacy, loss of cultural heritage).

Table 1: applying IVSC approaches to Land Resource Compensation scenario
(source: Boydell & Baya for this research)

	Cost Approach	Income Approach	Direct Market Comparison	Depreciated Replacement Cost	Synergistic ('marriage') Value	Relief-from-Royalty method	Premium Profits Method	Excess Earnings Method	Fair Value	Special (Indigenous) Value	Going-Concern Value	Discounted Cash Flow	Risk Replication Method	Marine Resource Inventory
Marriage of interests between the land and marine areas	X	X	X		X				x	X	X	X		
Loss of access, if any (taking)		X			X				X	X	X			
Removal of mangrove, if any (taking)	X	X			X	X	X		X	X	X			
Removal of reef, if any (taking)	X	X			X	X				X			X	
Removal of sand / shale (taking)	X	X			X	X				X			X	
Loss of mangrove habitat (damage)	X				X					X			X	
Increased vulnerability through lost nutrient filtering / flood control / storm buffer / shoreline stabilisation / microclimatic stabilization / biodiversity maintenance / education and research / bio-prospecting / carbon sequestration	X		X		X					X			X	
Enviromental contamination from resort waste, dumping and spillage (damage)	X		X		X					X			X	
Sedimentation (damage)	X		X		X					X			X	
Eutrophication (damage)	X		X		X					X			X	
Reef degeneration (damage)	X		X		X					X			X	
Construction contamination risk (damage that can be addressed through the EIA bond)	X		X		X					X			X	X
Reduction of fish stock (damage)	X	X	X		X				X	X	X		X	X
Potential loss of income from possible restriction on fishing access (damage)		X	X		X				X	X	X		X	
Loss of amenity / privacy (damage)					X					X			X	
Truncation of cultural association, and diminution / impact on cultural heritage (damage)					X					X			X	
Loss of direct cultural and spiritual connection (loss of Special Indigenous Value)					X					X			X	
Loss of ability to exercise cultural and spiritual connection (loss of Special Indigenous Value)					X					X			X	

The quantum of compensation will need to be determined on a case-by-case basis, with the synergistic value between the mine, mining infrastructure, depot/wharf and the marine area forming a main component on which to base the negotiated agreement.

In Table 1 we summarise, by way of example, the breadth valuation approaches that should be engaged in addressing the compensation issues to be negotiated in respect of our scenario. In this regard, we use as a basis for the terminology the 2010 Exposure Draft of the International Valuation Standards (IVSC, 2010) – and recommend that the forthcoming 2011 version be utilised once it is published. The tabulated compensation issues that are included (in Table 1) are not necessarily exhaustive, but are grounded on a synthesis of the literature on the sustainable management of land and reef areas as well as stakeholder evidence from our ongoing fieldwork in Melanesia. The table is for demonstration purposes only, and should be adapted as needed to fit the circumstances of the geographic location of the proposed scheme, the country context, and the proximity of associated physical and social factors.

The valuation components that are derived through this process will produce a much clearer indication of the overall compensation quantum. This figure, which the present value of the loss / infringement, should then be dealt with as a compensation package. This package should have regard for the benefits accruing from the scheme (if any), such as employment opportunities, food and service provision, training, and the current package of notionally goodwill items (such as village benefits, medical fees, schooling, donations and material items e.g. boats / vehicles).

This analysis highlights that the most comprehensive valuation is provided by the synergistic value approach. We discuss this finding and outline how we propose to field test our model in the concluding section.

5 Conclusion and Further Research

This research has identified the complexity of dealing with development on customary owned land in Melanesia. After demonstrating the lack of alignment between customary and western worldviews, we explored examples of compensation arrangements (particularly those impacting indigenous landholdings) from a number of countries. Having articulated our phenomenological transdisciplinarity approach, the international context allowed us to explore four approaches to compensation. We evolved these into a fifth approach, a hybrid, that we analysed through the stakeholder interests of a hypothetical wharf facility on customary land for mineral exportation. We discussed econometric approaches to valuation briefly, before engaging the diversity of approaches in the International Valuation Standards to our scenario. This analysis confirmed that the synergistic valuation approach has the potential to provide the most equitable compensation for land resource development schemes in a Melanesian context.

What remains to be done is to test this 'equitable pro-development compensation model' – our hybrid – on a number of live development situations in the region. We are currently in discussion with customary landowning groups, NGOs, a trust and government departments on how we might operationalise our model, in both a policy and practice context. We are also testing the concepts on land professionals in the Melanesian region through a series of workshops, as well as through an international symposium.

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Public Private Partnerships and financing urban development

Stakeholder Management an Imperative to Successful Project Delivery: Evidence from Privately Financed Market Projects in Nigeria

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Abstract:
Construction works procured using public private partnership arrangement (PPPs) are more risk prone than those procured using other forms, primarily due to the lengthy concession period and the multi-parties involved in the arrangement. There are differing types of stakeholders associated with PPP projects that in turn have multiple and often conflicting goals or needs. Successful project managers therefore need not only to realise that project success criteria relates to the client (i.e. iron triangle, cost, time and quality), but they also need to understand the needs and priorities of the different types of project stakeholders.

This paper focuses on stakeholder management in the context of PPP market projects in a developing economy. Projects, large or small, have knock on effects on local communities and economies. The study elaborates on how stakeholders on those projects have been managed. However, from two different case studies presented in the paper, it was revealed that whereas on one of the projects stakeholders were effectively managed, this was not the case on the second project. Poor management of stakeholders on the second case study explain the poor performance on the project and the failure to satisfy the end users.

The study establishes that failure to understand the needs of all other stakeholders to a project and their priorities leads to project failure. Thus, it is concluded that for successful implementation of PPP projects in a developing economy, especially in a market development that has both cultural and socio-economic impact on the people, adequate consideration should be given to the needs of all the stakeholders. The findings of the study should be useful to PPP promoters in market projects in devising possible ways of managing the different stakeholders involved in privately financed markets.

Keywords:
privately financed market, project success, stakeholder management, sustainable development

1 Introduction

The construction industry amalgamates a wide range of loosely integrated organizations that jointly construct, alter and repair a wide range of different building, civil and heavy

engineering infrastructures. These infrastructures (social or economic) constitute the backbone for economic growth and national development as they contribute directly to economic activities within a nation and improve the welfare of the people. This undeniably underscores the importance of the industry in any economy especially a developing economy.

However, in Nigeria, these much needed infrastructures are in short supply when compared with the demands of the growing population of the country. Global economic melt-down, debt crises and fiscal crises have accounted for the shortage of fund for infrastructure development in Nigeria. Hence, the need for the Nigerian government to rely on the private sector to invest in the development of infrastructure in form of Public Private Partnership (PPPs) arrangement. Unfortunately, despite huge resources being deployed by both public and private in the development of infrastructure in the country, projects still end up with cost and time overrun, and many are completed with compromised specification leaving stakeholders dissatisfied. Therefore, the challenge of how to handle a construction project successfully has attracted substantial research attention in the past decades especially PPP projects that have different types of stakeholders who in turn have differing and conflicting goals or needs.

The aims of this paper therefore, are to revisit the concept of project success from the context of PPP market projects - a kind of project with social connotations using private sector investment - and to elaborate on stakeholder management using lessons learned from PPP markets projects in the south-western part of Nigeria. The result is useful not only to participants in the PPP market projects in Nigeria but also to others would be participants in the developing countries in Africa and the rest of the world with rich cultural heritage.

2 Previous research

A project is a temporary endeavour undertaken to create a unique product, service, or result (PMBoK, 2004). Kloppenborg (2009) remarked that a project requires an organised set of work efforts that are planned in a level of detail that is progressively elaborated upon as more information is discovered. According to the PMI (2000) each project typically has a unique combination of stakeholders (i.e. persons or organisation that are actively involved in the project, or whose interest may be positively or negatively affected by the project). All projects, either small or large, go through predictable stages constituting a project cycle. A project cycle according to Kloppenborg (2009) is a collection of general sequential project phases whose names and number are determined by the control needs of the organisation or organisation involved in the management of the project. Hence, an organisation's control needs are to be assured that the work of the project is proceeding in a satisfactory manner and that the results are likely to serve its customer's/stakeholder's intended purpose. A project exists within an environment, populated by stakeholders. The different expectations of stakeholders' can pose significant risks to a project. It is unlikely that the requirements of all stakeholders will coincide. Each will seek to influence the project in order to meet own ends. Pressures from stakeholders can generate change, increasing costs and delay. To manage stakeholders it is necessary to understand whether they are supportive or not and how much power and influence they wield. Chinyio and Akintoye (2008) argue that in terms of decision–making, stakeholders can be considered as being supportive, neutral, or opposed to the project. They further argued that those stakeholders that are opposed to projects are often in the minority but can be very vocal. This implies that no

matter how few or little they may be (i.e. stakeholders opposing the project) they need careful management and if possible to come to term with project ideas or decisions.

Numerous studies have addressed the issue of project success. For example Nguyen, Ogunlana and Lan, (2004) opine that a project is acknowledged as successful when it is completed on time, within budget, and in accordance with specifications and to stakeholders' satisfaction. Crawford and Bryce (2003) suggest that project success can be evaluated from two different dimensions viz: the efficiency dimension – doing the thing right and effectiveness dimension- doing the right thing. Takim and Akintoye (2002) used functionality, profitability to contractors, absence of claims and court proceedings and "fitness for purpose" for occupiers as measures of project success. Others such as Cooke-Davies (2002), Chua *et al.* (1999) clarified that project success is measured against the overall objectives of the project while project management success is measured against cost, time and quality/performance. Baccarini (1999) contends that project success should be measured both in terms of product success and project management success. What this implies is that for project management to be successful, a project manager (PM) needs to understand the objectives of the project as it relates to the client (mostly - time, cost and quality or what is termed "iron triangle" by Atkinson, 1999) and also take into cognisance others that may be affected by the project or those who may affect the project in one way or the other.

Previous researchers have identified the critical success factors (CSFs) that contribute to the successful delivery of large construction projects (Toor and Ogunlana, 2008 and 2009) and PPP projects in particular. For instance Li *et al*., (2005) identified 19 CSFs for PPP projects in the United Kingdom, Zhang (2005) identified 47 CSFs. Jamali (2004) discusses the success and failure mechanisms of PPPs in developing countries using the experience from the Lebanese construction industry. Abdel Aziz (2007) reported that despite United State's initiatives, the implementation of PPPs has been facing some difficulties. One of the two main impediments identified in the USDOT, (2004) as cited in Abdel Aziz (2007) is local opposition i.e. lack of local community support. Opposition by transportation program administrators/staff was also reported as part of the impediments on another FHwA (2005b) report covering PPP implementation in seven states (see Abdel Aziz, 2007). Olander & Landin (2005) showed how failing to understand and manage external stakeholders can dramatically delay railway infrastructure projects, and surveys show that coping with external stakeholders is perceived as imperative to project success (Calvert, 1995). Moreover, Cleland (1986), had long affirmed that understanding and managing how internal stakeholders within the organisation impact a project is also important, and that managing them at times might constitute a major challenge. Chinyio and Olomolaiye, (2010) suggest that stakeholder management enhances greater competency in relational issues and minimises risks therein. In the opinion of Sutterfield et al (2006) project success comes from the adeptness of project manager in managing the interests of multiple stakeholders throughout the entire project management process. All the foregoing findings and many others affirm the need for more research work in the area of stakeholder management especially in PPP projects.

According to Aaltonen (2011) the managerial importance of stakeholder management has been accentuated in various studies all of which demonstrate that fair treatment of stakeholders is related to long-run survival of the organization (Clarkson, 1995; Freeman, 1984; Donaldson and Preston, 1995; Mitchell et al., 1997; Rowley and Moldoveanu, 2003; Savage et al., 1991). In Aaltonen's opinion, the majority of research on stakeholders has focused on theoretical discussions and debates about the concept of

stakeholders and the nature of stakeholder theory (Donaldson and Preston, 1995; Jones and Wicks, 1999; Mitchell et al., 1997; Rowley, 1997; Frooman, 1999). Various definitions of the term stakeholder exist in current literature. The Project Management Institute (PMI, 2008) defined stakeholders as individuals and organizations that are actively involved in the project or whose interest may be affected as a result of project execution or project completion". The definition is accepted in this paper because of the credibility of the PMI. Chinyio and Olomolaiye, (2010) explain that stakeholder management involves identifying and classifying stakeholders, which in turn facilitates both initial and subsequent engagement with them in a timely, planned and coordinated manner. Stakeholders can be classified as being primary or secondary, active or passive stakeholders depending on their involvement in projects. Winch, (2004) defined project stakeholders as being 'internal' or 'external' to the project. Internal stakeholders are the stakeholders that are formally members of the project coalition and, hence, usually support the project. They are often referred to as primary stakeholders (Cleland, 1998) or business actors (Cova and Salle, 2005). Such stakeholders have a formal, official, or contractual relationship with the project organization. External project stakeholders are not formal members of the project coalition, but may affect or may be affected by the project. Such groups are often referred to as non-business stakeholders (Cova and Salle, 2005) or secondary stakeholders (Clarkson, 1995).

Managing stakeholder therefore, involves managing relationships in order to motivate stakeholders to behave in ways that support the objectives of a firm (Chinyio and Olomolaiye, 2010). Harris (2010) suggested that practical stakeholder management requires the following five considerations: (i) Who are the stakeholders and their interests in the project? (ii) What opportunities do these interests offer the project or firm? (iii) What challenges or threat are thereby presented? (iv) What level of responsibility is appropriate in meeting stakeholder requirements? And (v) what are the necessary strategies demanded e.g. direct dealings, aggressive attitudes or accommodating or a combination of different courses of action? The PM can understand all aforementioned considerations through proper stakeholder analysis, effective communication with stakeholders and applying appropriate strategies and tactics. Manowong and Ogunlana (2010) sum up that having identified stakeholders through the stakeholder matrix created during the project's initiation, the PM should then utilize the attained stakeholder map to better understand the relationships among various stakeholders on specific problems. The next thing then, is for the PM to employ the right strategies in managing and dealing with the identified stakeholders. Weiss (2003) proposed the following tactics for coping with stakeholders (i) approach each stakeholder directly or indirectly, (ii) do nothing, monitor, take offensive or defensive actions with certain stakeholders; (iii) determine whether to accommodate, negotiate, manipulate, resist, avoid or wait and see with specific stakeholders; and (iv) combination of strategies.

Mathur, Price and Austin, (2008) argue for adequate stakeholder engagement. They assert that existing practices view stakeholder engagement: mostly from a management perspective; sometimes from an ethical perspective; less often as a combination of the two; and rarely have any element of the social learning perspective. However, they suggested an approach that will combine all the three perspectives for sustainability. From the foregoing, it is evident that efforts have been made in the area of project success and the impact of stakeholder management on successful implementation of construction projects. Little is known in these areas regarding PPP projects in Nigeria. Liu (1999) asserts that a set of success factors may not be transferable to another project due to the differences in the environmental variables, the nature of the project, the

nature of the stakeholders and their priorities. Furthermore, in a developing economy like Nigeria where the use of PPPs are still very recent, there is the need to review PPP project success in a systematic and comprehensive manner and document opportunities to improve the project management process.

3 Research Methodology

The study employs a qualitative research strategy in a multiple case setting. Data were collected on two PPP market projects within south-western region of Nigeria (i.e. the re-construction of Erekesan Market in Akure and the Oluwole Urban Market complex, in Lagos Island). Markets, in this context, are infrastructures whereby people trade, and goods and services are exchanged, forming part of the economy. These facilities vary in size, range, geographic scale, location, types and variety of human communities, as well as the types of goods and services traded. Good examples include neighborhood markets, central markets which are held in the centre of town/cities, local markets in villages etc. Aside from having socio-economic importance, markets also serve as places where health information and religious information are disseminated. Political rallies are also held in markets because of the strategic location of most markets in the centre of cities, towns or villages (Awodele *et al.,* 2010). The central place theory of location of market, as observed by Hodder (1965), is true as it is common to see a market in the centre of the town, surrounded by major buildings such as the central church or mosque, town hall and the King's palace.

Case studies may employ either qualitative or quantitative evidence or both. For the purpose of this study, qualitative research strategy using various data collection methods was employed in data collection; involving semi–structured interviews with key project stakeholders from the public and private sectors, questionnaire survey, reviewing of project documents as well as direct observations on site. The case selection was not random but based on purposeful sampling. Market projects have been selected because of their socio-economic and non-economic importance to the community where they are located. The choice of these projects within the region was informed by the need for homogeneity in the data collected and the fact that PPP arrangement was used in developing both projects and they fall within the same geopolitical region of the country.

Furthermore, In case study researches the phenomenon is not isolated from its context but is of interest precisely because the aim is to understand how organizational behaviour and processes are influenced by the organizational and environmental context (Yin, 2009). In order to increase the reliability of the study as a case study research, case study protocol (CSP) was developed for the conduct of semi-structured interview this document act a good guide when conducting face–to-face interview with the interviewee. The number of formal interviews with internal stakeholders on these projects (i.e. from private and public partners on those projects, contractors as well as consultants) who are top management officers of the stratified groups was eightwith four interviewees each from each case study. In addition, the first author spent two weeks each to conduct informal interviews with external stakeholders (i.e. traders and shoppers) and made personal observations which serve as confirmatory evidence to the information gathered from the internal stakeholders.

3.1 Case Study 1

The Erekesan market in Akure, Ondo State was re-constructed following the destruction of the old King's market (Deji's Market) by fire in the year 2000. The market is situated in front of Deji's palace; right at the centre of Akure town. Agreement to redevelop the Old market to an ultra-modern market was reached between the Ondo State Government, Akure South Local Government (public) and Spring Bank plc - then Omega Bank Nigeria plc. (private). The trio formed a special purpose vehicle (SPV) called Sunshine International Venture Limited. The concession agreement was to jointly finance the project with the bank providing much of the finance. Akure South local government provided the land as its own equity share while Ondo State Government contributed 20% of the fund. Two years construction period was agreed and the market was to be operated for a period of 20 years before being transferred to the government. Six contractors were involved in the construction as the whole project was divided into six packages: blocks A, B, C, D, E and Traditional market side. Omega Bank Plc., through its subsidiary mortgage company Omega Saving and Loans, managed the project, while private consultants were employed to design and carry out the initial documentation on the project. With these multi-party nature of the project, five set of stakeholders are identified on the project viz: (i) government (i.e State and Local), (ii) bank, (Omega bank Plc.), (iii) contractors (Six of them), (iv) consultants, and (v) end users (Traders and Shoppers to the market).

3.2 Case study 2

The Oluwole Urban Market Complex (OUMC) in Lagos Island was developed as part of the efforts of the Lagos State government to reposition and redeem the image of the Oluwole area. Oluwole market has been known before, to be notorious for fraud and home to drug addicts. The market is situated on the corner of Martins Street and Nnamdi Azikwe Street in Lagos Island. OUMC is a four floor level concrete structure covering a floor area of about 3,889 square metres with 390 shops and 240 K-Klamps (traditional market stalls) on a site measuring 4,829sq.m. OUMC was equipped with onsite facilities manager, standby electricity supply, 24-hour security, merchandise loading bays and ramps, and other modern facilities. The project is a PPP initiative between Lagos State Development and Property Corporation (LSDPC), ARM Properties Plc. and AZDEC ASC Design Company who, acting together, formed a special purpose company 'The Oluwole Urban Mall Properties Limited' (OUMPL). OUMPL was given a concession to build and operate the market for 25 years. The market development is part of the entire redevelopment plan of Lagos State government to regenerate and rebuild the historic Lagos Island. The market was commissioned by Lagos State governor, Babatunde Raji Fashola in April, 2010 (see figure 1 for a picture of the market).

Figure 1: Picture of Oluwole Urban Market Complex.
Source: Field survey October, 2010.

4 Findings and Discussion

Having described the two cases under study, the findings from the cases are hereafter analysed and presented under the following headings: (i) success of the project, and (ii) reasons for the performance recorded. Following those, cross-case analysis is done to highlight lessons learned.

4.1 Success or failure of case 1

Although, from the perspective of the internal stakeholders in case 1 , the project is said to be successful in term of actualising the goal of the venture; i.e. to redevelop the old market into a modern day market that befits the centre of a capital city. However, going by the performance of the project in terms of cost, time and quality, the interviewee from the consultants and the government side felt the project was not successful. One respondent referred to the projects as *"Monumental loss to Ondo State in general and Akure land in particular"*. This is because the project was not delivered on time, to cost and to desired quality. Moreover, from an informal interviews with end users (i.e. traders and shoppers to the market) it was gathered that, overall, users are not satisfied with the facilities. They felt the project fell short of their expectations in terms of effectiveness and efficiency. Furthermore, personal observation of the facility confirmed the claim of the end users about lack of functional sanitary facilities and inadequate parking spaces. Moreover, other project documents like the initial contract sum and the final contract affirm that the project experienced both time and cost overrun (about 12 months completion delay and ₦150 million approximately £683,123.449 cost overrun). Further, visual information as evident in figure 2 shows that while some of the shops are still unoccupied; traders are still seen selling on the road outside the market.

Figure 2: Traders selling outside the Ultra modern market

Source: Field survey April, 2010

4.2 Reasons for the performance recorded in case 1

Reasons advanced by the end users, especially concerning their dissatisfactions with the market, are as follows: (i) in adequate space for their trading; (ii) inadequate parking spaces which make it difficult for customers to visit the market; (iii) poor sanitary facilities due to lack of water; (iv) poor sales as a result of difficulties for shoppers in locating what to buy; and (v) the high amount being charged for a space/stall in the market compared to similar spaces elsewhere. From the internal stakeholders, it was gathered that poor cost and time performance of the project was due to some cultural issue as well as political problems which arose during the construction phase of the project. As a King's market (Oja Oba), Akure indigenes felt the market should be free, and should accommodate the market women selling traditional goods such as herbal leaves, hens, goats etc. who have been using the old market before. The idea of selling the market at completion also met with strong opposition from the indigenes who felt the cultural heritage of the city should be preserved. In addition, intermittent closure of the market for one festival or the other was cited as another reason for the poor patronage from traders.

4.3 Success or failure of case 2

All stakeholders interviewed adjudged the project to be very successful. Physical observation of the quality of the project also confirms the performance of the project in term of delivering to desired quality. Other facilities such as toilets, water supply/bore hole, and standby electricity supply and on site facilities management attest to the quality of the market as a truly 'modern market'. Documentary evidence on the lease/sales of the market reveals that the entire stall has been let/ purchased. Never the less, some of the stalls remain locked while some were empty when the project was visited in October 2010. Testimonies of some shop owners in the market are indicative of satisfaction with the project. For example, a shop owner remarked, *"the project provided us with an easy and convenient means to acquire a shop within the highly commercial Lagos Island"*. Another shop owner said *"The quality of work on the project is commendable"*. However, some of the end users interviewed stated that they could not conclude yet since the facility was still very new, but be able to talk competently on the performance of the market after two or three years. Some shop owners remarked that, though the cost of a stall in the market is high compared to what is obtainable elsewhere within Island. They are still satisfied because of other amenities

in the complex. One of them said, *"Obe to dun owo lopa"* meaning "every good thing comes with a price".

4.4 Reasons for the performance recorded in case 2

The internal stakeholders to the project asserted that the success recorded on this project was as a result of the cooperation they enjoy from the state government and Oluwole royal family. Furthermore, they asserted that the interests of the previous owners of the Oluwole land were taken into account in the development of the project. It was gathered from them that the previous owners of the land were given 39 flats in Shasha housing estate, Alimosho local government area of Lagos State. Moreover, they were also given 39 K-klamps in the market. Informal discussions with some of these previous occupants of the land testify to these claims. One of them said in pidgin English that *"when dem do dis Oluwole...dey no forget us, nah we help dem"*. What this means is that they (the previous occupants) are all instrumental to the success and that when the project finished, the developer did not forget them. It was evident from the discussions that the previous occupants of the land were fully engaged in the process of the development. Their interests were considered during the design and construction process. The developers worked actively with them in deciding how and where to relocate them and the appropriate level of compensation. The former land occupiers were given flats and former shop owners were allocated shops within their ability to pay. These worked in favour of the project as a whole.

4.5 Cross case analysis

From the two case studies, it is evident that in case 1, poor performance of the project is due to poor stakeholder management; whereas the success recorded in case 2 can be attributed to effective or good stakeholder management. In case 2, the relocation of the previous owners of the land is a product of negotiating tactics in stakeholder management and also, allocating some part of the project to them can be seen as accommodating strategy. In case 1, the consultation and negotiation processes were absent or inadequate. This may have been as a result of the market being burnt down. In case 1, when there were serious opposition from market women especially the indigenes, promoters had to set aside the traditional market side for the people to use free of charge. This in turn affected the expected rate of return on the market and had a multiplier effect on the overall prices of stalls in the market.

5 Conclusion and Further Research

This paper has alluded to the importance of market as infrastructure with both economic and non-economic value; which calls for care when managing the different stakeholders involved. Key stakeholders in PPP market projects have been identified and the need to know their interests as input to the process of establishing stakeholder management strategies that best suit them highlighted. Aside from meeting client objectives, effective stakeholder management is an important component of project success for PPP projects.

The performances of two projects have been assessed from the perspective of the key stakeholders to the projects. It is evident that while one of the projects was adjudged successful (case 2) by all stakeholders, the reverse was the case on the other (case 1). The performance of project 1 is very poor and external stakeholders were not satisfied as the project failed to adequately consider every stakeholder to the project.

Emerging from these findings is the need for adequate consultation with all the key stakeholders to any privately financed market project so as to understand their real needs from the inception of the project and to endeavour to keep them satisfied. It is therefore recommended that stakeholder management process should occupy a central place throughout the life cycle of a PPP market project. This requires that people charged with management role in privately financed market projects should seek to improve their knowledge, skill and competencies in working with stakeholders. Government also, should endeavour to invest in the training and development of their staff in this area.

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An Assessment Of The Adequacy Of Criteria Used In Concessionaire Selection In Public Private Partnership (Ppp) Projects In Nigeria.

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Abstract:

Construction is a high risk venture. In the bid to transfer the risks inherent in infrastructure development from the public sector to the private partner who can best handled them; Nigerian government have sought alternative procurement route in form of public private partnership (PPP) to procure infrastructures needed for the country's economic growth. The selection of private partner (i.e concessionaire) by the public or his professional advisers for construction projects is a critical function requiring careful thought and judgment. A wrong choice may not only lead to acrimonious client-contractor relationship, but also contribute to waste of resources. While many authors have argued for the use of an output-based specification rather than the traditional prescriptive model, many believe the choice should be based on the nature of the project whether it is social or profit oriented project. The paper therefore identified and assessed the criteria used in selecting appropriate concessionaire for PPP projects in Nigeria. Literatures were reviewed to identify evaluation criteria in use on PPP projects. Opinions of professionals who have experience of PPP procurement methods within Ondo State Nigeria were sought through questionnaires survey. The adequacy of these criteria was analysed using relative importance index (RII). The study revealed a disparity in the opinion of the respondents on the adequacy of these criteria. The paper concluded by recommending a transparent and objective competitive bidding process in the evaluation process which is an insurance against corruption allegations; adhering to a pre determined criteria to demonstrate commitment of the government and help in building the bidder confidence; reduction of risk in project execution and spur greater innovation on the part of the bidders.

Keywords:

competitive bidding, concessionaire, evaluation criteria, Ondo State, Public Private Partnership.

1 Introduction

The transition from the previous approach of government in provision of services to the new approach of private participation is evolving with new and challenging practices. This has been applied in telecommunications, energy, transport, water, wastewater, trash collection, ports, and so on. This scenario (Fitchranting ,2004) is bringing about a form of contractual relationship between a public agency (federal, state, local government) and private sector entity, with clearly defined public needs and rewards

like concession contracts. In Nigeria (like most other nations) government s have enacted laws and adopted own strategy in accordance with the local conditions and laws, like (Public Procurement Act, 2007) with the main objectives to: (a) regulate procurement process; (b) establish satisfactory regulatory frameworks; and (c) implement projects with private participation in order to engender transparency, value for money, and competition in the selection process.

However, this new stage requires a synergy of processes to select participant that will ensure efficiency and economy in the whole process. This is because wrong choice of bidder has resulted to failure of projects, criticism by the public, allegations of corruption and kickbacks (Aje, 2008). While many procurement laws/guidelines provide that lowest bidder ("technically and economically comprehensive; "substantially responsive") will be considered for award of contract (Public Procurement Act, 2007), arriving at this may be challenging and require determination.

Hence the evaluation of bidders before award is made critical. The procurement process must follow a logical and systematic procedure designed to cover all aspects - Tendering Procedure, prequalification of bid in appropriate routes like Single-Stage, One-Envelope, Single-Stage, Two-Envelope etc., Bid Evaluation and Procedure using quantitative weighting systems applicable to the procurement mode and concession project concerned(Public Procurement Act, 2007; Worldbank,2006) – in order to determine the most realistic lowest evaluated bid amongst the bids submitted before the bid closing time on the date specified in the bid documents instruction.

Procurement in P3 does not fit into lowest or highest bid class (Ayuli, 2010) because the choice of best bid is often consider on many criteria by procuring authorities(world bank,2002. In developing countries, large infrastructure projects procurement are often the target of allegations of corruption and kickbacks (Transparency International, 2006). This scenario is compounded by provisions of many procurement laws stating that lowest bidder (in any way qualified-"realistic"," technically and economically comprehensive', "substantially responsive") will be considered for award of contract (Public Procurement Act, 2007; Infrastructure Concession Regulatory Commission Act (ICRC), 2005). However, (Aje, 2008; Ayeni, 1987) contend that a bidder may not only fraudulently bid ridiculous price (just to win) but also be a bidder with no experience of the project especially where open competitive tendering/bidding process is adopted.

Beside, bid evaluation criteria are not only inadequate but not detailed enough based on assessment and analysis of economic data (ICRC,2005). Sadly to note is the paucity of data bank making data e.g. interest rate, inflation rate etc unreliable to prepare a realistic price (Shamsudden ,2007). Thorough understanding of procurement modes and project financing options by parties (clients and bidders) is asymmetrical (Ojo and Awodele, 2010), hence evaluation of bid proposals on differing systems (procurement mode and financing option) for same project portends a critical issue for determination. Most invitation to bid adverts fall short of standard requirement contrary to law (Public Procurement Act, 2007).Therefore, this study aims to identify and assess the adequacy of criteria used in selecting concessionaire in PPP projects in Nigeria.

2 Overview of PPP Procurement

The provision of infrastructural facilities by government is becoming a complex process in terms of procurement and financing. Fitchranting(2004) the recognition of these gaps

has resulted in a nearly universal acceptance that the private sector should play a large role in the financing of infrastructure with the public sector being acting as project sponsor or passively as an institutional bond investor. This scenario is bringing about the marriage between the public and private sectors in form of contractual agreement and cooperative venture, building on the expertise of each other, which clearly defines public needs through the appropriate allocation of resources, risk and rewards (NCPP ,2005); Leiringer, 2001).This partnership arrangement can be in different forms as suggested by World Bank(1997):

1. **Service contract:** Under this option, the private sector performs a specific operational service for a fee, for example meter reading, billing and collection. Suitable for power, gas or water supply projects.
2. **Management contract:** In this option, the private sector is paid a fee for operating and maintaining a government-owned business and making management decisions. Useful for specific technical expertise projects.
3. **Lease:** Under the lease option, the private sector leases facilities and is responsible for operation and Maintenance e.g. in the running of energy equipment and petroleum refinery project.
4. **Concession:** Under concessions, the private sector finances the project and also has full responsibility for operations and maintenance. The government owns the asset and all full use rights must revert to the government after the specified period of time. This is currently adopted in the running of Nigeria Airport, seaport and highway (Lagos – Ibadan Expressway concessioned to BI-Courtney Ltd. for the sum of 89Billion naira for 30years.
5. **Build own transfer (BOT):** These are similar to concessions but they are normally used for new greenfield projects. Ibrahim (2007) contented that the private sector

(Concession Company) under the arrangement is responsible for project design, finance, construction, operation and maintenance of the constructed public facility. However, ownership is retained by the concession company during the concession period before transfer to the government at the end of the concession period. Ibrahim further stated that BOT is a generic term taking forms like Build-Operate-Own (BOO), Build-Transfer-Own (BTO) and Build-Lease-Transfer (BLT) .The private sector receives a fee for the service from the users. **Build – Own – Operate (BOO)** Under this model, the private sector partner organization(s)design construct, finance and operates a facility for performing public services without transferring ownership of the facility to the public sector. **Buy – Build – Operate (BBO)** involve the transfer of a public asset (facility) e.g land, to a private organization entity under scales contract, who later rehabilitate the facility and operate it in a more cost – effectively manner. Public control is however, exercised through the terms of the control especial at the transfer. **Design – Build – Finance - Operate (DBFO).** DBFO project, a single point of responsibility for design, construction, financing and operating of a new public facility is award to a private entity, with the title to the facility remaining with the public sector. **Divestiture** option can take two forms – partial or complete divestiture. A complete divestiture, like a concession, gives the private sector full responsibility for operations,

maintenance and investment, but unlike a concession, a divestiture transfers ownership of the assets to the private sector.

3 Current Statutory Project Procurement Procedure

In most countries, governments and international multilateral banks and donor agency have enacted laws and bidding guidelines, which intend to serve as bases for legal framework and procurement procedure and proceedings for P3 and other public procurement processes (Public Procurement Act, 2007 and Infrastructure Concession Regulatory Commission Act, 2005 in Nigeria; India ; UNCITRAL, 2004: African Development Bank, 1997)). These laws engender transparency, value for money, competition in selection process. For the purpose of this research, salient parts of most of the procurement laws and procedures can be treated thus:

Invitation to tender

To commence procurement proceeding is by the way of invitation to tender/Bid (ITT/B)/ or Request for Proposal. This is usually through advertisement in national newspapers, official websites and, or tender journal of the procuring authority (Ministries, Departments, Agencies (MDA))(Public Procurement Act, 2007;world bank,2002). This makes the process competitive, ensures efficiency and economy, provokes integrity and fairness and, transparent in compliance with laws and regulations (UNCITRAL, 2004: African Development Bank, 1997; ICRC, 2005). The advert spell out general information like viz; intent to invite for bidding, procurement method, description of scope of work or service, conditions for eligibility, , procedure for collection and placing/submission of bid(venue, time and mode of packaging),opening of bid and other necessary information, duration of concession and a caveat on the bidding(usually stating that lowest bidder (in any way qualified-"realistic"," technically and economically comprehensive', "substantially responsive") will be considered for award of contract. Aje (2008) summarises the major criteria required in bid documents as those dwelling on contractor/bidders technical capacity, financial capacity, commercial capacity, managerial capacity, general information and past experience performance.

Bid Submission
In competitive bidding under local and international bidding procedures, procuring authorities employ suitable routes in evaluating bids, considering the nature of the particular procurement concerned. These are: (i) Single-Stage, One-Envelope, (ii) Single-Stage, Two-Envelope, (iii) Two-Stage, Two-Envelope, and (iv) Two-Stage. The bid documents are usually categorized into technical and commercial proposals (or both combined) and financial proposal.

(a) Single-Stage, One-Envelope Bidding Procedure: In the Single-Stage, One-Envelope bidding procedure, the bidders submit the bid documents in one envelope containing both the financial proposal and the technical proposal, which are opened, evaluated and, following approval of procuring authority, the contract is awarded to the responsive lowest evaluated bidder. This is the mostly used procedure. It saves time and bidders expenses and, helps avoid public allegations.

(b) *Single-Stage, Two-Envelope Bidding Procedure:* In the Single-Stage, Two-Envelope bidding procedure, the bidders submit bid documents simultaneously in two sealed

envelopes, one containing the technical/commercial proposals and the other the financial proposal. Initially, only the technical/commercial proposals are opened and evaluated without amendments or changes permitted and without reference to price. The financial proposal remains sealed and are held in custody by the procuring authority. Bids that do not conform to the specified requirements may be rejected at this level by the procuring authority, as deficient bids. Following procuring authority approval of successful technical/commercial bids, the financial proposals are opened and evaluated based on price and, the award or contract is made to the responsive lowest bidder.

(c) Two-Stage, Two-Envelope Bidding Procedure. : While this is similar to "Single-Stage, Two-Envelope Bidding Procedure", however, the procuring authority or bidders negotiates and is allowed/ required to amend or change the technical proposals after been evaluated. Following discussion of the amendments and changes to the technical proposals, the bidders are invited to submit supplementary financial proposals based on the revised technical proposals. Any deviation will result in rejection of the bids. This flexibility ensures that all technical proposals conform to the same acceptable technical standard and meet the requirements of the procuring authority. After the resubmission/replacing of bids, the process runs again, with bidders invited to the opening of the financial proposals. The original price proposals and the supplementary price proposals are opened and evaluated, and award of contract is made to the realistic lowest evaluated bidder. This procedure is good for complex project where expertise is essential.

(d) Two-Stage Bidding Procedure*.:* This procedure is similar to "Two-Stage, Two-Envelope Bidding Procedure", but without submission of financial proposals. The objective of the exercise is to ensure that all technical proposals conform to the same acceptable technical standard and requirements. After the evaluation and approval of technical proposals, the second stage is to invite bidders to submit revised technical proposals and financial proposals based on the revised and agreed upon technical proposals. The financial proposals and revised technical proposals are opened and re-evaluated, and the award of contract is made to the responsive lowest evaluated bidder.

Prequalification and Evaluation of Bids

In a survey conducted by (Ogunsemi and Aje ,2006)the main reasons for prequalification and evaluation is to identify and determine those bidders who are interested and capable of undertaking the contract, to keep tendering time and cost to minimum, ensure value for money, to meet client objectives ,for public accountability. Though most procuring authorities usually maintain a list of prequalified contractors, who are often invited to bid, these practices deters others from competing and, perhaps negate the objectives of international donor agencies and particularly for P3 contract procurement (World bank,2001:UNITAR,2010). In Nigeria, Public Procurement Act (2007), section 23(3 a-e) and section 16 state the basic criteria for prequalification documents. Procuring authorities usually decide the methods and scoring processes and weightings before starting the selection process in order to maintain transparency and to increase bidder's confidence. Criteria may be limited to;

a. Technical criteria.

1. Technical skills- Project Execution Plan (PEP) design, quality Assurance, Construction.
2. Project Organization/Management- Management team, other Key Personnel, Project control/schedule.

3. Past Relevant experience- Evidence of performance in related project.
4. Technology Base- Owned facilities and equipment for the project.
5. Supply chain management- List of Core/Technical Partners, subcontractors, and suppliers.
6. Environmental criteria-Health and Safety, Environmental Assessment (where applicable).

Moreover, section 16(6b-e) Public Procurement Act (2007), requires the legal and commercial capabilities of bidders to be established using criteria which may include:

b. Commercial Criteria.

1. Evidence of Registration with Corporate Affairs Commission.
2. Ownership structure of The Bidder's Company/Special Purpose Vehicle Company.
3. Evidence of Payment of Tax Clearance for at least 3 year.
4. Evident of Sources of Finance/Project Financing Structure/Company Audited Account.
5. Provision of Bid Security- Performance Bond.
6. Statement of Outstanding criminal legal proceeding against the bidder/any company director.
7. Statement /Schedule of Tender Risk.

These criteria can be quantitatively weighted and summed up, determine the minimum scoring level which qualifies a bidder for the evaluation of financial bid.

c. Financial Criteria.

Technical evaluation and or commercial criteria are then used to assess the bidders' financial proposals. Financial capacity can be established by analyzing the bidder's financial statements and whether other financial institutions are supporting its bid. These criteria may not be limited to;

1. Lowest Customer/ Bidder tariff required/Subsidies payable.
2. Highest upfront concession fee or periodic lease payments to the procuring authority.
3. Lowest Price for shares or assets to be sold.
4. Lowest Capital investment committed by the bidder.
5. Service Quality targets (output) coverage (value addition, geographical location etc.)
6. Shortest proposed concession period.
7. Most favorable project financing structure to procuring authority.
8. Least risk sharing/allocation

Financial information on the bidder's working capital and investment plans may also be included to ensure sufficient resources will be available. Consideration is often premised on combination of cost-benefit criteria analysis which fit the project need as couched by the procuring authority.

4 Research Methodology

The study was carried out in two main stages. The initial stage involved in-depth survey of existing laws, guidelines, literature to elicit information and identify commonly agreed criteria in use for infrastructure concession contract bid evaluation. The next stage involved questionnaire survey of active players in the construction concession contract particularly in Ondo State, Nigeria in order to assess adequacy of commonly identify and agreed criteria. The respondents were randomly selected but stratified sampled professionals -Quantity surveyor, architects, engineers, Lawyer and Accountant-(25 in population i.e 5 each) in the public and private sectors that represent project advisors in infrastructure Concession Procurement Contracts. The survey criteria were categoriesed into three parts; the first part consisted of Technical criteria, Commercial criteria and financial criteria. In stage one, A Yes(Y) or No (N) type scale indicating agree or disagree was provided against each criteria evaluated. The data from the survey exercise were analyzed using the percentage frequency analysis. In table 1, The frequency was calculated by using the following equation:

Percentage Frequency (F) = %

N_1 = Number of (YES) agree

N_2 = Number of NO disagree

N = Total number of respondents

$$F = \frac{N_{1,2}}{N} \% \quad \text{.....equation 1.}$$

$$\text{The Mean Percentage(M)} = \frac{\text{sum of Percentage Frequency(M)}}{\text{no of criteria}} = \frac{\sum F}{N_C} \text{.....equation 2}$$

In table 2, to analyze questionnaires' data, two statistical methods were used. At first, frequencies of the various answers were calculated (in percentage). Then the Relative Importance Index (RII) was calculated. In this case, a rating scale of 1-5 was chosen when '1' represents the lowest effect level and '5'represents the highest effect level.

The RII equation is:

$$RII = \frac{\sum yx}{\sum x} \quad \text{..... equation 3}$$

Where y represents the given rating by the respondents to each factor on a range of 1–5 (with '1' representing 'not adequate ' and '5' representing 'extremely adequate') and x represents the percentage of respondents scoring.

Further numerical values calculated by the formula were classified differently varying from 6 to 10 (due to the indices obtained) in defined significance intervals of 0.8 as the' rank agreement factor' thus:

$6.00 \leq$ 'not adequate' (NA) ≤ 6.80

$6.80 \leq$ 'somewhat adequate' (SA) ≤ 7.60

$7.60 \leq$ 'adequate t' (A) ≤ 8.40

$8.40 \leq$ 'very adequate' (VA) ≤ 9.20

$9.20 \leq$ 'extremely adequate' (EA) ≤ 10.00

5 Findings and Discussion

Review of various statutory regulations and laws on procurement of public goods and services and from extant literature as shown in table 1 below, revealed that, 85% of the laws/literature surveyed agreed to Technical criteria as adequate. Particularly, criterion like; Technical skills(meaning- Project Execution Plan (PEP) showing design, quality Assurance ,Construction),Project Organization/Management(meaning- Management team, other Key Personnel, Project control/schedule) and Past Relevant experience(meaning- Evidence of performance in related project etc are important. The Commercial Criteria attracted 92% of surveyed laws/literature .Criteria such as Evidence of Registration of company; Ownership structure of The Bidder's Company/Special Purpose Vehicle Company; Evidence of Payment of Tax for at least 3 year; Evident of Sources of Finance/Project Financing Structure/Company Audited Account etc are notable. This is in tandem with section 16(6b-e) Nigerian Public Procurement Act (2007), which requires the legal and commercial capacity on bidders. The financial criteria have overwhelming agreement of 100% adequatecy. Notable criteria include Lowest Customer/ Bidder tariff required/Subsidies payable, Highest upfront concession fee or periodic lease payments to the procuring authority; Lowest Price for shares or assets to be sold; Lowest Capital investment committed by the bidder etc.

Table 1: Criteria used for selecting concessionaire in PPP project as provided in reviewed regulatory laws and guidelines.

Class	Criteria	A	B.	C	D	E	F	G	H	J	K	Percentage %	
Technical												YES	NO
1	*Technical skills*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
2	*Project Organization/Management*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
3	*Past Relevant experience*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
4	*Method Statement/Technology/Design*	Y	Y	Y	Y	Y	Y	N	N	Y	Y	80%	20%
5	*Environmental System Proposal*	N	Y	Y	Y	N	Y	Y	N	N	N	50%	50%
6	*Supply chain management*	N	Y	Y	Y	Y	N	Y	Y	Y	Y	80%	20%
											Mean	85%	15%
Commercial													
1	*Evidence of Registration of company*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
2	*Ownership structure*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
3	*Evidence of Statutory Tax Payment*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
4	*Company Audited Account.*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
5	*Provision of Bid Security*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
6	*Outstanding legal proceeding*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
7	*Schedule of Tender Risk*	N	N	Y	Y	Y	N	Y	N	N	Y	60%	40%
8	*Bidders Eligibility*	Y	Y	Y	Y	Y	Y	Y	Y	N	N	80%	20%
											Mean	92%	8%
Financial													
1	Concession Fee Payment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
2	Capital investment(cash flow analysis)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
3	Service Quality targets coverage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
4	proposed concession period.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
5	Project financing structure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	0%
											Mean	100%	0%

Source; Authors Survey; A= Public Procurement Act,2007;B= Infrastructure Concession Regulatory Commission Act,2005 , C= Ghana Public Procurement Act ,2003 ;D=United Nation Development Programme(UNDP); E=Worldbank(2002);F=The African Development Bank (AfDB) (1997) ;G=Asian Development Bank (2006); H= Aje O.(2008);J=Ayuli J. (2010);

From the analysis in Table 2 show below, given the limitation of the data available, it is evident that the majority of respondents agreed to large number of the criteria as significant and hence very adequate for evaluating bids. For technical proposal respondents agreed that somewhat adequate with an average RII of 7.39 while project organisation (RII, 9.50), technical skills (RII,7.33) and supply chain management RII,7.50) were adjudged very adequate criteria for bid evaluation. Again, Schedule of Tender Risk(RII,9.00), Ownership structure of The Bidder's Company/Special Purpose Vehicle Company(RII.7.67) and Statement of Outstanding criminal legal proceeding(RII,8.20) were very adequate for evaluating commercial bids. Capital investment cash flow analysis (RII,9.50) forming part of the financial bid was rated extremely adequate for bid evaluation by procuring bodies.

However, from the three major areas of criteria required for bidders' evaluation (Aje, 2008) argue that there seem not to be a universal/conventional check list. Besides Procurement in P3 does not therefore evaluate based on single criterion say lowest or highest bid (toll price) like most traditional bid evaluation process, due to variables associated with it.

Table 2: Assess Adequacy Of Commonly Identify And Agreed Criteria.

Category	Criteria	RII	RANK	EFFECT LEVEL
Technical				
1	*Technical skills*	7.33	3	SA
2	*Project Organization/Management*	9.50	1	EA
3	*Past Relevant experience*	6.00	6	NA
4	*Method Statement/Technology/Design*	7.33	3	SA
5	*Environmental System Proposal*	6.67	5	NA
6	*Supply chain management*	7.50	2	VA
	AVERAGE	7.39		SA
Commercial				
1	*Evidence of Registration of company*	5.00	8	NA
2	*Ownership structure*	7.67	3	A
3	*Evidence of Statutory Tax Payment*	6.67	6	NA
4	*Company Audited Account.*	7.33	4	SA
5	*Provision of Bid Security*	6.67	6	NA
6	*Outstanding legal proceeding*	8.50	2	VA
7	*Schedule of Tender Risk*	9.00	1	VA
8	*Bidders Eligibility*	7.00	5	NA
	AVERAGE	7.23		SA
Financial				
1	Concession Fee Payment	1.53	5	A
2	Capital investment(cash flow analysis)	9.50	1	EA
3	Service Quality targets coverage	6.67	4	NA
4	Proposed concession period.	7.33	2	SA
5	Project financing structure	7.33	2	SA
	AVERAGE	6.47		NA

Source; Authors' Survey.

Since the main objective of this paper is to identify and assess evaluating criteria implore in determine most responsive evaluated bid in P3 concession contracts, it can be deduce from the study that:

I. The main purpose of bid evaluation is to determine the most responsive lowest evaluated bid, the process which is premised on evaluation criteria. These criteria are often stated in some procurement laws / procedure /guidelines amongst which are Public Procurement Act, 2007 and Infrastructure Concession Regulatory Commission Act, 2005 etc in Nigeria - in order to engender transparency, value for money, and competition in the selection process.

II. There is consensus that major criteria required for bid evaluation are those dwelling on bidders' technical capability, commercial capability and financial

capability as requested in the examined laws and guidelines; and these criteria are found adequate especially for prequalification and evaluation processes.

III. However, some criteria for prequalification are preferably be quantitative and others qualitative since quantitative criteria are more directly applicable and transparent, and qualitative criteria require a merit point system but be minimally used for aspects that cannot be quantitatively measured.

As an antidote to the seeming acrimonious Nigerian procurement process , adhering to a procurement plan and pre determined criteria for the bidding process would demonstrate commitment of the government and help in building the bidder confidence. In designing the bidding process therefore, it is essential to prequalify potential concessionaires(Armando ,1998; CRISIL (2006) to serve three purposes-first, it helps to ensure that only those firms with the requisite technical /commercial capacities to operate the project/concession participate in the bidding; Second, a defined number of bidders (resulting from the prequalification) may stimulate greater effort on the part of prequalified firms to prepare better financial proposals and will make it easier to obtain feedback on some aspects of the bidding documents (especially the draft concession contract) from those prequalified bidders and third, the number of applicants for prequalification will give a good indication of the risk measured by the market. The competitive process in the evaluation procedure can spur greater innovation on the part of the bidders and this can only benefit the procuring authority.

Depending on the type of P3 mode, so will the evaluation criteria fluctuate. Nigerian procuring authorities and investing concessionaire should be more concerned with the technical criteria included in the bids, while the bidder's financial proposal will need to assure the procuring authority on sufficiency of financial resource, financing plans in terms of project financing option etc (World Bank, 2006; ILI, 2007) as emphasized in the laws, guidelines of some international organizations and Ghanaian Procurement Law

6 Conclusion and Further Research.

A transparent and objective competitive bidding process is often seen as an insurance against corruption charges. This needed to be supported by adequate evaluation criteria, complete documentation of developments at each stage of the procurement process, objective decision making and transparent sharing with all affected parties. These are useful ingredients in ensuring a successful competitive bidding process, ensures selection of most realistic, substantially responsive bidder, who may not have nominally lowest bid price. Creating an evaluation mechanism through formation of high level tender board and evaluation committees would lend the bidding process credibility. Procuring authority need to establish a strong bid management structure able to handle the complexities of procuring the project and managing the bidding process. A competent and efficient procurement management team, linked to careful planning and coordination of the procurement process, ensures success of the selection proceedings.

It is important to examine the sufficiency of the information available to bidders and its compliance with standard requirements by law, guidelines etc . This is essential because, it could well noticed in Nigeria many concessionaires infrastructure contracts evolve unnoticed, and bid adverts fall short of standard requirement resulting into public outcry for foul.

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Retail property - shopping centers, big box development, logistics and distribution
When the Going Gets Tough, the Tough Gets Going: etailers' Reactions during Recession

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Abstract:
Phases of economic downturn can harshly affect the performance of major economies in general, and the retail industry in particular. In spite of that, not all retailers are equally affected by recessionary phases, with some looking at it as an opportunity to further invest and create competitive advantage while some others resorting to cost cutting and waiting for the recession to pass. By using the recent economic downturn as a basis, the purpose of this paper is to investigate what are the retailers' actions towards the economic downturn and assess how their actions differ across different retailers in terms of size, location and sector of retailing. A total of 25 stakeholders associated with the retail sector (ranging from fund managers to store owners) were invited to participate in face-to-face interviews, resulting in 15 in-depth interviews across a wide range of retail categories. These exploratory data were combined with a review of the literature to explore retailer actions to the recent economic downturn. This paper suggests that there are growth opportunities for retailers during the trying times of economic downturn. Specifically, this paper suggests that large retailers see this as an opportunity to invest in Corporate Social Responsibility (CSR) practices as a means to aid in the recovery of the recession in terms of reducing costs and beyond in terms of developing competitive advantage. Other strategies include: Customer Relationship Management (CRM), differentiation via personalised service, realignment of marketing to changing consumer behaviour(s), and reduced costs and investment. The focus of this paper is specifically limited to the SEQ region and, as such, its generalisability to other region(s), states may be somewhat limited. Past research reveals that not all the retailers are equally affected by recessionary periods. Given this, the value of this paper lies in providing insight into strategic react to an economic downturn, and providing a foundation for examining these strategies and their link to retail performance via quantitative research.

Keywords:
Corporate Social Responsibility (CSR), Customer Relationship Management (CRM), economic downturn, retail

1 Introduction

As the recent economic downturn has drag over the 18 months mark, times have proven increasingly challenging especially for Australian retailers, as they have for retailers in other developed markets globally. The recent recession is most unique with regard to

the duration of its recovery, with the majority of economists expecting it to extend into 2011, a period of over 18 months. This compares to previous global recessions, which, on average, have been no longer than 11 months in duration (Gascon, 2009). While the global economy is experiencing the worst recession in over 70 years (Oliver, 2009), the Australian economy have remained relatively resilient. This is due to a combination of factors such as the extended tail of the resources boom, rapid policy action by the reserve banks in the country and government stimulus packages and infrastructure spending, and generally more robust financial systems (Oliver, 2009).

One of the most disturbing global indicators of the downturn is the decrease in real retail sales, particularly in the USA and Europe, with the severities of these declines experienced thus far consistent with past recessions (Davies, 2000; Gascon, 2009). The current downturn has, however, been marked by a huge performance disparity between retailers (Baker, 2009) and when looking to past recessions, research suggests that the retail sector is supported by previous academic research which suggests not all retailers are equally affected, and manage the effects of a recession in varied ways (Srinivasan et al., 2005). While Srinivasan et al. (2005) suggest that some organisations view recession as a time to invest and establish competitive advantage, in practice, many organisations immediately focus on cost saving measures and reducing staff numbers in times of an economic downturn.

In February 2011, major Australian book retailer, Angus and Robertson, announced retrenchments of over 321 jobs and closure of its 37 stores over a 3 weeks period. This move further sparked a series of "attacks" by consumers regarding the company's loyalty to its workers, community and the Australian public in general, which negatively affected sales for months following and consumer brand perception to date (Sharp and Zappone, 2009). Other retailers, such as iconic Australian department store, Myer, and supermarket giant, Coles, have made substantial strategic investments despite the downturn. Myer invested most heavily in store refurbishments and the redevelopment of their customer loyalty program (Myer One), which resulted in a 15 percent growth in profit for the 2009 financial year (Myer, 2009). Coles similarly shrugged off the downturn to announce a 12.8 percent jump in net profit to almost AU$2 billion, which was built on the back of investment in its supply chain operations, which generated significant returns and cut expenses (Gardner, 2009).

This paper seeks to attend to two central questions: first, what are the probable strategic reactions to the current economic downturn by retailers? Secondly, how do these reactions vary across retail organisations in terms of size, geographic location and sector of operation? The answers to these are significant for both managerial practice and theory, particularly given the impact of the recent downturn and the increased pace of change in business cycles (Srinivasan et al., 2005). We will now demonstrate the background of the research, follow by the outline of the qualitative methods used to collect our data, followed by the conceptual model that arises from our data and discussion of the findings.
The conclusion comprises of recommendations for retail practitioners, address limitations of the paper and propose directions for future research.

2 Literature Review

There are limited academic evidence in the area of strategic react to economic, with only a few articles in the leading journals addressing the issue (Coulson, 1979; Cundiff,

1975; Srinivasan et al., 2005; Yang, 1964). Outside of these list there is some discussion retailer react to recessionary periods (Bradley and Taylor, 1992; Dawson and Larke, 2004; Davies, 2000; Piercy, 1983; Simmons, 1981; Simmons, 1983). In particular, a few key strategies and opportunities that took place during recessionary phases are discussed, which include (but not limited to): opportunities for merger and acquisition, managing supplier relationships through rationalising product lines, information exchange with suppliers, emergent market segment opportunities, capitalising on the online channel, establishing discount chains, introducing private-label products, and reducing prices to mainstream stores (Bradley and Taylor, 1992; Davies, 2000; Dawson and Larke, 2004). Yet, these strategies can have mixed effects towards different retailers, and indeed, not all retailers are impacted equally by recessionary periods, with some retailers experiencing growth through aggressive investment and capturing the market share of competitors (Srinivasan et al., 2005).

Usually, most retailers respond to recessionary periods by altering their corporate behaviour as consumers adapt their consumption behaviour. The way an organisation handles change in the environment (i.e. a recession) drastically affects both the level and type of react (Dutton and Duncan, 1987;Dutton and Jackson, 1987). For example, retailers that view a recession as an opportunity perceive that they have control over both the situation and the resultant outcome, and therefore focus on investment (e.g. building extension, brand extension). Retailers that took the recession as a threat, recognize a lack of control over the situation and the resultant outcome, and respond by conserving resources. Srinivasan et al. (2005) propose that backward-looking or defensive strategies are way of the past and suggest firms need to proactively engaging with consumers during recessionary periods.

Similar research suggested that there are a number of variables that impact a firm's strategic react to a recession (Shama, 1993). One variable is geographical location, or region, as different regions constitute different economic entities, which might be experiencing different economic climates with different consumer needs. For example, several authors have reported differences across US states in recessionary conditions (Sebastian, 1989; Rex, 1990). A second variable is the retail-operating sector, with the underlying theory behind sector-level differences being that different sectors may experience different, even opposite, economic climates at the same time (Milward, 1988). For example, in Australia, the food and beverages sector has been particularly strong during the recent economic downturn (Australian Food News, 2009). Finally, organisational size has been shown to impact firm performance during recession (Shama, 1993). Larger retailers possess more market power and resources, which can assist in cushioning the impact of a weak economy. On the other hand, smaller retailers might operate in a protected market niche to ride through the recession, while others may be unable to borrow needed cash and potentially be forced to exit the market.

Practically, many retailers also react by taking far-reaching strategic realignment in an attempt to maintain or improve current financial performance. Some of the more common strategies include cutting costs, production and investment, entering foreign markets, working more with equity capital, improving efficiency, and re-structuring debt (Beaver and Ross, 1999; Pearce and Michael, 1997). Often, cost reduction is automatically associated with a smaller workforce, or reduced working hours. However, there are counter-arguments against the redundancy strategy, with research showing that downsizing results in mixed effects on organisational performance (Cascio et al., 1997; Pfeffer, 1998). For instance, Cascio et al.' (1997) study of the impact of downsizing on

performance over a 15 year period and found that reductions in employment was not translated into improvement in performance in any way across all firms they studied. In fact, reactionary strategies such as workforce downsizing during a recession may have negative impacts by eroding customer loyalty in the longer term (Pfeffer, 1998).

From our literature review recollection, it is clear that further research is imminent to provide further understanding of the strategic choices that retailers make during recessionary periods, evaluating how these actions differ across retail organisations and linking these decisions to key performance outcomes such as revenue growth and profit. This paper addresses the first two of these three areas so as to assist retailers in their recessionary decision making. With this in mind we explore retailers' strategic reactions to the current economic downturn, to identify and compare differences across the retail industry based on organisational size, geographic location, and the specific sector of operation.

3 Research Methodology

Given the exploratory and qualitative nature of this enquiry, in-depth interviews were deemed most appropriate to deeply explore and capture retailer perspectives on strategic actions to the economic downturn. Consistent with theory building research and the discovery-driven purpose of the study, our sampling technique sought to generalise theory rather than be statistically representative. Data were collected from a range of individuals working in or associated with the retail industry, and included fund managers, senior managers, retailers, retail consultants and suppliers. A total of 50 invitations were sent to potential interviewees, resulting in 15 in-depth interviews.

The interviews followed a semi-structured format (Mick and Buhl, 1992) to allow for questions and discussion to flow naturally. Questions started broad, probing on the effect of the economic downturn on the retail industry in general, and appropriate strategies to navigate through and recover from the recession. Floating prompts were used for deeper meaning and understanding of the actions and issues of interest as they arose throughout each interview. Paraphrasing was also used to clarify interviewees' actions, and to ensure the interviewers understood the respondent's react and allow for any follow up questions (Strauss and Corbin, 1998). Interviews lasted between 30 and 45 minutes and actions were recorded with an audio-tape and transcriptions written for analysis.

Two interviewers were used in the data collection process to reduce the role of bias (Lincoln and Guba, 1985). Analysis occurred after each interview to identify themes, commonalities, and patterns, and to allow the actions to inform subsequent interviews. After an initial careful review of the transcripts, open coding was conducted, whereby text from each interviewee was classified into emerging categories (Strauss and Corbin, 1998). As part of this process, triangulation took place to check the credibility and validity of the information gathered, and whereby multiple perspectives were used to interpret a particular theme or pattern.

Throughout the study, a number of methods for improving the quality of the research were adopted. First, data were triangulated from multiple primary and secondary sources, collected from a range of individuals associated with the retail industry and across a variety of retail sectors, as well as company literature and trade and academic sources focused on the economic downturn and retail trends. Second, all three

researchers provided independent interpretations of the findings to ensure consensus. Third, three respondents were given the opportunity to provide feedback on initial findings. These three sets of activities all reinforced the reliability and construct validity of conclusions.

4 Findings and Discussion

We now reports on and discuss the findings from the in-depth interviews. It is important to note here that five key strategic actions for managing the recession were identified. However, given that some of these actions could naturally apply to any recessionary period (i.e. differentiation, repositioning of offer to changing consumer behaviour, and cost cutting measures), only those that are unique to the recent economic downturn and are mediated by organisational characteristics, are discussed. Excerpts from the interviews are used to illuminate and contextualise the key themes, which are presented in the conceptual model (Figure 1).

The conceptual model implies that there were five key themes emerging from our qualitative inquiry. The model also suggests that the macro environment (in this case, the economic downturn) impacts retailers' strategic operating decisions and these decisions are mediated by certain variables. From the literature review and in-depth interviews, we focused on three potential mediating variables between the macro environment and retailers' strategic decision making. Based on our discussions, two of the moderating variables play an equally important role. First, we found that corporate social responsibility (CSR) was mediated by the size of the organisation. Second, we found that customer relationship management was typically related to retailers in the fast moving consumer goods (FMCG), supermarket, and convenience sectors – arguably with large product assortments and large amounts of data available to mine. We did not find major differences between the strategic actions of our interviewees based on geographic location (regional or suburban SEQ). However, it is possible that these strategic actions may in fact be mediated by geographic location if this study was conducted in a bigger scale. While most of the strategies uncovered here are arguably intuitive, it was surprising to note that CSR practices were underpinned by economic, environmental, and competitive reasons as a result of the economic downturn. This supports Srinivasan et al.'s (2005) view that some organisations engage in proactive marketing during recessionary periods, and that these firms tend to view the recession as an opportunity. The two themes which appear to be unique to the recent economic downturn or to retailers in SEQ, which are presented with solid borders in Figure 1, are now discussed.

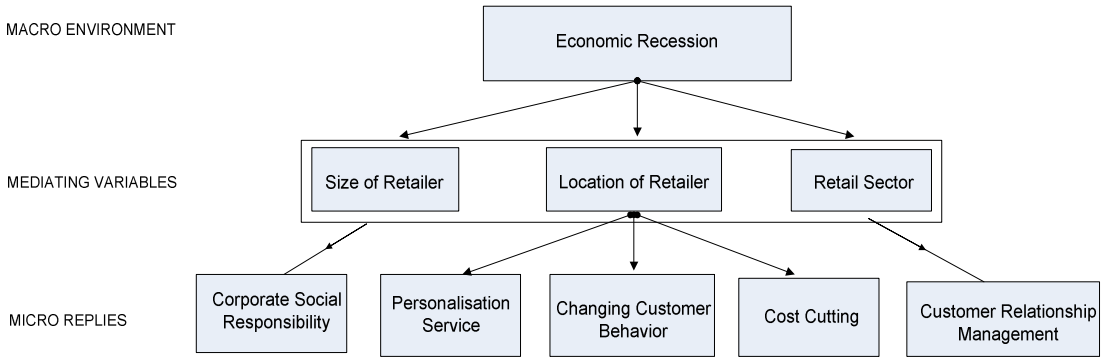

FIGURE 1. Conceptual Model

4.1 Corporate Social Responsibility (CSR) practices

Several of our informants viewed the issue of CSR as a retail strategy that will lead to cost savings, customer awareness and satisfaction and increasing staff morale during the recession, as well as aiding in the recovery process ahead. However, this view was largely expressed by retailers that were relatively large in size (i.e. with corporate staff levels in excess of 100). While additional investment during an economic downturn is not new (Srinivasan et al., 2005), the notion of investing in CSR practices during such times is new. Looking back 10, 20, or 30 years, other CSR movements lost momentum in the face of recessions, but the recent recession is different, as the CSR mindset is now much more solidified (Neff, 2009).

Our research suggests that retailers, particularly those large in size, are already, or are in the planning phase of, investing heavily in this area as a means to recover from the recession, increase business performance and gain competitive advantage. As part of this discussion, corporate social responsibility was broadly highlighted as an important metric and one which requires close monitoring and control. The following passages reflect this perspective:

> The way we approach [CSR] is that it reduces costs. For example, we are about to charge for carry bags, and we have done testing to show that we will be able to reduce usage by 80 percent and that will take a huge cost out of our operations. We will take the profits from the money and reinvest it in the community. So once customers are on board, we get the tick for reinvesting it in the community, but we also get a tick from our cost saving. We have reduced the carbon footprint of our supply chain in the last 12 months by 40 percent. The fact is that as a consequence, the associated operating cost reductions are significant. The way we approach sustainability is that it either reduces cost or saves us money. We have had a major focus this year on "grow your own veggies"; we just thought it was a nice little promotion. But when it started, before we knew what we were doing, we were into several hundred thousand dollars of sales a week. It just took off beyond our wildest dreams. We are not tree huggers and do not do it for the shear hell of it [. . .] Another thing we have just done in terms of green behaviour is review our waste management, and through careful management systems we have reduced our costs and reduced the amount of land fill that we put out. It [green and sustainable retailing] makes good business sense (P4).

> CSR is a big thing that underpins everything else and is not going to go away [. . .] An important aspect of this in our industry is about eliminating waste [. . .] a recession is the ideal time to cut unnecessary costs and save money through adopting more efficient ways

> of doing business. We have looked at our distribution chain in terms of its carbon footprint and we ensure that no trucks are driving around the country at less than full capacity. The bottom line is that our per box distribution costs are down, we attain fuel savings and we are reducing the carbon emissions of our network. Another aspect we have just invested heavily in is environment-friendly buildings. To us a green office space is about more than getting recognised by the green building council, we expect that it will have a direct effect on our employees' morale, the number of day's sick leave they take and position us as an employer of choice for graduates. We take a holistic approach to green and sustainable practices, it is much more than lip service, and during the economic downturn we are seeing cost savings which will continue into the future (P9).

These perspectives are particularly forward-thinking given that research by Nidumolu et al. (2009) with CEOs from 30 large corporations in the USA and Europe identified that many are of the view that the more environment-friendly the organisation is, the less competitive they become in that such investment will increase costs and not deliver immediate financial returns. Nonetheless, one of the key findings of their research was that CSR is a combination of both organisational and technological innovation that yields both bottom-line and top-line returns; environmental-friendliness lowers costs as companies essentially reduce their inputs and generate additional revenues from sales to new consumer segments, improved products or new businesses streams.

This argument is further supported by trade research undertaken by global management consulting firm A.T. Kearney (Mahler et al., 2009), who examined 99 companies across 18 industries, including retail, with a strong commitment to sustainability. The study compared their performance with industry averages and found that in 16 of the industries studied, companies committed to sustainability outperformed industry averages by 15 percent over the six months from May through to November 2008. Together these findings suggest that investing in sustainability for the long-term may be the best way to protect an organisation's value through good times and bad.

4.2 Customer Relationship Management (CRM) for personalised offerings

The second theme that emerged from the interviews which is distinctive to the recent recessionary period related to tailoring personalised offerings through customer relationship management (CRM). Discussions around effective strategies to combat the recent recession also focused around the importance of consumer intelligence, particularly through better utilisation of existing data sources. It is important to note, however, that this discussion tended to exist in FMCG retailers from the supermarket and convenience sectors. These are sectors that have substantially large product assortments and as such, are able to access large amounts of information from purchase scan data and customer loyalty programs. Many of our informants believed that, as a result of the economic downturn, it has become increasingly important to understand consumers – not only in terms of who they are (i.e. demographics and psychographics) but also in terms of their behaviour (i.e. basket analysis), which can then act as the basis for innovative ideas, products, and more precise marketing tactics. Through CRM and analysis, it was broadly recognised that more strategic and personalised product and communication offers can be developed and used to increase individual basket sizes:

> Retailers marketers typically begin with a shotgun [. . .] they put an advertisement in the paper promoting a product [. . .] but 99 percent of people may not see it, and it's a potential waste of funds [. . .] meanwhile Carrefour have shown that you can use data to understand your shoppers better and target your marketing efforts. They have been able to identify not only what people purchase, but have also been able to identify ways in which they can

> target particular segments of their customers – the special offer they send one customer may be very different to the special offer they send another client. You can reward different types of customers based on their behaviour in your store (P3).

This thinking is an extension to the shift in retailing from being product-centric to customer-centric and having a "one-to-one" dialogue with customers (Beatty et al., 1996). It is within this context that retailers are also shifting from mass marketing and advertising activities to more targeted and personalised relationship-building activities (Spellings, 2009). This approach is also important given the current focus on reducing operating costs as it reduces wasted time and money on unfocused campaigns to a broad audience, and thus lowering marketing costs. Leading retailers have reported impressive marketing results from campaign personalisation. For example, conversion rates have grown from 2 to 11 percent in certain categories, repeat purchase rates have risen by more than 100 percent, and average transaction sizes have increased by 10 percent (Cataldo, 2000).

Respondents also discussed the value in sharing customer data with suppliers in order to work more collaboratively and in identifying mutually beneficial opportunities in effectively meeting the changing needs and expectations of consumers. These thoughts are consistent with the findings of Davies (2000), which suggests that retailers effectively use data to aid in the retailer-supplier relationship during tough economic times:

> It is important to understand consumers and their shopping behaviour by obtaining data on consumer purchases at the point of sale. Not only to track how well products sell, but to see what products go well with each other. This information is very valuable [. . .] We are also able to get data from loyalty cards and are able to match customer demographics with this purchase data. With this information we are not only able to tailor our offer, but we are able to control our inventory levels in stores. The other benefit that there is with this kind of information is that it is very valuable for suppliers, and it can be sold back up the supply chain too (P2).

For many retailers, supplier collaboration is something of a new concept; many are cautious about sharing sensitive sales data. More and more retailers are, however, reaping the benefits of working more in partnership with suppliers. In recognition of this, a number of savvy retailers around the world are developing and implementing supplier collaboration processes and the tools to support them. For example, manufacturers whose products are sold in Sainsbury's, the second largest food grocer in the UK, are able to purchase a combination of loyalty and transaction data to find out what type of customer is buying their products and how new product launches are faring (Whitehead, 2003).

5 Conclusion and Further Research

With this paper we set out to identify the strategic actions that retailers are employing to combat the current economic downturn and qualitatively evaluate how the size of an organisation, its geographic location (i.e. South East Queensland) and the retail sector the organisation operates within may mediate the relationship between the external environment and the implementation of strategic actions. While our research reveals several strategies that have been identified in previous research (i.e. differentiation, realignment of offer to changing consumer values, and reduced costs and investment), the contribution of our research lies in two areas.

Our first contribution is in terms of the two key themes uncovered which are unique to this recession, or to the region The first of these is that large retail organisations in South East Queensland see investing in corporate social responsibility practices as crucial in aiding in the recovery of the recession and beyond. This is important as adopting such practices brings financial benefits through reducing waste and additional sales to scrupulous consumers, but also because environmental sustainability offers the chance to establish a position as a market leader and gain competitive advantage (Srinivasan et al., 2005). In addition, when genuine environmental leadership is rewarded in the marketplace (with market share, price premiums, public respect, and increased visibility), it motivates all industry players to innovate and shift their current thinking behind products, technologies, processes, and business models. This can have flow on effects to companies approach to innovation (Nidumolu et al., 2009).

The second theme unique to the recent recession is customer relationship management (CRM) for personalised offerings. This theme uncovers the importance for organisations to achieve a new level of customer intimacy. Managing customer data effectively can also assist retailers in understanding a customer's lifetime value, which can be used to plan customer acquisition, retention and growth strategies. A related retail priority lies in the utilisation of customer data for segmentation purposes as a means to grow specific niches and incremental revenues. Once a customer base is segmented into groupings of customers who think and behave in a similar way, retailers can begin to see patterns emerge that inform each group's preferences and needs (Chau, 2007) in order to deliver personalised, customer-triggered messages that result in improved loyalty to an individual retailer or retail chain (Cataldo, 2007).

Our second contribution is in the development of a conceptual model of retailer strategic react to recessionary periods. This model forms the bases for future research where quantitative analysis can be applied to examine the relationship between the retail strategies uncovered and key retail performance measures. Such research will provide valuable insights as to the effectiveness of strategic actions to recessionary periods and provide retailers with the tools to manage future recessions. It would be a logical next step to test this conceptual model and assess the relationship between these strategies and retail performance metrics. Furthermore, global comparisons of these strategic actions would be worthy of investigation to establish if they are indeed specific to the region.

It is important to note that the results presented here should be interpreted relative to certain limitations. Whilst the data is enhanced due to the fact that we were able to interview a range of strategic and practitioner thought leaders in the field of retailing, we recognise that the scope of the research is limited to Australia's South East Queensland region. This has some potential implications for the generalisability of the results. How the recent economic downturn might impact retailers nationally and internationally, and the long-term impact of the changes in consumer behaviour on retailers, are areas worthy of further investigation. It is also worth noting that our respondents were drawn from medium to large size retail organisations and therefore the findings may not apply to smaller retailers. Finally, as previously noted, given the studies focus on retailers in Australia's South East Queensland it is possible that the strategic actions discussed in this paper may in fact be mediated by geographic location if this study was conducted nationally. Despite these limitations, our findings provide retailers with insights as to how investment in corporate social responsible (CSR) practices and using customer relationship management (CRM) to deliver personalised

offerings can be a means of developing competitive advantage in times of economic downturn. Our data suggest that some retailers are already pursuing these strategies, and time will tell if these retailers will exceed competitors in terms of market growth during the recession and beyond.

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Risk management

Insights into Capital Program Audit Effectiveness

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Abstract:
Complex projects and mega-programs tend to experience great volatility, resulting in overspending and significant delays in completion. The need is greater than ever for careful oversight of these endeavors, especially those using public funds. Although audit is the most commonly used oversight method, traditional performance audit techniques and standards are insufficient, providing a mere illusion of adequate administration. The question becomes one of how audit can be improved, and stakeholders satisfied regarding program management, expenditure visibility, and risk.

This paper builds upon previous analyses of project complexity, stakeholder expectations, and obstacles to audit, and advocates an assurance-based approach that focuses on governance, accountability, and risk mitigation as project oversight tools. The approach is grounded in experience, supplemented by empirical research of audit findings from over 600 projects, and is being realized in practical application. This paper will also review more deeply the study population of audit data, providing more insight into audit results and effectiveness.

Elements of the assurance methodology are currently being applied on:

Los Angeles Community College District, Bond program, $5.725 billion

MGM Resorts International-Dubai World, CityCenter Las Vegas, $9.1 billion

Autoridad del Canal de Panama, Third Set of Locks, $5.25 billion

Keywords:
accountability, audit, construction, governance, risk management

1 Introduction

Where owners have more to construct than funds available, or are experiencing cost & schedule overruns, there is often a heightened atmosphere of expenditure awareness. On construction mega-programs, this is the norm rather than the exception. Consequently, stakeholders for both public and private sector construction programs are demanding greater accountability for and transparency of expenditures, and stricter governance.

Audit represents one independent oversight method utilized in construction. However, variability in audit sampling and review techniques, team composition, quality and availability of data, and other factors significantly affect the results produced by the audit. Thus, the effectiveness of audit may be limited as a construction oversight mechanism. Available literature on the topic of construction audit is sparse, and often

designed to teach accountants about the industry of construction instead of providing audit methodology guidance. There is very little published information available for practitioners and / or academics, and next to none for the entities audited. Yet, in order to best define the scope of the audit, phrase a solicitation for services, and select the audit team, auditees need to understand the factors that impact audit results.

The research agenda grew from a suspicion that construction program performance audits were not meeting stakeholder expectations and/or the audit scope did not include the depth and breadth of review promised. This stemmed from the author's significant experience in construction audit and cost/risk management, and discussions with clients and peers. Specifically, the author observed that some audits appeared to be more effective (generate more qualitative findings and/or questioned expenditures) than others, and realized that certain audits conducted did not match the defined scope.

An increase in the number of grand jury investigations of construction projects (per California Penal Code Section 933.5), conducted in response to citizen complaints, corroborated stakeholder concerns about the construction programs, especially when the grand jury surfaced more serious findings than the routine controls errors reported in the performance audits. Similarly, State and City Controller audits of construction projects validated stakeholder complaints, and caused consternation over the quality of audit reports when the supplementary audits resulted in jail time for construction program leaders, findings not discovered by the performance audits. During the course of this dissertation, 'investigations' of publicly-funded construction programs by local newspapers significantly increased, changes in legislation mandated stricter audit administration through the application of audit standards, and pending legislation (if enacted) would mandate transparency of expenditures – these, too, indicated a perceived failure of the existing performance audit mechanism.

However, because the concepts of 'quality' and 'expectations' were subjective and difficult to evaluate, the concerns about audit effectiveness were next elucidated as several specific questions, which could be answered quantitatively:

How does audit scope impact the quantity of audit findings?

If a construction expert is on the audit team, are audit findings affected?

Does the application of audit standards affect audit findings?

Does a higher percentage of tested expenditures yield more findings?

With answers to these questions, a new construction audit methodology could potentially be developed, providing a mechanism for appropriately deep capital program review, which could thus effect better control of capital expenditures and performance. Where stakeholders wish to receive the maximum benefit for monies spent, it is possible that better control of expenditures and performance would satisfactorily address stakeholder expectations and concerns.

2 Literature Review

Published construction audit theory, academic papers, and applied research were difficult to find. Thus, literature review on the topic of construction audit began with the history of audit, including financial audit, and the evolution of performance audit from

financial audit to government evaluation (Waring & Morgan, 2007; Penno, 1990; Newcomer, 1994) and oversight mechanism (Shand & Anand, 1996; Wheat, 1991). This included legislative requirements (Walsh, 1996), sampling theory, compliance (Trodden, 1996), iterative performance cycles (Steel & Van Scotter, 2003), and operational audits (Lane, 1983). The literature provided insight into the typical auditor's skill-set (accounting and financial analysis), systems focus of audits (Glynn, 1996), and the statutory dominance of accounting- and controls- focused auditing (Sloan, 1996).

A review of audit standards (Brown & Craft, 1980) led to questions about their insufficiency (Davis, 1980), and the near absence of performance audit standards (Holmquist & Barklund-Larsson, 1996). The literature review demonstrated that current audit standards created a framework for audit engagement oversight, adding a level of administration in order to improve report and work-paper quality. Yet, none of the standards addressed in depth such issues as auditor skills, sampling, risk, or testing. This gap begged the question of how requiring standards use could result in a 'better' audit.

Building upon the concept of audit as a project management tool, literature review included the application of audit techniques in project management. This included Total Cost Management, PMI's PMBOK, ISO certification, stage gate reviews & PRINCE2 (Huemann, 2004), risk management (Barzelay, 1996; Rikhardsson *et al.*, 2006), program evaluation (Goldenberg, 1983), quality assurance (Bowman, 1994), scenario planning (John *et al.*, 2008), cost reporting (Rasche & Esser, 2006), and value engineering / peer review (Merrow, 1988). The literature confirmed that audit skills were utilized in construction projects (Huemann, 2004), and they translate well when applied as part of other mechanisms. However, although 'risk' was important to stakeholders (Chapman, 2003), there was little formal research available in the intersection between risk, governance, and internal controls (Rikhardsson *et al.*, 2006).

Subsequent literature review covered project governance (Stretton, 2010) and stakeholders (Beach, 2009), in order to put accountability expectations in context. This included stakeholder attitudes toward risk (Chapman, 2003), consequences (Behn, 2002; Roberts, 2002), success (Klakegg, 2009), continuous improvement (Goldenberg, 1983), and resource use (Roth, 1996). The differences between accounting and accountability (Barzelay, 1996; Newcomer, 1994) were studied. Most often associated with performance audit and accountability, the three graces of economy, efficiency, and effectiveness (U.S. Government Accountability Office, 2007) were considered, including procurement performance measures (Kestenbaum & Straight, 1995). The literature surfaced a subtle difference between public accountability and financial accountability (Glynn, 1996), a distinction between systemic and substantive auditing (Trodden, 1996), and a new definition of satisfactory accounting (Barzelay, 1996). Together, these explained the need for both financial audit and performance audit, and supported the notion that the performance audit could reasonably be expected to go 'above and beyond' a mere accounting of expenditures. The process of governance was seen to include accountability and stewardship (Stretton, 2010), where accountability equalled providing justification to stakeholders for actions and omissions and auditing was defined as a process of validating accountability (Rasche & Esser, 2006).

On capital mega-programs, where multiple powerful stakeholders mean overlapping accountability relationships, stakeholder expectations were seen to conflict (Beach, 2009), creating a situation in which a project could simultaneously be both a success and a failure. To understand this, a literature review of construction megaproject theory was necessary. This included understanding project failure (Mian, 2005), cost overruns

(Flyvbjerg, December 2005), schedule slippage (Merrow, 1988), the catch-22 of project planning (Flyvbjerg, Design by Deception: The Politics of Megaproject Approval, 2005; Butts & Linton, 2009), project complexity (Wood & Gidado, 2008), trust in project culture (Zuo & Ma, 2005), and the volatile nature of construction (DeCarlo, 2004; Guo, 2004). The literature showed that cost overruns were common in megaprojects, and that audit was a necessary tool for accountability to stakeholders regarding the expenditure of funds, especially where those entrusted with the funds were expected to do so "legally, effectively, efficiently, economically, ethically, and equitably". (U.S. Government Accountability Office, 2007)

3 Data Population

Because documentation from taxpayer- funded projects were a matter of public record, audit results were obtained easily. With the objective of identifying a homogeneous yet broad data population, the author selected school (K-12) and community college bond-funded construction programs in the State of California (United States of America), in which the Owner-entities were statutorily bound to conduct an annual performance audit. The construction programs represented by the population were unilaterally subject to the same public procurement laws, inspection requirements, State and Federal oversight requirements, and similar taxes and economic conditions.

All agencies audited were also required to publish their audit reports. The publication requirement was not met by all agencies in the State, thus audit reports for some Districts were unavailable at the time of data gathering, even though the audits had been conducted. Not all public agencies abided by the annual audit requirement, and thus audit reports were completely unavailable for other Districts. By gathering the audit reports available at the time, 240 performance audit reports were obtained for meta-analysis along with, for comparison purposes, 378 expenditure audit reports. The data population represented 73 discrete Districts, with audit reports published between the years of 2002 and 2010, and construction programs that varied in size from $4 million to $14 billion in capital improvements. The data population represented $37 billion, nearly half (by U.S. dollar value) of all bond-funded programs in the State of California, which totalled $76 billion at the time the data was gathered.

Some of the audit reports were from the same construction programs, where the audit work represented different years, a different population of expenditures, and audit work performed by different audit firms or audit team members. There was no consistency in the timing of the expenditure audits, as the audits in the population were not statutorily-required. There was consistency in the timing of the performance audits, as all the audits in the population were required to be conducted at fiscal year-end, which for all Districts was during the month of June. The expenditure and performance audits were conducted by many different audit teams and companies. There was little documentation about the composition and calibre of audit teams, in terms of construction industry skill-set and education. It was likely there was also no consistency in the quality of documentation audited. However, it was assumed for this study that the audit firms, project management teams, and construction companies would be consistent in their inconsistency, thus maintaining data homogeneity.

The data to be extracted from the population of audit reports included: audit type, contract type, total expenditures, expenditures tested, expenditures questioned, number of qualitative findings, type of qualitative findings, audit standards applied, total

invoices, number of invoices tested, and construction expert as team member. In the population of 378 expenditure audits, only 114 reported the number of invoices tested, and only 100 reported the number of invoices available. Similarly, in the population of 240 performance audits, only 63 reported the number of invoices tested, and only 10 reported the number of invoices available. This lack of data did not significantly impact the analysis, as the number of invoices tested and available were not key to the primary research questions. However, the auditors failed to provide an accounting of the capital program 'spending to date' in 48 instances, and failed to report the total amount of expenditures tested in 128 instances. Because the audit firms were reluctant and/or unable to provide additional information, these data gaps rendered a portion of the data population useless for the purposes of analysis, and the sheer quantity of missing data called into question the very competence of the audit firms.

4 Previously Published Results

Preliminary review of the available data (618 audit reports) yielded basic univariate statistics, from which preliminary conclusions were formed. The expenditures questioned in the 378 expenditure audits were on average (mean) 2.65% of total expenditures, compared to a mean of 0.02% questioned in the 240 performance audits. These percentages raised questions about the methodology used by audit firms for selection of expenditures to be tested and for expenditure review. It was posited from the questioned cost percentages that, by reviewing both a high percentage of expenditures and high number of invoices in context and in sequence, the auditor could better understand the history of and relationship between expenditures from period to period than could be obtained by reviewing only individual expenditure records, thus leading to an increase in the questioned costs and overall audit effectiveness. (Nalewaik, Systemic Audit and Substantive Evaluation in the Built Environment, 2010)

It was observed that a higher percentage of expenditures was tested in the population of expenditure audits (a mean of 59% tested, compared to 24% tested in performance audits). It was concluded this was likely because the size and scope of the expenditure audits were, by their very nature, limited to disbursements against a single contract (Nalewaik, The Inadequacy of Publicly-Funded Construction Audits, 2011), against which there may have been only dozens of invoices. In contrast, the performance audits were of large construction programs involving multiple projects and thus many contracts and hundreds (if not thousands) of expenditures, where a high percentage of those expenditures could not be tested within the constraints of audit cost and time.

The low percentage of expenditures questioned raised concerns about the calibre of the auditors conducting the work, and their understanding of the construction industry. It was wondered whether questioned costs were especially low where audits were conducted by accounting firms with only certified public accountant (CPA) staff, supporting the notion that advanced skills in accounting and application of financial auditing techniques might not be entirely appropriate for construction audits. Similar observations were made when the California League of Bond Oversight Committees (CALBOC) alleged fraud, deceit and misrepresentation in the profession by certain audit firms licensed by the California Board of Accountancy. CALBOC correspondence stated that "most, if not all, licensees of the board, engaged in the practice of public accountancy, lack the staff and expertise to measure the efficiency, effectiveness and economy of a facilities program. A typical CPA firm does not have experience and expertise in managing a school facilities program. We contend that one cannot judge

and evaluate the performance of processes and systems in which one is not experienced." (California League of Bond Oversight Committees, 2009)

The low percentage of expenditures questioned, for all audits, also raised concerns about the methods used by audit firms to win audit work. "Audit firms routinely promise a certain high percentage of expenditure recovery or a return on investment in multiples of the [audit] fees charged. ... The data in this study...proves auditors' salesmanship belies their ability to generate questioned cost results." (Nalewaik, The Inadequacy of Publicly-Funded Construction Audits, 2011) If stakeholders expected a higher return on their audit investment, they were likely disappointed.

Table 1. Effect of Audit Type on Audit Findings
(Nalewaik, The Need for Assurance in Project Management, 2011)

Audit Findings	Expenditure Audit	Performance Audit
Contract compliance violation	32.01%	1.67%
Excessive or unallowable charges	27.25%	3.75%
Lack of expenditure support	23.28%	0.42%
Incorrect rates charged	16.67%	2.08%
Inadequate controls or accounting	7.41%	10.42%
Incorrect math	1.32%	0.42%
Duplicated scope of work or payment	0.26%	0.83%
Recommendations for program management improvements	0.00%	30.00%

The differences between the categories of findings by audit type, shown in the table above, indicated that audit scope could have an effect on the audit findings, in that certain types of audit might be more suited to questioning expenditures and other types of audit might be better suited to yielding qualitative findings. Further, it was posited that stakeholders were likely unaware of this, and might not have appropriately scoped their construction audits, thus failing to receive expected benefit from the audits.

It was questioned whether the traditional technique of statistical sampling was effective for the performance audits, where the capital program scope necessitated many design, engineering, consultant, procurement, services, and construction contracts. A preliminary conclusion was drawn from the data that "statistical sampling surfaced only routine contract compliance and accounting controls issues" (Nalewaik, Systemic Audit and Substantive Evaluation in the Built Environment, 2010). It was observed that "certain types of high-dollar-value errors were not identified in the population of expenditures, which ... could be very relevant in the management and oversight of capital projects" (Nalewaik, The Inadequacy of Publicly-Funded Construction Audits, 2011). The high incidence of "no issues" reported (128 in the performance audit population, and 164 of the expenditure audits) led to the question of whether a broader audit scope, different audit methodology, or more multifaceted audit team would have yielded more findings or better satisfied stakeholder expectations.

It was noted that the expenditure audits contained no findings related to project / program management improvements. This was likely due to the scope of the expenditure audit; because expenditure audit scope did not include evaluation of performance, the qualitative findings concentrated on contract compliance and controls. Similarly, the heavy concentration of expenditure audit compliance- and controls-related qualitative findings may have occurred "because certain contracts [may] have been judgmentally (not randomly) selected by the Districts for expenditure audit due to

concerns about the propriety of expenditures or contract performance" (Nalewaik, The Inadequacy of Publicly-Funded Construction Audits, 2011).

The data population was comprised entirely of audit reports from school districts and community colleges in California, which issued General Obligation Bonds for construction. All the agencies were required by California State Proposition 39 and Assembly Bill 1908 (AB1908, State of California Education Code, Sections 15278 et seq.) "to ensure voters will be given a list of specific projects their bond money will be used for ... and to ensure that the proceeds from the sale of school facilities bonds are used for specified school facilities projects only, and not for teacher and administrator salaries and other school operating expenses, by requiring an annual, independent performance audit to ensure that the funds have been expended on specific projects only." (The Office of the Secretary of State of California, 2000) A high percentage of the performance audits (195, or 81% of the population) self-identified in their audit reports as 'agreed-upon procedures' (AUP) audits. The scopes of these audits were designed solely to meet the statutory requirements. "The procedures for the audit involved validating funds were expended for approved projects, with no detailed review of expenditures. Thus, 164 (68%) of the audits reported no exceptions were found with Proposition 39 compliance." (Nalewaik, The Inadequacy of Publicly-Funded Construction Audits, 2011) However, Proposition 39 also explicitly stated its primary objective is to "ensure accountability so that funds are spent prudently" (The Office of the Secretary of State of California, 2000). Referencing the literature review, by specifically requiring a 'performance' audit, Proposition 39 evoked the traditional definition of performance audit and implied an assessment of accountability. The CALBOC documentation likewise stated the "AICPA [American Institute of Certified Public Accountants] expects a performance audit to offer much more than a review of the agreed upon procedures [and] the California State Controller's Office has concluded that an 'agreed upon procedures review' does not constitute a performance audit." (California League of Bond Oversight Committees, 2009) From the data, a preliminary conclusion was drawn that the prevalence of extremely-limited-scope AUP audits indicated a desire on the part of the Districts to adhere to the letter but not the intent of the law, thus satisfying regulatory audit requirements at the lowest possible cost.

5 New Findings and Discussion

By culling the audit reports to include only those containing all necessary data, the population was reduced to 467 audit reports (357 expenditure and 110 performance audits). Five audit reports were added to the population, from public and private sector construction projects on which a different audit methodology was applied.

The 'new' risk-based methodology used for the five new audit reports involved testing a high percentage of expenditures (greater than 50%, in context and in sequence), including construction experts on the audit team, and auditing contracts and / or projects by judgmentally selecting those representing an element of organizational risk. This method redefined audit by substantially broadening its definition to include any activity that consumed project resources. The mechanism was designed to improve the audit process for expenditure and performnace audits, while also enabling 'audits' (deep analysis, using rigorous audit methods) of non-traditional audit areas such as: scheduling, design, policies and procedures, and program management.

On whole, the results from the redacted population yielded slightly different statistics but were very similar to those from the originally published findings. The data population yielded the following descriptive statistics:

The expenditures questioned in the expenditure audits were on average (mean) 7.21% of the total expenditures, compared to a mean of 0.08% questioned in the performance audits, and a mean of 44.65% in the risk-based audits.

The highest percentage of expenditures were tested in the population of risk-based audits: 100% of expenditures were tested for the risk-based audits, compared to 77.79% tested in expenditure audits and 66.03% tested in performance audits.

Of the performance audits, 76.36% were conducted as agreed-upon-procedure audits, of which 86.71% (72 of 84) reported no findings and no questioned costs.

From a correlation matrix and other data, the following was concluded:

Expenditure audits did not test a mixed group of expenditures. They tested either construction payment applications, or non-construction invoices. This was likely because such audits often tested a contract instead of a project, on which the sample type would be mutually exclusive.

Many of the performance audits followed an agreed-upon-procedures method, in which questioned costs and qualitative findings were rare. Most of the performance audits tested a mixed population of both construction and non-construction expenditures. This was likely because the performance audits typically reviewed a sampling of all expenditures on a construction program, not just a contract.

The newly-added population of risk-based audits included construction experts on the audit team, tested a consistently higher percentage of expenditures yielded significantly more questioned costs than other audit methods evaluated, and were not conducted according to specific audit standards.

Where performance or expenditure audit scope was expanded to include qualitative review, there were often construction experts on the audit team, more qualitative findings (than other audit types) were generated, and the engagement was often conducted according to consulting standards.

When construction experts were on the audit team, a higher dollar amount was tested (than other audit team configurations). This was likely related to correlation between dollar amount tested and audit type, and is not a significant correlation. Where a construction expert was on the audit team, more qualitative findings were generated.

In the full data population, the dollar amount of expenditures tested was higher when there was a mix of construction and non-construction expenditures. Corollary 1: Performance audits tested a higher dollar amount (not percentage) than expenditure audits. Corollary 2: Where the total expenditure population was high, the total amount tested was likewise high. This was likely because the performance audits typically reviewed an entire construction program, and the total expended on a program would be much higher than that on a single contract or project.

Where a higher number of invoices were tested, more qualitative findings were generated. This may have occurred if the auditors gained greater understanding and identified trends by reviewing more invoices.

6 Conclusion and Further Research

Although audit is one of the independent third-party construction oversight mechanisms most often requested by governing boards and Chief Financial Officers (CFO), various factors significantly affect audit results and traditional audit techniques might not be effective in certain industries where expenditure interrelationships, context, and sequence are meaningful and provide necessary information. Available literature on the topic of construction audit is scarce. In order to best satisfy stakeholders, auditees need to understand the factors that impact audit results and use that understanding to appropriate scope and guide their construction program audits.

This research reviewed over 600 audit reports, and answered the research questions:

Does audit type affect the number of qualitative and quantitative findings? Yes.

Does the risk-based audit yield significantly more quantitative findings? Yes.

Do performance audits classified as agreed-upon procedures yield fewer qualitative and quantitative findings? Yes.

Do performance audits with a broader scope yield more findings? Yes, they yield more qualitative findings.

Is the type of findings (qualitative, quantitative) affected by the type of contract audited? No.

If construction professionals are on the team, does the audit yield more findings? Yes, they yield significantly more qualitative findings, and slightly more quantitative findings.

- If GAGAS standards are applied, are there more qualitative or quantitative findings? No.

Does a higher percentage (of expenditures or invoices) tested yield more qualitative or quantitative findings? More qualitative findings, yes, with a higher number of invoices tested.

The next stages of the review will include further statistical analysis and contextual insights drawn from the correlations, cross-tabulations, histograms, and more. The author has concerns about developing a predictive model, as the model could be used to generate false confidence of certain audit scopes yielding more findings.

This research does have implications for industry, both audit and construction, and as such the author recommends further study in the following specific areas:

In order to better understand stakeholder expectations, a survey should be conducted to identify stakeholders, and qualify both their expectations (audit 'success') and their level of audit awareness. For the purposes of this dissertation, consideration of stakeholders was limited to the tax-paying public, District governing boards, and

government agencies. This selection was based on the perceived level of stakeholders' influence and urgency, as evidenced by vehement insistent outcry and subsequent impact. Further study will yield more information about these and other stakeholder groups.

An assumption was made that audit firms, project management firms, and construction companies would be consistent in their inconsistency, thus maintaining a homogeneity in the data population. Further qualitative study of the composition and calibre of audit teams (in terms of leadership, experience, education, and construction industry expertise) could have an impact on the discipline of construction audit. Specifically, much deeper review is needed of the correlation between experts and audit effectiveness.

The risk-based audit method is not likely to supercede traditional statutorily-required audits, but could supplement them. Although the risk-based audit data for this study included both audits of contracts and specific expenditure categories, the audits yielded both qualitative and quantitative findings. This methodology considerably redefines audit by substantially broadening its definition to include any activity that consumes project resources. More study of the method is needed to understand its potential profound impact.

Opportunities need to be explored for including audit as part of standard quantity surveyor, project management, and cost engineering academic curricula.

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An Appraisal Of Risks Associated With Contractor's Cash Flow And Their Impacts On Project Delivery In Nigeria

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Abstract:
The successful completion of a construction project within the budgeted cost, on schedule and to desirable quality standard depends on adequate management of the risks associated with the cash flow during the project life cycle. This paper identifies the key risks influencing the contractor's cash flow in Nigeria and appraises their impact on the delivery of construction projects in Nigeria. The identified risks were prioritised according to their significance of influence on contractor's cash flow. The data for this research were collected by means of questionnaire surveys, based on which 33 key risks were collated. The strategies for managing the risks were sought from the perspectives of project stakeholders and external forces. It is concluded that majority of the identified risks were mainly related to the design team, contractors and government policy/ agency, while the 2 top ranked risks namely poor funding and delay payments were related to the clients. The study recommends that project stakeholders should work cooperatively from inception to commissioning in order minimize construction risks and ensure value for money invested.

Keywords:
contractor's cash flow, project delivery, risks, risk management, stakeholders

1 Introduction

Risks occur in the construction projects because they are one-off activities with, many unique features, such as financial intensity, complicated processes, abnormal environment and changing organisation structures. (Wikipedia, 2010) asserts that risks are simply future issues that can be avoided or mitigated rather than present problems that must be immediately addressed. They concluded that there are different types of risks, but the risks associated construction projects are financial risks which are unexpected variability or volatility of returns.

(Kwakwye, 1997) described risks as an unwanted negative consequence of an event of which the possible outcome can be identified, predicted and quantified. (Smith, 1999) opined that while risks cannot be eliminated, successful projects are those where risks are effectively identified, analysed and managed. (Odeyinka and Lowe, 2002) asserts that financial management has long been recognised as an important management tool and that proper cash flow management is crucial to the survival of a construction company, because cash is the most important corporate resources for its daily activities. They concluded that an accurate forecast of construction cash flow has been a difficult issue due to risks and uncertainties inherent in construction projects.

This paper first presents a critical literature review of risks associated with construction projects cash flow and then identifies the key risks influencing the contractor's cash flow and assessed their impacts on project delivery in the Nigerian construction industry with the aid of a questionnaire surveys and develop strategies for managing them.

2 Literature Review

2.1 An Overview of Contractor's Cash Flow

The successful completion of a construction project within the budgeted cost and time depends on adequate management of the risks associated the cash flow during the project life cycle. (Akindoyemi, 1988) opined that lack of adequate financial planning by the two parties to a contract has in the past led to poor cash flow. He concluded that this in effect has adverse effects on the Nigerian construction industry and thus contributed to the abandonment of projects across the country.

(Navon, 1995) asserted that proper cash flow management is important as a means to obtain loans, as banks and other money lending institutions are normally much more inclined to lend money to companies that can present periodic cash flow forecasts. The contractor's cash flow in the construction industry is basically the revenue and costs. Lowe and (Whiteworth, 1996) opined that most revenue of the contractor's is variable and hence is determined by progress on site. They explained further that risk will occur if the valuations do not match the outgoing or if the certificates are not honoured within the stipulated time. They concluded that risk will also occur if there was a lot of cash tied up in a long time to settle by the client.

2.2 The Importance of Risk Management Research in the Nigerian Construction Industry

Although many researchers have worked on cash flow in construction industry; take for instance, on the international scene, (Lowe, 1987) used simulation approached to predict cash flow of building client. (Lowe and Lowe, 1987) also examine the cash flow of construction clients in general. (Odeyinka, 2003) developed and validates models for assessing risk impacts on construction cash flow forecast. With all these efforts, there is still a need to commit more efforts in both research and practice to systematically identify and management risks associated with contractor's cash flow in Nigeria. This suggestion does not refute many researchers' contribution in a particular aspect of cash flow management in Nigerian Construction Industry such as (Ogunsemi, 1991) cash flow forecast as a tool for reducing project abandonment in Nigeria, (Onukwube, 2005) cash flow and financial management in some selected Nigerian Construction firms and others.

The overseas research and experience can contribute to the management of risks associated with contractor's cash flow in Nigeria. However, the unique cultural, environmental economic and political background in Nigeria and lack of advanced technology and management technique in the Nigerian construction industry, there is a need for research in this area, which is the main focus of this paper.

2.3 Risks versus Cash Flow

According to (Akintoye and Macleod, 1997) financial risk to contractor includes whether the building owner has enough money to complete the project (cash flow). They concluded that the contractor is concerned about availability of money in a

suitable manner and time to enable him progress with the work and complete it at scheduled time. (Flanagan and Norman, 1993) asserted that the environment within which decision making takes place can be divided into three parts: certainty, risk and uncertainty. They concluded that certainty does not happen very often in the construction industry.

(Kaka, 1996) identified risk factors affecting cash flow profiles to include estimating error, tendering strategies, cost variances and duration overrun. (Khosrowshahi, 2000) also identified other risk factors that impact on cash flow to include delay payment and difficulty in obtaining the right amount of fund at reasonable interest rates. (Patrick *et al*., 2007) identified risks associated with project cost overrun as an important aspect of cash flow to include inaccurate cost budgeting, price escalation of material and labour, non-availability of material, supplier/ subcontractors' default; unpredictable weather, fluctuation in currency, excessive interface on project management, political instability and corruption.

3 Research Methodology

This paper aims to study risks associated with contractor's cash flow in Nigerian construction industry. The research methodology used comprised of comprehensive literature review, distribution of questionnaire to construction industry practitioners. The survey data were analysed using relative importance index. The risks were sourced from a wide range of literature including journal paper as well as those books that are specifically related to Nigerian construction industry. The questionnaire consisted of two sections. The first section solicited general information about the respondents; The second section contained a total of 70 risks associated with construction projects and asked the respondents to review and indicate the likelihood of occurrence of these risks as highly likely, likely or less likely and the magnitude of consequence on project performance in term of time, cost, quality, safety, environmental sustainability and contractor's cash flow. Some of the projects detailed that were used in the analysis are shown in table 1 below.

Table 1: Respondents Profiles
(Source: Authors survey, 2011)

Experience	**%**	**Position**	**%**	**Educational Qualification**	**%**
0-5 years	1.5	Foreman	12.0	Trade Test	2.0
5-10 years	2.5	General Foreman	15.0	H. N. D.	5.0
10-15 years	30.0	Site Supervisor	4.0	B Sc.	35.0
More than 15 years	64.0	Management Cadre	69.0	Higher Degree	58.0
Total	**100**		**100**		**100**

A pilot survey was carried out to test and verify the risk list with a few industry experts. The survey questionnaire was redesigned based on the pilot survey feedbacks. It is believed that the 70 risks listed in the survey are comprehensive to represent all risks that might affect contractor's cash flow in Nigeria. The 33 risks identified were categorised into six groups as presented by (Patrick *et al*., 2007), with three related to clients, nine related to consultants, nine related to contractors, two related to subcontractor/suppliers, five related to government agencies and five related to external factors (that is economic circumstance, physical working and social environments).

The questionnaires were distributed to 120 practitioners in Nigeria and 98 responses were received. This represents about 82% response rate. The respondents had an

average of 14 years working experience and about 69% of them are in senior management position, 98% have higher education and are professionally qualified. Therefore, this background information regarding the respondents indicated that responses provide by them could be relied upon for this research.

4 Data Analysis and Results

The purpose of this investigation is not only to generate a list of risks, but to identify the key risks that can significantly influence the contractor's cash flow and affect the delivery of construction projects. The risks explored in the survey included a large number of factors, choosing the top 10 ranked ones (out of 33 identified risks factors) are assumed as an appropriate way to represent the key risks as used in similar research by (Patrick *et al*.,2007). The result of ranking is shown in table 2 below:

Table 2: Significance of risks on contractor's cash flow
(Source: Authors survey, 2011)

Key risks	RII	Ranking
Poor funding client	0.8197	1
Delays in payment from client	0.8086	2
Delay in agreeing valuation/day work	0.8004	3
Delay in receiving interim certificates	0.7991	4
Agreeing interim valuation on site	0.7902	5
Contractor's poor management ability	0.7806	6
Inability to employ qualified professionals	0.7800	7
Poor competency of labourer	0.6902	8
Delay payment by commercial Banks	0.6888	9
Delay in settling claims	0.6708	10
Variation by client	0.6678	11
Price inflation of construction materials	0.6602	12
Contractor's difficulty in reimbursement of Subcontractors/Supplier	0.6500	13
Inadequate safety measures during operations on site	0.6400	14
Lack of readily available utilities on site	0.6378	15
Unsuitable construction programme planning	0.6200	16
Inadequate site information (soil test and survey report)	0.6180	17
Design variations	0.6000	18

Table 2: Significance of risks on contractor's cash flow – cont'd.

Key risks	RII	Ranking
Bureaucracy of Government	0.5800	19
Change of Government	0.5200	20
Delay in release of retention	0.4802	21
Poor interpersonal relationship among the Professionals	0.4202	22
Suppliers in competency to delivery of materials on time	0.4106	23
Unavailability of sufficient amount of skilled labour	0.4100	24
Imposition of subcontractors/suppliers on construction site	0.3806	25
Change in currency exchange rates	0.3776	26
Change in interest rates	0.3668	27
Inclement weather, strikes, war e.t.c.	0.3507	28
Kidnapping of construction workers	0.3486	29
Problem of foundation	0.3342	30

Imposition off labourers on construction site	0.3232	31
Inaccurate cost estimate	0.3000	32
Low management competency of subcontractor	0.2826	33

From the table 2 above, the main risk variables with high extent of occurrence are poor funding by client, delay in payments from client, delay in agreeing variation/day work, delay in receiving interim certificates, agreeing interim valuation on site, contractor poor management ability, inability to employed qualified professionals, poor competency of labourer, delay payment by commercial banks and delay in settling claims. The statistical results shown in table 3 disclose the relationship between the category of risks and the 33 key risks identified. This was based on a categorization by (Patrick *et al*., 2007) in a similar research in China.

Table 3: The categorisation of the 33 identified key risks.
(Source: Authors survey, 2011)

Category of risks	The 33 identified keys risks	with significant impact on				
		Cost	Time	Qtly.	Safety	Environment
Risks related to Clients	Tight project schedule,	✓	✓	✓	✓	✓
	Delay in payment from client,	✓	✓	✓	✓	✓
	Variation by clients,	✓	✓			
Risks related to Design Team	Delay in agreeing Variation /Day work,	✓	✓	✓		
	Delay in receiving interim certificates,	✓	✓			
	Agreeing interim Valuation on site,	✓	✓			
	Delay in settling claims,	✓	✓			
	Inadequate site Information (soil test and report),	✓	✓	✓		
	Design variations,	✓	✓			
	Delay in release of retention,	✓	✓			
	Poor interpersonal relationship among Design Team,	✓	✓	✓		
	Inaccurate cost estimate.	✓	✓	✓		
Risks related to Contractors	Poor competency of labourer,	✓	✓	✓	✓	✓
	Contractor poor management ability,	✓	✓	✓	✓	✓
	Inability to employ qualified professionals,	✓	✓	✓	✓	✓
	Unstable construction programme planning,	✓	✓	✓		
	Unavailability of sufficient number of skilled labourer,	✓	✓	✓	✓	✓
	Problem of foundation	✓	✓	✓		
	Contractor's difficulty in Reimbursement of subcontractors/suppliers,	✓	✓			
	Inadequate safety measures during operations on site,	✓	✓		✓	
	Lack of readily available utilities on site,	✓	✓		✓	
Risks related to Subcontractors /Suppliers	Suppliers incompetence to delivery of material on time,	✓				
	Low management competency of subcontractors,			✓		
Risks related to Government Policy/Agency	Delay payments by commercial					

	Banks,	✓	✓	
	Bureaucracy of Government,	✓	✓	
	Change of Government,	✓	✓	
	Change in currency exchange rates	✓		
	Change in interest rates.	✓		
Risks related to External Forces	Price inflation of construction materials,	✓		
	Imposition of suppliers/ Subcontractors on construction site,	✓	✓	✓
	Inclement weather, strikes, war e.t.c,	✓	✓	
	Kidnapping of construction workers,	✓	✓	
	Imposition of labourers on construction site.	✓	✓	✓

From statistical table 3 above majority of the 33 risks are related to the design team and the contractors, compared with less risk related to government agencies and external forces, while much less risks are related to the clients and subcontractor/ suppliers. This means that a large portion of the risks investigated originated from the design team and contractors. This is so because majority of the contractors in Nigerian construction industry are indigenous contractor who does not take risk mitigation into consideration and lack advanced managerial competency. The design team on the other hand consider most of their contractual obligations as responsibility to the client and not to the contractor. They believe that they are the boss to the contractor and that they can treat the contractor like their subordinate.

In addition, table 3 presents the relationship between category of risks and the project performance objectives. The distribution of the risk in table 3 shows that risk related to clients, contractors can influence all the five project delivery parameters while the risk related to design team, subcontractors, suppliers, government policy/ agency and external forces can influence part of the project performance objectives.

5 Discussion of Findings

To further reinforced the importance of different project stakeholders on the successful delivery of construction projects, an in-depth discussion on the risks factors relating to each stakeholders are presented as follows:

5.1 Risks related to Clients

Two risk factors related to the clients were identified with significant influence on all the project performance objectives while the third ‘variation by clients’ was found to have significant impact on cost and time. A thorough examination of the three risks factors in table 2 shows that they were ranked first, second and eleventh. This indicates that the client can influence the contractor’s cash flow and project delivery objectives maximally.

5.2 Risk related to Design Team

In all nine risk factors were related to the design team, four of it were ascertained to have significant influence on cost, time and quality of the project while the remaining five risk factors significantly influences the project cost and time. A careful look at table 2 shows that four of the risk factors were ranked among the top 10 while the second four risks factors were ranked among the first 20 and the last one ranked 32nd. Therefore, the design team play an important role in determining the contractor’s cash flow and also influence the project delivery objectives greatly.

5.3 Risk related to Contractor

Nine risk factors were related to the contractors, four of the risk factors were acknowledged to have extensive influences on all the project performance objectives while two were found to have significant impact on cost, time and quality. Another two risk factors were found to have substantial influences on cost, time and safety while the last risk factor was identified to have influence on cost and time. A detailed examination of table 2 indicates that the first two risks were ranked among the top 10, while the next four were ranked between 11 and 20 factors. The remaining three factors were between 21 and 30. This shows that the contractor have major influence on the cash flow and the project delivery objectives.

5.4 Risk related to Subcontractors/Suppliers

The two risk factors related to the subcontractors/suppliers were ascertained to have significant influence on the time and quality of the project. A close examination of the two risk factors shows that they were ranked between 21 and 30 respectively in the table 2, this imply that they may have influence on the contractor's cash flow and project delivery objectives.

5.5 Risk related to Government Policies/Agencies

Five risk factors were related to government policies and agencies. Three of these factors have extensive influences on cost and time while the remaining two risk factors were found to have significant influence on cost. A thorough examination of table 2 indicates that the first risk was ranked 9^{th}, while the next two were ranked 19^{th} and 20^{th} in table 2. The remaining two risk factors were ranked 26^{th} and 27^{th}. This implies that the Government being the major initiator of capital projects in Nigeria have great influence on contractor's cash flow and project delivery objectives.

5.6 Risk related to External Forces

Five risk factors were related to external forces. Two of the risk factors were acknowledged to have significant influence on cost, time and quality while another two risk factors were found to have extensive influences on cost and time. The last risk factor was found to have influence on cost of the project. A detailed examination of the risk factors in table 2 indicates that the first was ranked 12^{th}, while the remaining four were ranked between 25^{th} and 31^{st}. Two of the risk factors in this group 'Price inflation of construction materials and inclement weather, strikes, war e.t.c are not directly related to a particular project stakeholder, but global and environmental risks respectively.

Table 4: Comparison of key risks identified in two parallel surveys in Nigeria and China.

Category of risks	Key risks associated with construction projects	
	Key risk identified in China Survey	Key risk identified in Nigeria Survey
Risks related to Clients	Tight project schedule, Project funding problems, Variations by the client,	Tight project schedule, Delay in payment from client, Variation by clients,
Risks related to Design Team	Design variations, Inadequate program scheduling, Inadequate site Information (soil test and survey report), Incomplete or inaccurate cost estimate,	Delay in agreeing Variation /Day work, Delay in receiving interim certificates, Agreeing interim Valuation on site, Delay in settling claims, Inadequate site Information (soil test and report), Design variations, Delay in release of retention, Poor interpersonal relationship among Consultants, Inaccurate cost estimate.
Risks related to Contractors	Contractors' poor management ability Contractor's difficulty in reimbursement, Poor competency of labourer, Unavailability of sufficient professionals and managers, Without buying safety insurance for employees, Inadequate safety measures or unsafe operations, Lack of readily available utilities on site, Unavailability of sufficient amount of skilled labourers, Prosecution due to unlawful disposal of construction waste, Serious air pollution due to construction activities, Serious noise pollution caused by construction, Water pollution caused by construction,	Poor competency of labourer, Contractor's poor management ability, Inability to employ qualified professionals, Unstable construction programme planning, Unavailability of sufficient number of skilled labourer, Problem of foundation Contractor's difficulty in reimbursement of subcontractors/suppliers, Inadequate safety measures during operations on site, Lack of readily available utilities on site,
Risks related to Subcontractors/Suppliers	Low management competency of subcontractors, Suppliers incompetence to delivery of material on time,	Suppliers incompetence to delivery of material on time, Low management competency of subcontractors,
Risks related to Government Policy/ Agency	Excessive procedures of government approvals, Bureaucracy of government,	Delay payments by commercial Banks, Bureaucracy of government, Change of Government,

Risks related to External Forces	Price inflation of construction materials,	Change in currency exchange rates, Change in interest rates. Price inflation of construction materials, Imposition of suppliers/Subcontractors on construction site, Inclement weather, strikes, war e.t.c, Kidnapping of construction workers, Imposition of labourers on construction site.

(Patrick *et al.,* 2007) conducted a parallel survey using a similar question to explore Chinese construction industry practitioners' perception with regard to risks associated with construction projects in China. Table 4 above was used to compare the summary of the result of the two surveys conducted.

From table 4, a large portion of the identified risks associated with construction projects in Nigeria and China are equivalent. For example, all the risks related to the clients and subcontractors/suppliers are the same, while parts of the risks related to design team, contractors, government policy/agencies and external forces are the same.

A careful look at table 4 shows that more risks related to design team, government policy/agencies and external forces were identified in Nigeria. This indicates that construction activities in Nigeria are exposed to more problems than in China.

6 Conclusion

Risks management has been recognised as an important process in order to achieve adequate cash flow in construction projects. In this research a total of 33 key risks were identified and ascertained to have significant influence on the Contractor's cash flow in Nigeria and the project performance objectives. These risks were compared with the findings of a parallel survey in China to ascertain the generic risks in both countries and highlight the unique risks associated with Nigerian construction projects. The unique risks include delay in agreeing variation, day works and valuation, delay in receiving interim certificates, delay in settling claims and release of retention, poor interpersonal relationship among the design team, problem of foundation, delay payment by commercial Banks, change of government, currency exchange rates and interest rates, imposition of suppliers, subcontractors and labourers on construction sites, inclement weather and kidnapping of construction workers. It is these unique risks that result in contractor's cost and time overrun and in some cases projects abandonment in Nigeria.

An initial analysis using relative important index showed that the main risks variables influencing the Contractor's cash flow in Nigeria are poor funding by client, delay in payments from client, delay in agreeing variation/day work, delay in receiving interim certificates, agreeing interim valuation on site, contractor's poor management ability, inability to employ qualified Professionals, poor competency of labourer, delay payment by commercial Banks and delay in settling claims. A further analysis of identified risks found that they are mainly related to design team and the contractors, followed by government policy/agency, external forces, clients and subcontractors/suppliers.

Although only 3 risk factors were related to the clients, they are crucial to the regular cash flow of the contractors.

7 Recommendation

The recommendations were based on the research findings and the author field experience. The recommendations were also based on appropriate strategies to be taken by stakeholders in managing their relevant risks as indicated below:

7.1 Managing risks related to Clients

The clients should minimize the risks related to it by preparing fund disbursement plan that will ensure prompt release of fund as at when due and secure a standby source of finance that would accommodate any unforeseen expenditure during operation on site.

7.2 Managing risks related to the Design Team

The design team should arrange comprehensive site investigation to obtain reliable design data and keep design within the client's capability. They should establish an efficient communication scheme that would improve their inter-personal relationship.

7.3 Managing risks related to the Contractors

The contractors should stop subletting their labour works and employ labour on permanent basis, so as to have control over their competency.

The contractor should map out sufficient construction strategies and ensure that utilities and safety equipment are always ready for use on site.

7.4 Managing risks related to the Subcontractors/Suppliers

The subcontractors should improve their management skills and competency through constant professional training while the appointment of supplier should be based on sound investigation of their credit witness and ability to fulfil the contract of supplying the required materials on time.

7.5 Managing risks related to Government Policy/ Agency

All government agencies should make more effort to create a friendly working environment that would reduce approval procedures, minimize corruptions and bureaucracy. The commercial Banks should ensure prompt release of cash advance payment to the contractors to enable them procure materials in advance and guide against fluctuation claim. Whenever there is change in the leadership of government at all the three ties of Government the new head should continue all ongoing viable projects rather than commencing new projects.

7.6 Managing risks related to the External forces

The youth in the coastal line area should be oriented and integrated into Nigerian society, so as to reduce the incidence of kidnapping of construction workers, imposition of subcontractors/suppliers and labourers on construction sites.

All contracting organisations, such as owners, design team, contractors, sub-contractors, suppliers, government agencies, e.t.c. should have formal risk management process to mitigate all types of risks allocated to them. Finally, the Contractors who are the main

source of risks should employ professionals within their organisations who will assist them in managing risks throughout projects life cycle.

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The adaptive capacity of hospital facilities to cope with the risk of disasters caused by extreme weather events: a case study approach

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Abstract:
A three-year study is currently being conducted to determine the adaptive capacity of hospitals in Australia and New Zealand to cope with climate change-related extreme weather events. The primary objective of this research is to develop strategies that can be employed to improve the resilience of hospital facilities to these events. A case study approach was adopted to collect data through focus groups comprising participants who had experienced extreme weather events. Using risk and opportunity management methods, focus group workshop sessions were used as a structured approach to identify, assess and control the risks and opportunities associated with an extreme weather event scenario. The research findings indicate that there is considerable scope for clinical and non-clinical staff to work cooperatively in developing preventative as well as response and recovery strategies. The findings reinforce the view that the relationship between building users and building facilities needs to operate in an integrated fashion if any adaptive strategy is to be effective. This raises interesting governance issues which will be explored in future research.

Keywords:
adaptive capacity, case study, hospitals, opportunity, risk

1 Introduction

In recent years there has been an accumulation of evidence pointing to links between climate change and extreme weather events (Hennessy et al., 2007; Steffen, Love, & Whetton, 2006; Stern, 2009). For Australia and New Zealand, this is likely to manifest itself as more frequent and severe heatwaves, floods and storms (Australian Greenhouse Office, 2006; Hennessy et al., 2007; Preston & Jones, 2005). Extreme weather events are caused when an individual climate variable such as temperature or rainfall "exceeds a particular threshold and deviates significantly from mean climate conditions or when there is a critical combination of different variables" (Linnenluecke & Griffiths, 2010, p. 2). This can occur either when climatic conditions fluctuate much more than normal, thus resulting in a severe weather event, or when the event falls outside the normal climatic season, such as a flood occurring during a normally dry season. Due to the unpredictability and impact of these events, they pose significant risk to society at large, and place strain on critical infrastructure. The health sector is especially vulnerable to natural disasters (PAHO/WHO, 2004) and the capability of hospitals to carry out their

vital roles during and immediately after an extreme weather event is paramount to the success of the wider recovery process. While new hospitals are relatively resilient to external forces, existing building stock would benefit from the application of adaptation strategies to improve their resilience (Australian Greenhouse Office, 2007). The aim of this research is to identify what actions can be employed by hospital management, both clinical and facilities, to enable the continuity of health care during an extreme weather event.

Whilst the impact of climate change on healthcare delivery is currently the focus of considerable research (Bonnett et al., 2007; Lalonde, 2007; McCaughrin & Mattammal, 2003), physical healthcare infrastructure has been relatively neglected. The importance of addressing this deficiency was acknowledged by the Australian Science Engineering and Innovation Council (PMSEIC Independent Working Group, 2007) and by the Council of Australian Governments (2007) when they recommended that Australian governments should give priority to developing climate change adaptation strategies for Australia's health infrastructure. Given the age of Australian and New Zealand healthcare infrastructure, they recognised that extreme weather events are likely to create increasingly challenging physical and patient-related demands which were not envisaged in original hospital designs. Hence it is important to undertake research which focuses on the interplay between health service providers and designers, constructors and managers of hospital facilities.

The research method adopted was a multiple case study approach employing in-depth focus group workshops. The case study approach yielded successful outcomes with the focus group sessions identifying a detailed range of controls that could be employed to mitigate risks and also opportunities for the development of adaptive strategies. There was general agreement amongst workshop participants that the exploration of risk and opportunity profiles which marked the culmination of this stage of the project was of both conceptual and practical use in the management of hospitals particularly during and after an extreme weather event.

2 Research agenda

The research project commenced in June 2009 and comprises three stages viz.

- Stage 1 - vulnerability analysis
- Stage 2 - adaptive capacity analysis
- Stage 3 - development of adaptive strategies

A case study approach was used for Stages 1 and 2 with the same case study hospitals being used for both stages. Stages 1 and 2 of the project have now been completed and Stage 3 has recently commenced. The results from Stage 1 are discussed in previous publications (Carthey, Loosemore, Chandra, & Chand, 2010; Loosemore, Carthey, Chandra, & Chand, 2011); the topic of this paper is the Stage 2 results.

3 Research Methodology

The case study approach deployed for Stages 1 and 2 is widely accepted as a useful tool for studying organisational responses to crisis and for developing theory inductively by recognizing patterns of relationships across cases (Loosemore & Hughes, 2001). This is important because understanding the operation of hospitals requires more than a simple appreciation of building related issues given that a hospital is a complex organisation

with many diverse stakeholders and functions. Responses to extreme weather events are similarly complex and involve an interplay of many economic, social, organisational, political and cultural considerations which can only be explored fully using a case study approach (Yin, 2009). A broader approach, such as a survey or questionnaire may have failed to provide the depth of insight needed to understand the social and organisational complexity of the adaptive system in responding to an extreme weather event.

3.1 Description of Case Studies

Three major referral hospitals were chosen in close consultation with partner health services in Australia and New Zealand. The case studies were selected based on their size and age, population dependency, historical climatic records and future climatic predictions. The three case studies comprised Coffs Harbour Base Hospital; Whangarei Hospital; and Ceduna District Health Services. Each of these facilities had previously been subjected flash floods, floods caused by storm surges and heatwaves respectively.

3.2 Description of Case Studies

3.3 Coffs Harbour Base Hospital

Situated on the mid North Coast of NSW, Coffs Harbour Base Hospital is the largest hospital in the North Coast Area. It serves a population of 100,000, an estimated 68,000 of which resides in Coffs Harbour city. Coffs Harbour is a humid, sub-tropical area with an average annual rainfall of 1,700mm (Coffs Harbour City Council, 2009). Flooding and storms are relatively common, although its intensity has increased dramatically in recent years, with the region experiencing six major flooding events in 2009 alone. Whilst Coffs Harbour Base Hospital is relatively new, being operational only since 2001, the hospital suffers from its location adjacent to a creek and on a flood plain, and the area around the hospital is one of the first in town to be inundated in a flooding event.

3.4 Whangarei Hospital

Whangarei Hospital serves a district of 78,000 and is located in the North Island of New Zealand in the Northland area which has a population of approximately 155,000 people. The hospital building is situated on a hill, and accessed by only one road which can be cut off during floods and storms. A major renovation was undertaken in 2001, but many of the buildings date from the 1950s-1960s or even earlier. The NZ Ministry for the Environment (2009) warns that due to climate change, Northland's temperature is expected to rise by 3^{o}C over the next century and the frequency of floods could increase fourfold by 2090. Specifically, summer and autumn tropical storms may bring an increase in the intensity of extreme rainfall causing severe flooding to the hospital and surrounding areas (Ministry for the Environment, 2008).

3.5 Ceduna District Health Services

Ceduna is located in the remote northwest corner of the Eyre Peninsula, South Australia and is approximately 10 hours by road from Adelaide. Out of its small population of 3,731, 25.5% of the population in 2006 identified themselves as indigenous i.e. of Aboriginal or Torres Strait Islander origin (Australian Bureau of Statistics, 2010). Located within an arid zone, the town is exposed to hot, dry summers with limited rainfall, during which time the daytime temperatures can reach up to 47^{o}C for a week or longer. In early 2009, when Adelaide reported up to 6 days over 40^{o}C - some of the

hottest days recorded in the region for more than 70 years - Ceduna recorded a temperature of 46.2^{o}C (ABC News, 2009).

Ceduna District Health Services offers a mix of 25 acute care beds and 10 beds for high level aged care, with a further 29 beds for low level aged care located on another site (Country Health SA, 2009). A major upgrade of the health service facilities are currently being undertaken (South Australia Parliament House of Assembly Public Works Committee, 2009).

4 Data collection

Data collection was by means of a series of focus group sessions using a risk management tool called 'Risk and Opportunities Management System' (ROMS, 2011) to capture stakeholder experience. Focus groups are designed to promote interaction and self-disclosure among a carefully structured group of respondents who can share their perspectives about a specific topic in a non-judgemental environment (Morgan, 1997). ROMS is a process which uses multimedia technology to provide a structured approach to identifying, assessing and controlling the risks and opportunities associated with an nominated problem – in this case "How to respond effectively to an extreme weather event scenario". By acknowledging employees' expertise and insights as an organisation's key asset in managing risks, it provides a multimedia platform for the organisation's key stakeholders to come together to engage in an interactive and constructive process (Loosemore, 2010). The scenarios for these ROMS workshops were different in each case study and reflected the local extreme weather event possibilities. Scenarios are an accepted method in risk management in helping stakeholders think about risks and opportunities (Henstra & McBean, 2005). In our case studies the scenarios were generated from scientific advice and statistical evidence from UNSW Climate Change Research Centre (a partner in this research). In both Stages 1 and 2 the ROMS workshops were conducted in each case study hospital with key stakeholders including clinicians, emergency department staff, facility managers, nurses, technical staff, health care specialists and health service representatives. Stage 1 involved a one-day workshop to identify and assess the risks and opportunities for each case study hospital and Stage 2 (the subject of this paper) involved another one-day workshop to consider the controls which could reduce the risks to an acceptable level and maximise the opportunities associated with the climate change scenario. The results of Stage 1 (Carthey et al., 2010) showed that the overriding organisational objective was continuity of service delivery with the primary supporting objectives of (a) preserving the building structure's integrity along with its building services; (b) having effective communication both externally and internally; (c) maintaining access to and from the site; and (d) ensuring availability and safety of relevant staff on hand to respond to the crises. From the profile of the risks and opportunities identified from the first round of focus-groups, it was also clear that many of the risks and opportunities were in a dynamic relationship where the occurrence of a single event could trigger a number of associated events. For example in one of the case studies the lack of an early warning flood monitoring system resulted in the inundation of a car parking area with the consequential loss of 90 cars belonging to staff, and key clinical and maintenance staff not having enough time to arrive on site before the roads became inaccessible.

5 Findings and discussion

In Stage 1 a total of 90 risks and 36 opportunities had been identified across the three case studies. In the Stage 2 ROMS workshops a total of 158 ‘additional controls’ were identified. Additional controls are items that the stakeholder group felt could be accomplished ‘in-house’ to supplement or complement their existing controls in order to mitigate the risks or maximise opportunities. An end ‘residual level’ is computed, showing the resulting severity(/benefit) of the risk(/opportunity) if those additional controls identified were to be implemented. This is calculated based on the stakeholders’ judgement of the probability of the risks(/opportunities) happening and the impact to their ability of achieving the objectives if it were to happen (i.e. residual probability x residual consequence = residual level). Table 1 shows an extract from the second workshop at Coffs Harbour Base Hospital by way of illustrating the nature of some of the additional controls identified.

Table 1. . Some of the additional controls identified for the objective "to ensure staff and patient safety" at Coffs Harbour Base Hospital

	Risks and Opportunities	Additional Controls	Residual Probability	Residual Consequence	Residual Level
Objective	To ensure staff and patient safety (including vulnerable patients within the community) (Weighting 40%)		Rare Unlikely Possible Likely Almost certain	Insignificant Minor Moderate Major Extraordinary	Low Medium High Very High Exceptional
Risks	(13) Roads being cut (Almost Certain, Major, Very High)	Lobby Road and Traffic Authority/Council to upgrade roads from hospital to bypass – as part of Pacific Highway upgrade and Coffs Harbour bypass to ensure all weather access	Likely	Major	Very High
		Further develop support provided to local hospitals	Almost Certain	Moderate	High
		Developing a process of when we receive early warning that those on call physically come into the facility so we have them on site (intensivist, anaesthetist, general surgeon etc)	Almost Certain	Minor	Medium
	(21) Adequacy of community age care facilities BCM plans and capacity to implement those plans (Possible, Major, High)	Help age care providers to secure funding to develop risk management/emergency/business continuity management plans	Possible	Major	High
		Lobby commonwealth to make risk management plans/business continuity management part of age care facility accreditation process	Rare	Major	Medium
		Lobby local Government planners to make location of age care facilities in development application approval consider risk of where they are building	Rare	Major	Medium
	(25) Inability to respond to speed of event (Possible, Major, High)	Improve internal communications relating to early warning – give staff time to move cars etc	Possible	Major	High
		Provision of real time data about levels of creeks (currently a critical lag of 15 minutes) - linked to triggers which commence activation of plans	Unlikely	Major	Medium
		Automated early warning system is needed to ensure that alarms ring if rate of creek flooding rises above a certain rate – currently manual	Unlikely	Major	Medium
Opportunities	(21) Develop and implement flood mitigation strategy for the site (e.g. Coffs Harbour bypass may present opportunity, engage with urban planning controls) (Possible, Major, High)	Work together with council and SES to develop a mitigation strategy – document procedures	Unlikely	Major	Medium
	(38) Build a multi-storey car park (Unlikely, Moderate, Low)	Private medical centre developer wants to build one – negotiate with them as a JV to build one	Likely	Moderate	High

Table 1 provides a sample of the large range of possible controls identified to reduce the risk exposure of hospitals to climate change related extreme weather events. In each case study, the foreseen residual risks and opportunities profile were compared to the

original risk profile from the Stage 1 workshops (for combined results from all three case studies, see Figure 1). When compared to the original risk profile, the residual risk profile shows how the risks and opportunities would shift as a result of implementing the additional controls, assuming the organisation chooses to and is able to act on the additional controls and that the controls have their intended effect. Figure 1 show how across the three case studies, the existing climate change risks can be significantly lowered, and the opportunities improved with the *caveat* that the lowering of risks and the improvement of opportunities represents the most optimistic projection of outcomes.

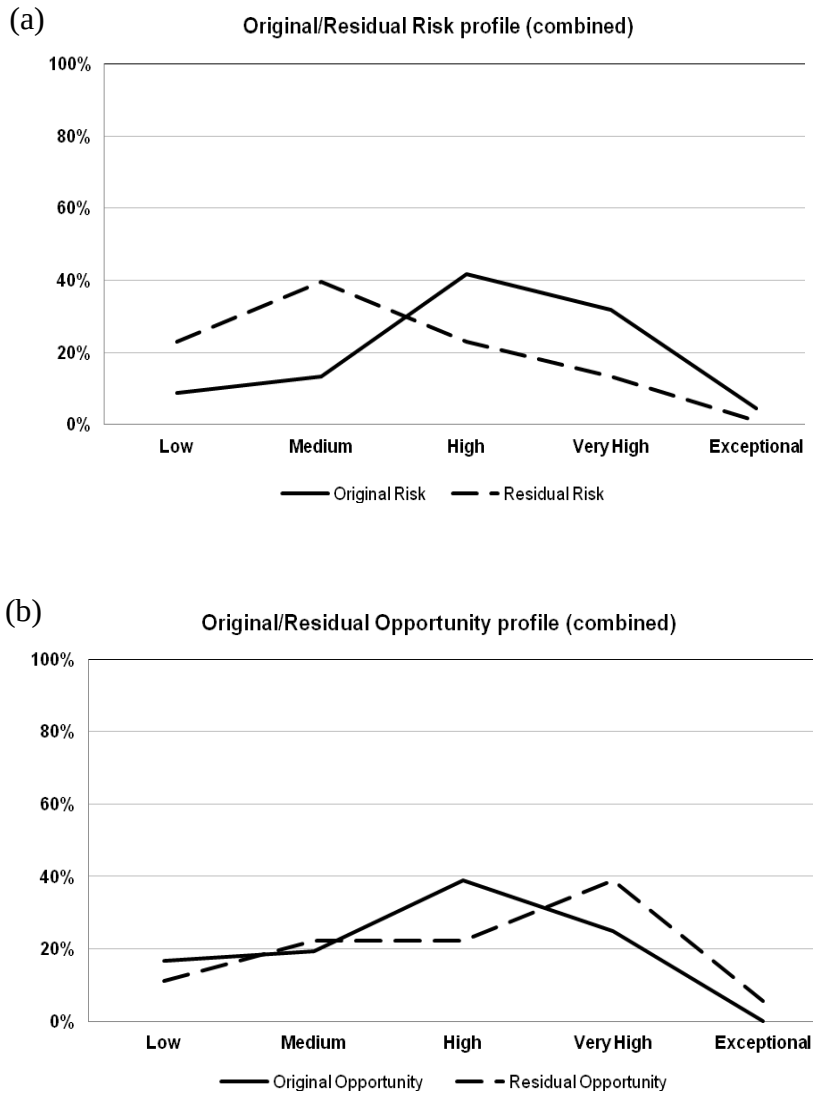

Figure 1. Graphs of the combined results from the three case studies profiling the distribution of (a) original risk versus residual risk and (b) original opportunity versus residual opportunity.

Three main observations can be made regarding the additional controls:

1. The controls relate to a wide range of health service delivery issues. Some are building related; others are organisational in nature and some relate to situations where the organisation and the building are closely inter-connected.
2. Some controls have a particularly strong impact and have a 'knock-on' effect on other controls. For example an automated early flood warning device.

3. Although by definition additional controls should be able to be accomplished 'in-house' the implementation of a control may not always be within the sphere of influence of the health service organisation in question – for example lobbying the Roads and Traffic Authority and the local Council to upgrade access roads is a case in point.

Observation 3 raises some interesting issues with respect to the ability to implement a control which is not directly within the sphere of influence of the stakeholders. In order to explore this issue further, a coding exercise was undertaken to categorise the nature of the controls identified. The objective of the coding exercise was to systematise possible strategies in order to compare like-with-like and to identify any patterns that could be used towards formulating an adaptive strategy. Patterns were identified by examining co-occurrences such as correlation between "themes, respondents or events" (Guest & McLellan, 2003, p. 188). Each item coded was checked against the others to establish analytical categories, in a process referred to as 'constant comparison' (Pope, Ziebland & Mays, 2000).

This analysis was, in essence, a fine grained exploration of spheres of influence. Controls were coded into endogenous and exogenous categories and then further broken categorised into 'within sphere of influence', 'partially within sphere of influence' and 'outside sphere of influence'. These categories reflect the nature of healthcare systems which are characterised by a complex hierarchical structure of decision takers with varying spheres of influence (Becker, 2007). The term 'endogenous' refers to the sphere of influence of decision takers in the case study hospitals. The term 'exogenous' refers to the sphere of influence of external agencies, such as other government departments or private organisations. The approach which was adopted is similar to that advocated by Wu et al (2006, pp. 352-353) who grouped risk factors, in their case inbound supply risk factors, into similar categories. It is interesting to note that natural disasters are classified by Wu et al as "external uncontrollable" (i.e. 'exogenous and outside sphere of influence'), whereas the ROMS process has helped our case study organisations to gain an element of control to deal with these external risks. Examples of endogenous and exogenous controls are provided in Table 2. Although these are presented as two distinct categories, in practice the boundary between the two is often a fuzzy continuum. It was clear from our second workshop that the likelihood of a control being proposed and, in turn, implemented is directly correlated to the degree of influence or authority which a stakeholder is able to exert. For example, in the case of Ceduna hospital, the stakeholders were assertive in taking control over seemingly exogenous issues. When faced with the challenge of needing to provide accommodation on site for an extended period of stay for staff during a heatwave event, ideas of appealing to a higher authority for funding quickly turned inwards, with participants noting "I think we can do some of that ourselves... we could publically raise funds [from the local community] for beds and the like".

Table 2 gives examples of each endogenous control and exogenous control with 3 levels of spheres of influence with the proviso that the boundary between these spheres of influence has been presented as clear cut for illustrative purposes.

Table 2. Endogenous and exogenous controls

	Categories	Definition	Example (extracted from workshop transcript)
Endogenous (En)	Within sphere of influence (a)	Actions that can easily be implemented using existing resources and associations within the hospital organisation	Set up a pseudo pharmacy service for visitors
	Partially within sphere of influence (b)	Actions that will require collaboration or assistance from other health departments	Develop support system amongst local hospitals
	Outside sphere of influence (c)	Strategic decisions relating to the hospital that its organisation does not have the authority to make	Build a new hospital
Exogenous (Ex)	Within sphere of influence(a)	Actions involving or dealing with outside bodies but which the hospital organisation can easily manage and control	Educate public about extreme weather event risks
	Partially within sphere of influence (b)	Actions involving or dealing with outside bodies but which the hospital organisation can manage and control somewhat	Negotiate with nearby mining company to share their resources
	Outside sphere of influence (c)	Actions involving or dealing with outside bodies and which the hospital organisation has little scope or likelihood of management and control	Lobby commonwealth government to change the building requirements for aged care facilities

As part of the process of identifying suitable adaptive strategies, Stage 2 of this research project is primarily concerned with the interplay between organisational activity (the users) and the built environment (the physical infrastructure). In order to ascertain the ratio of controls relating to 'organisational activity' and 'physical infrastructure' the data was further analysed by sieving the results of the sphere of influence exercise illustrated in Table 2 through these two identifiers. The results of this exercise are illustrated in Table 3. In all 158 additional controls were analysed as part of this exercise.

Table 3. Coding of additional controls into categories of endogenous and exogenous, with sub categories of 'within sphere of influence', 'partially within sphere of influence' and 'outside sphere of influence'

	Total	Organisational[#]	Built Environment##
Endogenous (En)	109	57	52
En – within sphere of influence	88	50	38
En – partially within sphere of influence	15	7	8
En – outside sphere of influence	6	0	6
Exogenous (Ex)	49	30	19
Ex – within sphere of influence	21	17	4
Ex – partially sphere of influence	15	7	8
Ex – outside sphere of influence	13	6	7
TOTAL	158	87	71

Protocols; internal procedures; disaster plans

Building envelope; building services; equipment; layout and provision of space

Given that the data is derived from three case studies no statistical inferences can be drawn from the results of the analyses. They do however provide an interesting insight into the stakeholders' perceptions of risk and opportunity management. The scenario presented to stakeholders at the commencement of the ROMS workshops for Stage 2 was "What controls in addition to existing controls can the organisation implement internally to minimise risks and maximise opportunities?". This approach is very much in line with systems thinking where the main causes of change in an organization (i.e. a system) are considered to be the interactions within the organization itself, not influences from outside the organization. Problems of the organization are not attributed

to outside circumstances – the competitors, the press, the markets, the economy or the government. “Systems thinking implies that there is no outside; that you and the cause of your problems are part of a single system” (Senge, 1990, p. 67). This view does not mean ignoring effects of external factors; it does however mean that the way the system responds to external factors depends on the dynamic structure of the system itself (Mbiti, 2008). Previously we have made the point that natural disasters are classified by Wu et al (Wu et al., 2006) as “external uncontrollable”, whereas the ROMS process provides organisations with an element of control to deal with these external risks. The ability of our case study participants to think inside the system boundaries is confirmed in the results obtained from the coding of the additional controls. Table 3 illustrates that the dominant area for suggested improvement, both in terms of organisational activity and the built environment is ‘endogenous – within sphere of influence’ with very few suggestions being deemed to be outside the sphere of influence. In the exogenous zone it is worth noting that ‘exogenous-within sphere of influence’ (for example a public education program) has the largest number of controls and typifies an organisation taking a pro-active role in influencing external circumstances. This analysis is still at an exploratory stage of the ongoing research project and may lead to the development of an assessment tool to measure the adaptive capacity of hospital facilities both in terms of the management of the physical infrastructure and the management of the organisational activities.

The ratio between endogenous organisational controls and endogenous physical infrastructure controls is evenly balanced indicating that the stakeholders do perceive the physical environment as being important to the stakeholders. This was to some extent an unexpected result given that most of the workshop participants were clinicians or administrators whose primary responsibility has more to do with organisational issues than issues relating to the built environment.

6 Conclusion and Further Research

Extreme weather events are, by definition, an extraordinary event which falls outside of the norm. The ability to mitigate the risks posed by such an event and to identify opportunities for improvement is a reflection of the adaptive capacity of hospital facilities (facilities being defined in the broad sense of the physical infrastructure and the users of the facility). Whilst it could be argued that extreme weather events are uncontrollable occurrences, this does not necessarily mean that the impact of the event cannot be lessened or indeed absorbed by a combination of a robust physical infrastructure and a properly prepared organisation. Although the study is limited to three case studies the application of the ROMS system produced a large and rich data set which allowed insight into user perceptions of controls which could be implemented to improve the adaptive capacity of hospital facilities.

To date research into physical healthcare infrastructure has been relatively neglected. Our research has added to knowledge in this field. Amongst other things our analysis of the data from the case studies demonstrates that it is possible to categorise controls into user activities i.e. organisational and physical infrastructure with the proviso that the built environment includes not just the building envelope and building services but also the provision of space. The findings demonstrate that hospital organisations are capable of identifying risks associated with extreme weather events and of conceptualising a wide ranging set of controls which can be implemented to improve the adaptive capacity of hospitals. The findings also demonstrate that stakeholders perceive most of

the proposed additional controls as being endogenous and within their sphere of influence which is indicative of a positive and proactive mind set.

The use of a case study approach in Stages 1 and 2 of the project has provided a clear insight into user perceptions. Stage 3 of the project, which is about to commence, will seek to validate the findings of Stages 1 and 2 by undertaking extensive consultation with key decision takers.

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An assessment of housing finance availability to property developers in Nigeria

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Abstract:
Access to housing finance is a critical bottleneck for the majority of property developers in developing countries like Nigeria. Lack of available and accessible fund has been identified as one of the challenges confronting the housing conditions for middle and lower income households in Nigeria. The problem of housing finance is more acute in developing countries than in a developed country mainly because of the lower per capita income and the paucity of external sources of finance. The aim of the paper was to assess the availability of housing finance to property developers in Nigeria. The objectives of this study was to assess the ease of access to housing finance by property developers, to evaluate the challenges in sourcing funds from financial institutions in Nigeria and to evaluate the current level of government intervention in housing provision in Lagos state. The survey research method was adopted for this study. A structured questionnaire was used as the principal instrument for collecting data from respondents. The results indicate that government's effort in housing provision in Lagos is below average. The findings show that interest rate, the amount of money requested for and security (collateral) are the critical challenges faced by private developers when sourcing for funds from financial institutions. The study highlights government and financial institutions as being responsible for the inadequacy of housing finance. The paper recommends that private developers should collaborate and explore alternative sources of finance for their activities.

Keywords:
housing finance, property developers, housing provision, financial institution, Nigeria.

1 Introduction

Nigeria is a land of contrasts. Great oil and gas wealth, reasonable agricultural exports, and a fast growing manufacturing and services sectors as well as a fast growing telecommunications sector with poor growth in infrastructure. Nigeria; though prominent, is one of Africa's promising economies. Conversely, its major strength lies in the enormous human capital resources. Based on United Nations standards, Nigeria is an underdeveloped country and majority of its people are poor and live in the rural hinterland which are underdeveloped and lack basic amenities such as clean water, sanitation, electricity and good housing for all. Most of its cities are overpopulated with poor living condition for a majority of its occupants.

Shelter occupies a unique place in the life of human beings; a person requires security, privacy and certain elements of personal identification, which a house can offer (Windapo and Iyagba; 2007). In sharing this view, Olayiwola, Adeleye and Ogunshakin

(2005), opine that housing is also one of the best indicators of a person's standard of living and of his place in the society. Housing represents one of the most basic human needs and has a profound impact on the health, welfare, social attitudes and economic productivity of the individual.

Onibokun (1985) explains that housing problems have resulted in overcrowding, poor and inadequate social amenities, unsatisfactorily and unwholesome environmental conditions and urban squalor, the absence of open space, the over development of land area leading to the crowding of buildings, in-accessibility within residential areas as well as scarcity and high cost of building materials. In general, it seems evident that the urban housing problems is mostly a phenomenon originating from the large and uncontrolled influx of people from the rural regions marked by gross underdevelopment into land locked urban areas in search for a 'better life'.

The Nigerian government, have enacted several policies aimed at providing affordable housing to its teaming population with little success. The private sector is presently co-opted into the lucrative business of housing provision. The demand for housing is especially higher than supply so this informs the interest of the private sector whose major driving interest in investment of funds is profit making. Despite the ongoing effort of the private sector in investing in housing, the demand level remains high. Also, majority of the houses built by private sector investors are majorly for commercial interest, hence are not affordable by the low income class who constitute a majority of the population. The difficulty in accessing fund and the high interest rates on funds accessed for building projects also contribute to high overall cost of housing provision.

Ojo (1983) reckons that the field of housing finance is in a state of continuous change, change in practices, methods, clientele and sources. This can be attributed to the dynamics of the socio-political climate of the country alongside other external forces. The financing of building construction projects is expected to be one of the major responsibilities of our financial system. Oloyede (2007) is of the view that real estate and its finance are essential elements of economic development, economic growth and capital formation. However, housing finance in many developing countries has been limited to state owned specialised housing banks, which is a sector that is primitive and under-developed.

Access to housing finance is a critical bottleneck for the majority of the private sector, including the private developers in developing countries like Nigeria. Hoek-Smith (1998) argues that lack of available and accessible housing finance has been identified as one of the important hurdles in improving the housing conditions for middle and lower income households. According to Ojo (1983), the problem of housing finance is more acute in developing countries like Nigeria than in a developed country like the U.K. mainly because of the lower per capita income and the paucity of external sources of finance. Lack of effective demand for housing finance on an economic basis reflected primarily the low per capital income, resulting largely in lack of developed commercial sources of housing finance in the country. In financial sector in Nigeria has been undergoing a lot of restructuring in nearly a decade. The ability of financial institutions to provide funds for housing development has been slow coupled with the ever stringent conditions which form the basis of collateral requested by most financial institutions. The objectives of this paper are to assess the availability of housing finance to property developers in Nigeria, to evaluate the constraints faced by private developers in sourcing funds from financial institutions in Nigeria and to evaluate the level of government effort to housing provision.

2 Literature review: scope of the research

Over a decade, the real estate development sector has made significant contribution to many sectors in the economy (Jamil and Ahmad, 2007). Private sector property developers are actively involved in the provision of shelter in Nigeria. There exist in the real estate business, the problem of availability of housing finance to property developers which the study will try to unravel.

Housing finance by its nature is a capital intensive ventures which if financed through personal financial resources will require slow and tedious accumulation of saving. Ajanlekoko (2001) opines that since housing (real estate) provides benefits over many years, long term credit financing is a more logical option as it will spread the repayment burden. This will require the availability of long term facilities having institutional capacity, structure and mechanism that will allow a convenient and effective linkage between the saver/investors and the consumers of the fund. In Nigeria, housing is financed through a number of institutional sources: commercial/merchant banks, insurance companies, federal mortgage bank of Nigeria (FMBN) and other mortgage institutions. There are various challenges affecting housing provisions in Nigeria; amongst which include the availability of funds.

3 Research Methodology

A survey research design was adopted in the study. Specifically, a cross-sectional strategy was used where samples were drawn from the population of study at one point in time. The study was conducted in Lagos state which is viewed by some as the commercial capital of Nigeria despite the movement of the capital to Abuja. The city houses a good number of private developers who have been in business over a period of time. The population for the study comprises private owned property development firms of all categories (small, medium and large) based in Lagos. Specifically, senior management staffs, site engineers, project managers and other key personnel involved in construction activities of these property development firms were the targeted respondents. Structured questionnaire was used as the principal instrument for obtaining responses for housing finance availability to property developers in Nigeria. A total sample of sixty nine (69) was drawn from these collections of private developers of various categories (small, medium and large) registered with the Nigerian Institute of Estate Surveyors and Developers. Purposive sampling, which is a non-probabilistic sampling technique was adopted for the study due to our inability to obtain a current and comprehensive list of private developers operating or based in Lagos as at the time of carrying the study.

4 Findings and Discussion

4.1 Characteristics of respondents' organisation

An insight into the nature of the respondents' organisation will deepen our understanding of the nature and quality of their responses. Project managers constitute the highest proportion of the respondents indicating their high involvement in the procurement process of most property developing companies.

Table 4.1 Demographic data of Respondent

Designation of Respondent	Frequency	Percent (%)	Cumulative Percent
Managing director	3	6	6
Commercial manager	13	26	32
Principal partners	8	16	48
Project manager	14	28	76
Others	12	24	100

Commercial managers account for 26% of the total population. Managing directors who participated in the survey account for 6% of the population.

Table 4.2 Inadequacy of housing finance and its causes

	Frequency	Percent (%)	Cumulative Percent
Inadequacy in housing finance			
Yes	39	97.5	97.5
No	-	-	97.5
Indifferent	1	2.5	100
Who is responsible for the inadequacy			
Government	2	5.1	5.1
Financial institution	1	2.6	7.7
Government & financial institution	22	56.4	64.1
Government, financial institution & public	14	35.9	100

Majority of the respondent agree that there is an inadequacy of finance for housing and property development relative to the demand for such fund. This could lead to cases of abandoned project in the worst case. Respondents opine that government and financial institutions are responsible for the inadequate supply of funds for construction projects. Although government regulate the activities of financial institutions through the Central Bank of Nigeria, the financial institutions can also make access to funds for property development more difficult with its endless list of requirement.

The respondents' perception of the effort of the Lagos state government on housing provision is shown in the pie chart below. 57% of the total population share the view that government involvement can be regarded as fair, while 40% of the total respondents argue that their level of involvement in housing provision is poor, only 3% of respondents reckon that government's effort in housing provision can be considered better than that of the private sector property developers.

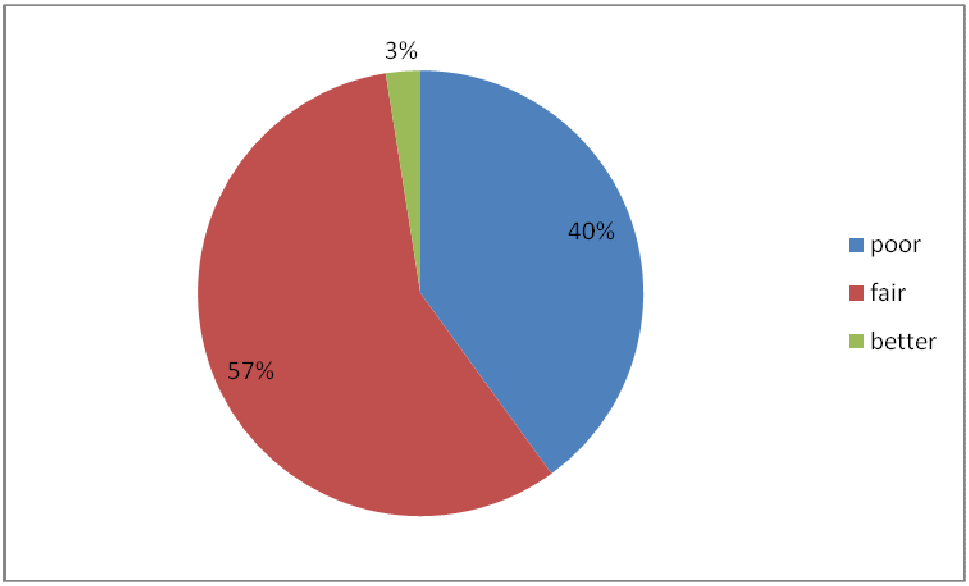

Fig 1: Pie chart of the level of government effort in housing provision in Lagos.

The mean item score of constraints encountered in sourcing for funds for housing projects from commercial banks in Lagos state is indicated on Table 4.3. High interest rate is the major constraint to property developers in sourcing for loans to be used for housing projects. The application procedure presents little constraints in sourcing for loans for housing projects. This agrees with a general fact that interest rate and collateral are the most critical constraints in accessing fund in the housing sector in Nigeria.

Table 4.3: Constraints in sourcing for loans from commercial banks

Constraints	N	MIS	Rank
Interest rate	39	0.94	1
Amount requested for	38	0.89	2
Security collateral	39	0.89	2
Application time	36	0.73	4
Information level	38	0.69	5
Application procedure	39	0.67	6

The effectiveness of the source of finance in housing provision was evaluated on a scale of 1to 4 where any formal source of housing finance equal and above 4.00 is considered as highly effective as an important source of finance in housing provision while factors below the mean limit is regarded as having a low effect on housing provision.

Table 4.4 Effectiveness of the following sources of housing finance

Formal source of housing finance	N	Mean	Rank
Commercial banks	38	3.66	1
Cooperative societies	38	2.93	2
Federal mortgage bank	37	2.69	3
Mortgage institution	38	2.48	4
National housing fund	38	2.31	5
Development institution	38	2.11	6
Insurance companies	38	1.83	7
Microfinance institution	38	1.59	8

As shown on table 4.4, commercial banks with a mean score of 3.66 are the most effective formal source of housing finance, while microfinance institution is viewed as the least contributor to housing provision in Lagos.

5 CONCLUSION

Government and financial institutions are largely responsible for inadequate finance of construction project which will directly impact on the level of housing availability. Government policies on housing provision should be more proactive in meeting the ever increasing demand for housing in Nigeria. Government policies should also encourage private investors to build affordable houses by making available mortgage funds at a low interest rate. Presently, interest rate placed on loans high and the limits to the amount that can be made available to property developers is little in comparison with huge capital outlay required for construction projects. This study recommends that property developers in Nigeria should invest in innovative housing solutions that are cost effective and yet sustainable; such as prefabricated housing units that can be assembled on site and are affordable and durable.

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Evaluating the Impact of Social-Cultural Values on Technical Risk Management

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Abstract:
This is an exploratory research aimed at identifying and evaluating social-cultural values and the impact such values could have on the technical risk management in oil refinery business of Kuwait. Generally, the management of risks in the oil refinery tends to be centred on the collection and simulation of technical data which can then be used to make decisions on the wellbeing of the workforce as well as the refinery installations. While the number crunching in the process is immensely vital, there tends to be a problem of ignoring if not sidelining the social cultural values of the people dealing with risk management processes. It could be presumed that trivialising people's values when setting the technical performance of oil and gas installations could be the starting point for poor integration and implementation of risk management strategies because the psychology of risk, as perceived by the locals. This research was conducted using an interview based survey to explore how the Kuwait Petroleum Corporation (KPC) incorporates the social cultural dimension of risk management processes. Based on a stratified sample of 19 respondents the result indicates that there is an unusually low level of recognition of social-cultural values in the risk management process in the KPC. The research recommends a further research so as to gain a clear understanding of the drivers for such a scenario.

Keywords:
risk management strategy, social-cultural values, technical data, oil refinery business, Kuwait

1 Introduction

Generally, the management of risks in the oil refinery tends to be centred on the collection and simulation of technical data which can then be used to make decisions on the wellbeing of the workforce as well as the refinery installations. Villai et al (2006) argued that in some corporations the simulation of fire related risk incidences takes a much larger share of resources than that evaluation of related factors to risk of the operations in general. While the number crunching in the process is immensely vital, there tends to be a problem of ignoring if not sidelining the social cultural values of the people dealing with risk management processes. It could be presumed that trivialising people's values when setting the technical performance of oil and gas installations could be the starting point for poor integration and implementation of risk management strategies because the psychology of risk, as perceived by the locals. This research was conducted using an interview based survey to explore how the Kuwait Petroleum

Corporation (KPC) incorporates the social cultural dimension of risk management processes. This paper was designed to test a hypothesis that "presently the social – cultural values of the workforce of the KPC hydrocarbon facilities have no impact on the technical risk management processes and techniques". Based on two stratified samples (n) comprising of 19 respondents in each sample the result indicates that there is an unusually low level of recognition of social-cultural values in the risk management process in the KPC. The wider implication of neglecting the social-cultural values in the risk management processes is that there could be an inherent error in the technical risk assessment used in the refinery processes because of the failure to recognise the influence that can be exerted by the psychological factors of those partaking of the risk management processes. The challenge however is how to quantify such human induced errors in the risk management processes that can be attributable to social-cultural values of the organisation.

2 Culture at the Work Environment

Kopelman (2009) says "culture is conceptualised as a subjective construct; it is reflected by an individual's mental representations and consists of interrelated patterns or dimensions, which come together to form a unique social identity shared by a minimum of two or more people". Cross-cultural research often relies on geography as a proxy for culture; but culture amounts to more than external attributes (Kopelman, 2009). For example, observed differences in bargaining behaviour between decision makers from the United States, Japan, Israel, and Yugoslavia suggested they were not due to differences in languages, currencies, or experimenters, but were attributed to group-level psychological differences, i.e., national culture (Kopelman, 2009). While some people perceived their negotiation capabilities to be strong as the negotiation developed, others felt the opposite. "Often, hypotheses theoretically grounded in differences in cultural values focus on individualism versus collectivism and predict that collectivists, who are more group focused, will be more cooperative" (Kopelman, 2009). However, if the collectivists have their own cultural beliefs, it could be difficult to convince them otherwise with or without tangible evidence pointing to the need to take a different view from that which they may have known over the years as the "norm".

When decision makers assume a collectivist approach, their workforce could cooperate more than those whose leaders' take an individualist approach (Kopelman, 2009). This means that "a main effect of culture such that decision makers from collectivist cultures will find it easier to forgo individual gains for the greater good of the group than decision makers from individualist cultures who will be more self-interested" (Kopelman, 2009). Such perceptions of how to behave in certain situations can be dictated by the way someone has been trained but also by the way they are expected to behave due to their social cultural wellbeing within the organisation. However if the decision that has to be made is centred on their technical capability, it might be presumed that they would be expected to decide objectively. Such would be expected even in a risk management process.

2.1 Social-Cultural Values and Risk management

Chijoriga (2011) explained that most business that deal with risk of some sort tend to consider both quantitative (statistical or mathematical) and qualitative risk assessment methods as part of the overall risk management process. The major difference is that the quantitative methods facilitate the classification of risks while qualitative methods focus more on the "judgmental and subjective factors" that could influence the decision

making. In the engineering sector, Perez-Floriano and Gonzalez (2007) opined that international risk management and safety systems "*leave some room for failure if local cultural factors are not accounted for*". They reckon the problem is of "*great importance for the global corporate social responsibility for organizations that operate in industries were workplace risks are common*" because "*even a slight oversight in the implementation of a home-developed risk management system may translate into a catastrophe elsewhere*" (Perez-Floriano and Gonzalez, 2007).

The main reason for such a scenario, it could be argued, is that while the technical aspects of risk management have been fully developed, the commonly held standards of acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable in any society – herein called social values – can be dynamic and severely under developed. The ideas, believes, attitudes, opinions, principles long cherished by members of a society can have an influence on the perception of risk (Karlsen, 2011); yet they cannot easily be linked to success and or failure of the risk management processes. Figure 1 illustrates the key factors that make up the uncertainly management maturity model, developed by Karlsen (2011). However, the model only covered the processes, the application, experience and culture; yet the social-psychological values could be added to the model, as show by light green process on figure 1.

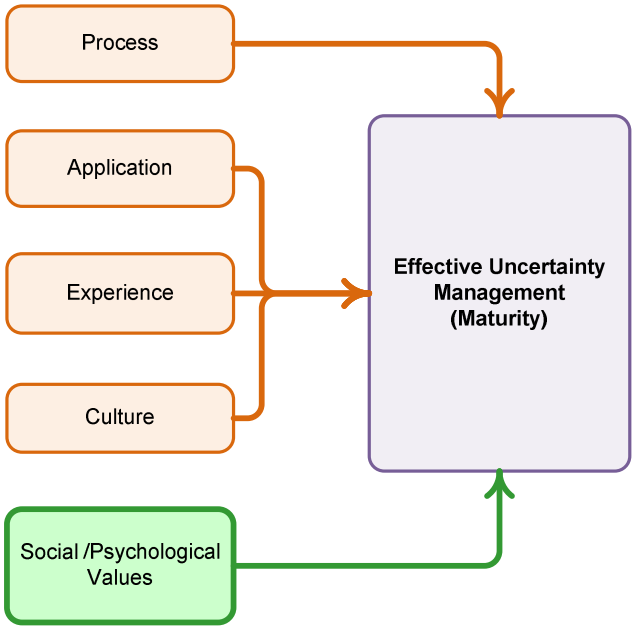

Figure 33: Uncertainty Management Maturity Model (Adapted: Karlsen, 2011)

The uncertainty management maturity model (Figure 1) can influence the organisational climate, Karlsen (2011) argued in that it aggregates the attributes of the organisation such as "*attitudes, feelings, and modes of behaviour which characterises life in the organization*". Karlsen (2011) also noticed that within the organisation, culture has a bearing on "*organization's values, beliefs, practices, rituals, and customs*". This implies that for any organisation, "*safety in the workplace should be a cause of concern for organizations and employees given that the social, physical and psychological well-being of workers depends on a safe work environment*" and "*thus organisations must find ways to best communicate hazard information to their workers and promote of safety in the workplace*" (Perez-Floriano and Gonzalez, 2007).

Davies (2002) reviewed the risk standards of the UK nuclear industry and found out that at some point risk management processes were centred on certification processes by licensed risk assessors accredited by the health and safety executive (HSE); and that there has been a movement to use probabilistic approaches to the evaluation of risks, including reviews of every 10 years. While the procedures and systems have been strongly enough, sometimes events occur that could not have been envisaged. A case in point is what Grimston (2011) reported about the Japanese earth quake and Tsunami. "At 14:46 local time on 11 March, a magnitude 9 earthquake struck off Japan's north-east coast. The 11 operating nuclear power reactors in the region all "tripped" as designed (the nuclear fission process was stopped), with consequences as shown in Figure 2.

Figure 34. Picture of the Fukusihma Nuclear Plant after the March 11 Japanese Earthquake and Tsunami Damage (Source: Grimston, 2011)

Davies (2002) dwells so much on the procedures, regulations and safety; yet these tasks are performed by the people. The only reference to the people is about the "licensing"; which is an all encompassing statement assuring the reader that the social-cultural aspects of the assessors could have been taken care of by the licensing of the assessor. This is the major weakness of the current technical risk management strategies because decision makers' social-cultural values are not considered as vital to the process in a much formal way.

2.1.1 Evidence of social-cultural Factors in risk management process

From the literature, it can be argued that there is little evidence of how the social-cultural factors are being incorporated in risk management process. All the technical processes for risk management articulate, to a large extent, the scientific steps that are necessary for the process to be implemented successfully. This factor is critical in that it highlights the gap in the way decision makers adopt social-cultural factors during the risk management processes. Since the industry is able to model the technical procedures necessary for the implementation of risk management, it could be argued that there is a need for a similar approach relating to social-cultural procedures necessary for an effective implementation of the technical risk management processes.

2.2 Cycle of Decision Making and Risk Management in the Oil and Gas Industry

"A key factor in achieving successful management policies in the oil and gas industry is the availability of adequate and reliable records of generation rates, characteristics, and distribution of different wastes produced by the industry. This is irrespective of the fact that such rates and distributions are highly site-specific and significantly vary from one location to another" (Elshorbag and Alkamali, 2005). This means that there is a correlation between the management of risk and the risk management policies of an organisation. For instance, the HM Treasury (2004) developed a model which an organisation could base their policy on the management of risks in their business. The model explains that the capability of leadership (BS 31100: 2008); policy and strategy; people; partnerships and resources; and processes can lead to a more robust system that can integrate qualitative and quantitative mechanisms in risk management. While the risks in the hydrocarbon industry are plentiful, so are the business chances. If however operational risks are not properly contained, they would impact the environment, especially the communities around the refineries. Aven and Vinnem, 2005) developed a model that abstracted the decision making process (Figure 3) from the organisational and strategic level – denoted by (1); to the decision problem and alternatives (2); the analysis and evaluation of risks (3); and the management review and judgement (4); before the main decision can be made.

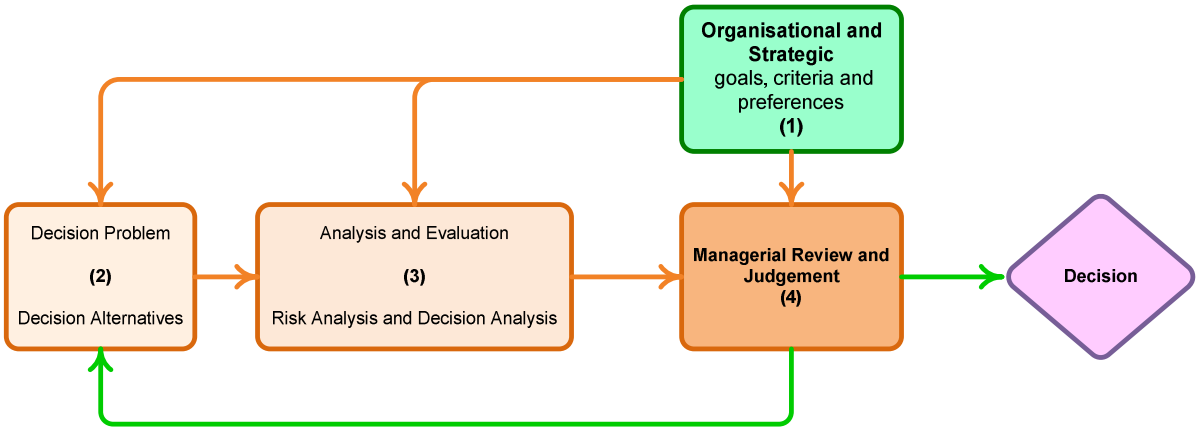

Figure 35. Model of the decision making process (Source: Aven and Vinnem, 2005).

Regardless of the method used, a decision can only be made if there is management review and judgement – whose characteristics are qualitative at best. One could argue that "management review and judgement" section of the model in Figure 3 carries, among other things, the key elements of social cultural values that can drive a manager to perceive risk in their own way; over and above the technical elements that they may have known in their day to day operations. Take for instance the general risk assessment and risk management based on the hazard and operability (HAZOP) and hazard identification (HAZID) (DoE, 1996) studies; no matter how technical the processes would be, there would still be a requirement for the "judgement" of the final outcome before the decisions are made. This type reasoning led to Villani et al (2006) stating that there are certain sources of uncertainty safety systems relating to:

People's behaviour: a number of reasons can make people behave in a way different than expected. One of the most important is fear. Different people react to panic in

different ways. Some of them may face a dangerous path in a desperate attempt to leave the building. Others may simply run away from the fire as far as possible, even if it means not trying to leave at all. There are also people that do not know the escape route and may take a wrong direction, or take another route in order to find a family member.

Out-break behaviour: the uncertainty in this case is related to the conditions under which a risk event occurs. It comprises the kind of material that is burned, humidity, temperature and other air related variables, among many others;

Equipment failures: most of the time failures are due to inadequate maintenance or inappropriate use.

The foregone factors are compounded by the fact that the hydrocarbon industry is a multi cultural and multi-disciplined industry with workers from around the world with varied industrial experience. From the foregoing, one could critically argue that while the literature points to key indicators of the requirement for social-cultural specifications that may promote a robust risk management process, there is no evidence as such in the way the industry operates. This means that the gaps within the risk management processes may not necessarily be triggered by the technical competencies of the processes; rather by the way social-cultural values that influence decision makers are incorporates in an organisation. Therefore the perception of risk could be said to be critically weaker. This research, therefore, was set to test if the Kuwait Petroleum Corporation (KPC) workforce can realise the impact of social-cultural values on the risk management processes on the hydrocarbon installations.

3 Research Methodology

Theoretically, the choice of the research strategy depends on many factors, but the key ones according to Naoum (2007) are but not limited to: (i) the type of the research; (ii) the availability of the information required to carry-out a successful research. Flick (1998) further reasoned that an ideal research methodology at a point in time should be viewed from its appropriateness. Because the research forms part of the on-going doctoral research project aimed at unifying risk management systems for an organisation it was crucial that the choice of the research methodology as well as the data collection tool be a "gradual" development. For this reason, a qualitative research methodology was adopted. Naoum (2007) stated that *"qualitative research is subjective in nature and that it emphasises meanings; experiences and descriptions*". This research method takes two categories:

Exploratory: used when you have a limited amount of knowledge about a topic. A research can explore the topic with a combination of various methods such as interviews, observations, and the like to make sure the information makes sense (Naoum, 2007; Dawson, 2002).

Attitudinal: a subjective way to evaluate the opinion or view of a person about a topic (Dawson, 2002).

Qualitative approach can be said to rely so much on the attitude of the researcher and that the measurement is based on opinions, views and perceptions (Naoum, 2007). There is a need for a researcher to get 'rich and deep' data to make such a research method to be effective; and for such to happen it was important to generate a set of

questions that were used in an interview based survey with the employees of the KPC that were naturally stratified by their role in the corporation.

4 Findings and Discussion

Figure 4 summarises the category of questions that were necessary to generate enough primary information from the interviews. This paper was designed to test a hypothesis that "*presently the social –cultural values of the workforce of the KPC hydrocarbon facilities have no impact on the technical risk management processes and techniques*".

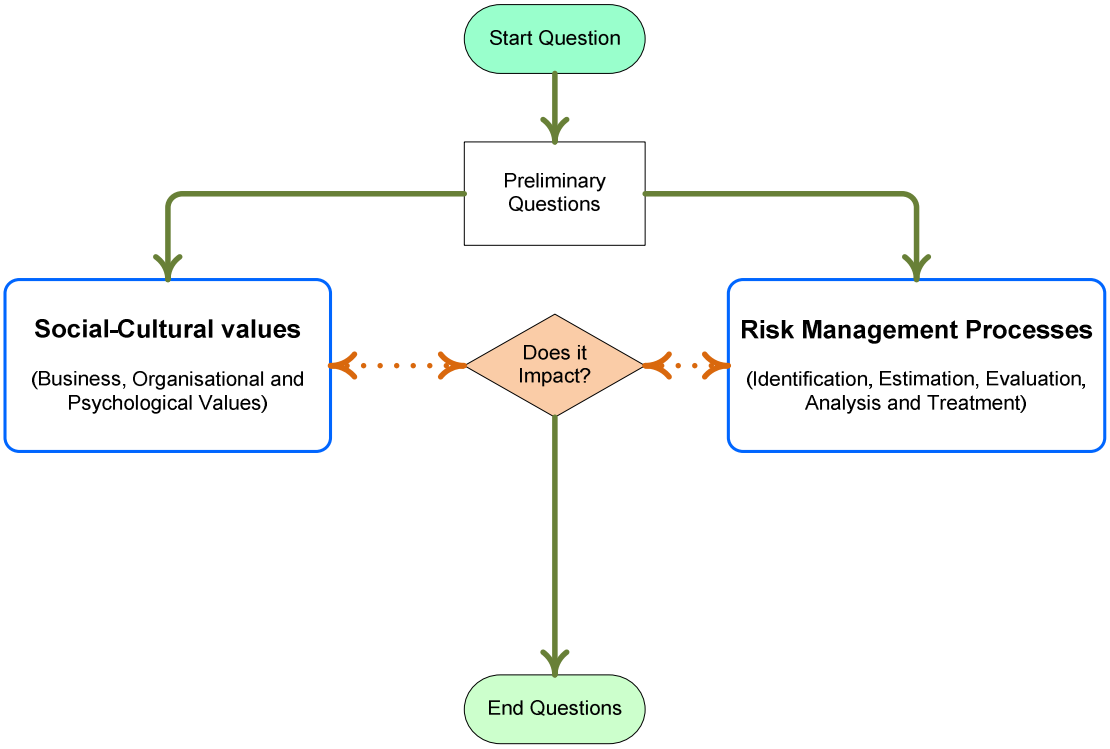

Figure 36: Summary of the set of questions used in the interview based on the Questionnaire

The Null Hypothesis **(H_o)** states that "the social-cultural values of the workplace of the Kuwait Petroleum Corporation hydrocarbon facilities have no impact on the technical risk management processes and techniques".

Alternative Hypothesis (**H_a**) states that "the social-cultural values of the workplace of the Kuwait Petroleum Corporation hydrocarbon facilities have a positive impact on the technical risk management processes and techniques"

The social cultural values were aggregated in one section with the processes of risk assessment aggregated on the other. Using a likert scale of 1 to 5; where 1 meant "very insignificant impact"; 2 meant "insignificant impact"; 3 meant "neutral"; 4 meant "significant impact" and 5 meant "very significant" impact; the risk management processes of (i) risk identification; (ii) risk estimation; (iii) risk evaluation and (iv) risk treatment; where assessed and the results are presented in Table 1.

Table 19. Aggregate of the results from the Chi Square test of independence

	RISK PROCESSES			
SOCIAL-CULTURAL CHARACTERISTICS (Beliefs, practices, rituals, customs, ideas, believes,)	risk identification	risk evaluation	risk estimation	risk treatment
Sample A (Plant A)	67	57	53	57
Sample B (Plant B)	48	68	73	62

The level of significance, [α] at 0.05 and the degrees of freedom [*v*] was determined using the formula [r-1][c-1], where **'r'** and **'c'** stand for number of rows and columns respectively (Table 1). Hence, the degree of freedom [*v*] = [2-1][4-1] = 3. Using the X^2 distribution table the critical value works out to be 12.838 (Stephens, 1999). However the Chi square test results in the value of 6.9044 which is way below the statistic of 12.828. The implication is that the Null hypothesis cannot be rejected; which means that as far as the workforce is concerned, they do not see the significance of the social-cultural values in the risk management processes of the firm.

4.1 Assessing the Implications of the Research Findings

For the Null hypothesis to be rejected there needs to be overwhelming evidence that respondents were for the idea that indeed social-cultural values could have an impact on the risk management processes and techniques at work. The implications of the result is that if there is a fault in the risk management process that could be triggered by non technical sources such as the way people relate to each other or by their work culture it would be difficult to isolate and confidently apportion the "cause and effect". This is because the workforce felt that they could not easily pinpoint themselves as the possible weakest link in the risk assessment process. This could be said to relate to "human factors and human nature" where the workforce may not easily understand their role in the overall risk management process and how their being human can have an influence in their decision making process. Therefore the implications of the findings is that if the source of weaknesses in the risk assessment process emanated from the workforce, it would be difficult to deal with because the perception of the workforce leans towards technical risk management processes as the main area of concern if one was to effectively manage risks. This means that the workforce does not feel that people's behaviour is as important as technical risk management processes that are deployed by the organisation. The poor link between human behaviour could, in turn, be linked to a poor perception of how social-cultural factors have an impact on how people behave.

5 Conclusion and Further Research

The amalgamation of social-cultural dimensions to the risk management processes of the Kuwait Petroleum Corporation hydrocarbon facilities has been envisaged to be critical to the promotion of a risk culture in the operations. This has been as a result of presumptions that relate to the way technical risk management processes have been developed based on international standards applicable to general industries. Because the literature review indicates the importance of organisational culture, social and psychological dimensions of the any organisations have equally been observed to have a significant impact on the decision making processes relating to the safety and reliability of installations. However a preliminary survey carried out using 2 samples each from a

separate facility has concluded that as far as the workers are concerned they do not see a significant level of impact that their social-cultural dimension to the business would affect the overall risk management approach. However, the level of significance based on the chi square test may not have been the ideal way to assess the level of rejection to the proposition. Therefore further research is necessary in the area of assessing the impact of social cultural factors on the overall risk management processes in the oil and gas industry of Kuwait. Further research could yield reasons for such a perception from the workforce.

5.1 Further Research

The research has been part of the ongoing PhD research on the social –cultural dimension for risk management in the oil and gas industry of Kuwait; therefore further research is required in the area of the factors leading to the perception that there is insignificant impact of the social cultural values to overall risk management process. Since the workforce have not been able to link behaviour to their social cultural values at work and that that could affect their technical performance, it could be argued that more work needs to be done to establish the drivers for such a perception in the organisation.

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Rural practice

A preliminary study on the legal and policy background for provision of affordable housing on or by the rural estate in England.

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Abstract:
This paper focuses upon legal and policy aspects of affordable housing provision likely to be of interest to owners and managers of rural estates in England. At this stage, a macro approach is taken, where the paper seeks to promote understanding of relevant key areas with a view to stimulating further discussion based upon this understanding. These key areas include the policy setting and mechanics of affordable housing provision, funding arrangements, and legal structures used for affordable housing provision. In conclusion five themes are drawn out for further discussion during the collection of qualitative data. In effect this paper is intended to ask more questions than it answers in order to set the scene for structured interviews, which will be the next step in this research.

Keywords:
rural, housing, affordable, housing association

1 Introduction

The provision of affordable housing is a complex area of law, having been subject to a multiplicity of changes over the last 100 years. Every successive government seems to want to either 'tweak' or 'revolutionise' legal provisions for housing, with the intent of doing a better job than the last. This paper does not seek to rehearse the history of changes to the law on housing, unless relevant; but seeks to explain the legal and policy position as of June 2011. First, the policy setting for the provision of rural housing is discussed and the rationale for the research defined. Second, an overview is provided of the regulatory setting for provision of affordable housing generally, and where poignant, in rural areas. Finally, some key themes are drawn out for further discussion as this research progresses into qualitative data collection. This paper is concerned with the situation in England only as since devolution, Scotland, Wales, and Northern Ireland have all taken slightly different directions.

2 Recent policy background to affordable housing in rural areas

The great British need for more housing has been a recurring theme of politics over the last 100 years or so (BBC Radio 4, 2011; Hughes and Lowe 2000), and 'affordable housing' have become buzz words of election manifestos (Labour Party 2010; Liberal Democrats 2010), and political speeches see e.g. Demianyk (2009). The meaning of

'affordable' in terms of housing can be a relative term, depending, amongst other things, upon the geographical location or means of an individual; this has been a recurring theme in housing policy (Malpass 2000). The term is defined in The Communities and Local Government (DCLG) Good Practice Guide 'Delivering Affordable Housing' as:

"...social rented and intermediate housing, provided to specified eligible households whose needs are not met by the market [...] ***Social rented housing*** *is rented housing owned and managed by local authorities and RSLs* [Registered Social Landlords]*, for which guideline target rents are determined through the national rent regime [...]* ***Intermediate affordable housing*** *is housing at prices and rents above those of social rent but below market price or rents..."* (original emphasis) (Great Britain. DCLG. 2006).

The specific inclusion of the word 'prices' in the definition of intermediate housing indicates that the definition applies equally to housing for purchase and housing for rent, as confirmed later in the guidance.

The particular problem of affordable housing (or lack of it), in rural areas has regularly been flagged up in government reports and papers in recent years (Goodman, 2006; Burgess, 2006; Burgess 2010; Taylor, 2008). Outwardly, at least, there is a political will to grapple with the issue, which is often raised by the current Housing Minister (Lawson, 2010; DCLG, 2010a). In fact Berlin (2010), argues that the shortage can be taken as a *"given"* and his report proceeds upon the basis of a *"solutions approach"*, this paper is intended to continue in that spirit.

For the purposes of this work, the definition of a rural estate coined by Forum for the Future (2006) is adopted: "...an area of land, incorporating agriculture alongside other land-based businesses, managed as a whole organisation with overlying aims". Unfortunately there is no data available on the amount of estates in England. However, if this definition is considered alongside the Agriculture in the United Kingdom 2010 (DEFRA 2010a) statistics for holdings in England of over 20 hectares; we at least have an indicator, though it is acknowledged that many estates comprise of more than one holding. In 2010 there were 67,500 holdings of over 20 hectares farming a total of 8,552,600 hectares (DEFRA 2010a). In any event the general trend is towards consolidation (Munton, 2009), with evidence of farm sizes increasing (DEFRA, 2010b), indicating that the power of estates is growing.

Given this overall and increasing predominance of large landholdings in rural areas, it is argued here that rural estates should be considered as key players in the delivery of affordable housing in rural areas. However, it is also argued that there is a failure to engage with estate owners and their managers. For instance Varley (2008), in discussing management of the Clinton Devon Estate housing stock said:

"Commercial and residential let property to over 100 rural businesses and 400 families was managed as a separate business and whilst over 75% of residential rents could be considered "affordable" little attempt was made to "join up" or align objectives with other elements of the wider Estate strategy. The provision of "low cost housing" for local people was just "what the Estate did"."

A recent study by the East Midlands Development Agency (emda) on the contribution of rural estates to the local economy found that estates had a "significant role in housing

provision in their localities" and recognised that estates "can play a key role in the sustainable development of settlements" (emda, 2009). This key role has added value; it is a fact that rural estates have the right characteristics to provide other services needed for sustainable communities, such as shops, pubs, village halls, and recreation areas.

It is clear then that rural estates hold much of the land which might be used for affordable housing in rural areas, and are ideally poised to assist in the provision of affordable housing. Further, in many cases these estates are already providing affordable housing whether or not by design. Whilst there is no evidence that rural estates in particular are not pulling their weight, there is evidence that not enough affordable housing has been provided in rural areas (DEFRA, 2004), or indeed at all (Hills, 2007). Berlin (2010), recommended that The Homes and Communities Agency (HCA) commit to "Build on relationships with large public landowners and estates, with a view to identify ways of bringing forward land for rural affordable housing". Whilst Goodman (2006), identified rural land owners as gatekeepers, and suggested that the decision on whether to release land is based upon factors such as price, business, and social interests; she then recommended various 'carrots' such as changes in taxation, planning policy and regulation, to improve the amount of land released. This all seems very plausible but assumes that either landowners want to fully divest themselves of their interest in a proposed site, or the legal structures for being involved in the provision of affordable housing are acceptable to them. It is argued here that there is scope for estates to become involved on many different levels, a plurality with does not seem to be recognised in current policy. No one has suggested, for instance, that the estate might like to form its own housing association. In 2009, in response to the Taylor Review, the DCLG commenced a consultation on proposals to incentivise landowners to bring forward additional land for rural affordable housing (DCLG, 2009), the consultation has not yet been formed into something more concrete, to the chagrin of some (Rural Coalition, 2011). The proposals centre on referrals by landowners (to the ultimate affordable housing scheme), and landowners retaining an interest (such as the freehold of the development) these correspond to recommendations 17 and 18 of the Taylor Review. It is suggested here that there may be additional ways for landowners to remain involved, or to entice landowners into releasing land for development of affordable housing. Indeed, it is the wider object of this research to establish whether there is sufficient regulatory scope for rural estates to become more widely and actively involved in the provision of affordable housing in rural areas; and if so, to understand why rural estates do not always engage with the idea of affordable housing provision.

3 Provision of affordable housing: an overview

The definition of when housing becomes 'affordable' has been outlined above, with a distinction drawn between rental housing and housing for sale, in this section, the mechanics of housing provision in these two areas are explained briefly.

3.1 Provision of homes

Under section 8 of the Housing Act 1985 (HA85) 'Local Authorities' are required to *"consider the housing conditions and needs in their district with respect to the provision of further housing accommodation"*. These 'Local Authorities' are defined depending upon where they are in England or Wales, and may be District Councils, Unitary Authorities, Metropolitan District Councils, Common Council, or Borough of London. "*Housing conditions"* relate to the condition of standing stock; whilst *"needs"* relate to the needs of residents in the Local Authority area and also those of persons

who might conveniently be housed in it (*Watson v Minister of Local Government and Planning* [1951]). This housing is paid for by a combination of subsidy from central government, local authority funds, and rental income from tenants, which may or may not originate from housing benefit provided by central government.

3.1.1 Providers

The housing stock itself may, or may not be provided by the Local Authority itself (HA85 section 9), in fact under section 161 of the Local Government and Housing Act 1989 Local Authorities are not bound to have housing stock at all. Since Medieval times when Almshouses provided shelter for the poor and sick, there has been a voluntary or 'third sector', intent on housing those in need (Malpass, 2000). However, this sector was not really recognised as a partner in the provision of affordable homes until the passing of the Housing Act in 1961 (Malpass, 2000). Since then, there has been a steady increase in the predominance of this 'third sector' (Malpass and Murie, 1999; Handy, 2007a). The bodies in this sector consist of what can be known as 'Housing Associations', these are defined by section 1 of the Housing Associations Act 1985 (HAA85) as:

"a society, body of trustees or company—

(a) which is established for the purpose of, or amongst whose objects or powers are included those of, providing, constructing, improving or managing, or facilitating or encouraging the construction or improvement of, housing accommodation, and

(b) which does not trade for profit or whose constitution or rules prohibit the issue of capital with interest or dividend exceeding such rate as may be prescribed by the Treasury, whether with or without differentiation as between share and loan capital."

Despite this statutory definition, the treatment of a housing association for purposes such as taxation, regulatory oversight, and even judicial review varies according to the characteristics of the individual association (Alder and Handy, 2003; *R(Weaver) v London & Quadrant Housing Trust* [2009]). The most recent legislation, the Housing and Regeneration Act 2008 (HRA08), provides for significant changes in the regulation of this sector (Handy, 2008). Section 59 of the HRA08 has now opened up the definition of a Housing Association which might be subject to regulatory oversight, and receive funding. However constitutions will still vary, both as a result of history, and according to the purpose of the association. The possibilities range from charitable trusts, to co-operatives, to Industrial and Provident Societies, to fully mutual associations. Suffice to say for now that there are many options, which need to be evaluated according to the objectives to be achieved.

Housing associations may have received a volume of housing stock from a Local Authority under a Large Scale Voluntary Transfer (LSVT) agreement as provided by section 106A of the HA85 (subject to certain checks and balances therein), or they may have built or accumulated housing stock under their own steam. Also in existence is a hybrid body called an 'Arms Length Management Organisation' (ALMO), this is a body which is usually partly tenant controlled and has delegated responsibility for the management of a Local Authority's housing stock, or part thereof, under section 27 of the HA85 (Terry *et al.*, 2005).

3.1.2 Regulation

Since the passing of the HRA08, regulation of the sector is by the Tenant Services Agency (TSA) under section 81, regulation having previously been conducted by The Housing Corporation. However, in October 2010 the DCLG announced that the TSA was to be abolished, with its regulatory functions absorbed by the HCA, though this is dependent upon parliamentary time, and as such has not yet happened (HCA, 2010a). Sections 59, 68, 69, and 70 of the HRA08 ensure that virtually any provider of social housing, to rent or on a shared ownership basis, is subject to regulation and oversight by the TSA, this has the effect that Local Authorities and Housing Associations alike are covered. The TSA has ten regulatory objectives set out under section 86 of the HRA08, and performance is evaluated yearly based upon these objectives, see e.g. TSA (2009a). The TSA has brought in a new regulatory framework for housing providers, entailing a much more purposive and broad brush approach, than under the previous regulator (TSA, 2009b), in fact there are only six broad standards which each encompass some more specific guidance (TSA, 2009c). When the Housing and Regeneration Bill was passing through Parliament there was a concern that the TSA would be given too much power, and this would detract from the independence of housing associations (Handy, 2007b; Handy, 2008). In fact, the HRA08 does bestow wide powers of regulation upon the TSA, but fettered by provisos that require the regulator to have regard to the desirability of housing associations maintaining their independence, and a requirement for consultation on any changes to regulation (sections 194-196). Given the, all be it fettered, powers of the TSA a decision to become subject to this sort of oversight is not to be taken lightly, and this sort of commitment can only be long term.

3.2 Tenure

The duty to provide housing is focussed upon the provision of rental housing, however there are also certain provisions allowing Local Authorities to sell properties, though it may be difficult to argue that this is part of their duty under section 9 of the HA85.

3.2.1 Rental properties

The allocation of homes by the Local Authority is subject to the provisions of the 1996 Housing Act (HA96), and in particular, the guidance issued under section 169, which acts as a gateway to an individual being allocated with accommodation. Under section 159 of the HA96 the Local Authority can then either give the individual a tenancy or nominate them for a tenancy provided by someone else; it should be noted that this provision does not apply to certain existing tenants. The relationship between a Housing Association and a Local Authority is primarily one of contract, and can vary individually, but generally, it is that of client and service provider, with some statutory oversight. Most housing associations will their own allocation policy that is in accordance with their objectives, which must be published in summary form (HA85 section 106(1)). The regulatory compliance of allocation policies can be a problem where a landowner is seeking to have control of, or a say in who moves into the affordable homes. Housing Associations will also have a duty to co-operate with Local Authorities, to such an extent as is reasonable in the circumstances, in offering accommodation to those who qualify under that local authority's allocation policy (HA96 section 213).

3.2.2 Tenancies offered

Which one of the four types of tenancy available is offered by a public, private or third sector housing provider will depend, amongst other things, upon when it was granted, to

whom, by whom, and under what circumstances. Just one of these tenancies could be the subject of a book, therefore only the points on each that are relevant to this work are outlined here.

Protected tenancies' are regulated by the Rent Act 1977 (RA77), and though now superseded are still relatively commonplace, particularly in rural areas. They only apply to private landlords where the property was let before January 15th 1989 (HA88 part 1), and subject to several exclusions which may depend upon when the tenancy commenced. The tenant is entitled to generational succession where there is no spouse or partner to succeed (even if the spouse or partner has already succeeded), and there are limited grounds for landlord possession. A 'fair rent' is set by a 'rent officer' subject to section 70 of the RA77, based upon the characteristics of the property and subject to a maximum increase formula based upon RPI and set under the Rent Acts (Maximum Fair Rent) Order 1999.

'Secure tenancies' are regulated under the HA85 Part 3, and provided by 'social landlords' who are either Local Authorities, or certain Housing Associations who were registered as 'social landlords' (RSLs) under what is now the HA96, and granted the tenancy on or before January 14th, 1989. There are certain landlord and tenant conditions which must be satisfied for a secure tenancy to arise, and numerous exceptions to the rules. Secure tenants have the right to one generation succession, restricted grounds for landlord possession (which is only possible with a court order), and various other beneficial rights. Tenants of Local Authorities pay 'reasonable rents' under section 24 of the HA85, which are largely a matter of discretion for the local authority (Arden and Dymond, 2007). Rents paid by housing association tenants are covered by the Rent Act regime as described above (RA77 part 6).

'Assured tenancies' were introduced by the 1988 Housing Act (HA88), and apply to tenancies granted by what were at that time RSLs after January 14th, 1989, and to 'protected tenancies' in the private sector which in reality means they replaced RA77 tenancies. The headline features are spousal or partner succession, and limited grounds for possession by the landlord (which may be possible without a court order). There is a limited right to refer the rent to a rent assessment committee, on notice (HA88 sections 5-6), which is assessed according to the value of other such tenancies with vacant possession. Rents are further controlled by the TSA whom since 1999 (then as the Housing Corporation) have issued guidance (now under section 197 of the HRA08) to limit yearly increases in the total rental income of a housing association (Alder and Handy, 2002). The guidance also contains rent caps depending upon the size of a given property (TSA, 2009d). Most tenancies currently granted by Housing Associations are of this type.

'Assured shorthold tenancies' are also provided for by the HA88, they are the virtually unregulated form of tenancy practitioners and members of the public are most familiar with. The important point to note is that following the HA96 all tenancies granted after February 28th 1997 are considered to be of this type, they will only be 'assured tenancies' where an 'opt in' notice is served.

3.3 Sales

3.3.1 Right to buy (RTB)

Those with 'secure tenancies' are endowed with a right to purchase the property they live in under part 5 of the HA85, particularly section 118. The secure tenant must have enjoyed the status of a 'public sector tenancy' for two years or more, but the landlord and dwelling can be vary during that period. The 'public sector tenancy' can be with a Housing Authority. Section 20 and Schedule 5 of the HA85 contain exceptions to the 'public sector tenancy', which include charities, co-operatives, and some non-public funded Housing Associations, amongst others.

3.3.2 Right to acquire (RTA)

Section 16 and 17 of the HA96 gives 'assured' tenants a similar right to purchase their dwelling if it was provided with public funding, or the proceeds of other RTA sales, or because of a LSVT; and the tenant satisfies the RTB conditions as above. The excepted situations are similar to those under schedule 5 above, but contained in a separate schedule 5 to the Housing (Right to Acquire) Regulations 1997. Of particular importance is 1A, which prevents RTA *"where the dwelling-house is situated in a rural area designated by order of the Secretary of State"*.

3.3.3 Other provisions

Section 32 of the HA85 allows a Local Authority to make general disposals of land or housing stock, subject to general or individual consent by the Secretary of State under section 34 of the HA85. Housing Associations can also make voluntary disposals of property at their discretion and provided within their objects.

3.3.4 Shared ownership

Shared ownership is typically provided using one of two models. Either the tenant purchases a long lease over a proportion of the property for a premium, then pays rent on the residual value of the property; or the tenant purchases the legal title of the property outright, but only a proportion of the equitable interest, the remainder of which he 'rents'. It is usually possible to 'staircase' up or down, meaning to increase or decrease the share of the property value the tenant holds. Whilst it is general policy that tenants should be able to staircase all the way to 100% ownership, in certain protected areas, which include many rural settlements of <3,000 inhabitants, there is an 80% limit on tenant equity, to ensure that affordable properties remain available (HCA, 2010b). There has been a steady increase in the popularity of shared ownership schemes (Bramley and Dunmore, 1996), and despite some the problems with evictions for rent arrears (Cowan, 2010), this is a policy which the current government seem all for (Arden, 2010). A particular problem arises in relation to the objects of charitable Housing Associations and shared ownership. As outlined by Holden (1999), there must come a point where a person who owns a certain amount of equity in their home is no longer in need, a point agreed by Alder and Handy (2003). Fortunately the Charities Commission has now provided guidance on such schemes, and the short answer is: yes it is possible (Charities Commission, 2009). The longer answer is that it very much depends upon the persons to whom the accommodation is provided, the part shared ownership has in the overall scheme, and whether or how non-charitable parts of the enterprise benefit the charitable parts (Charities Commission, 2009).

4 Funding

4.1 HCA grant funding

Grants from Central Government (the DCLG) for provision of affordable housing in England are now subject to the provisions of the HRA08, which has significantly altered past provisions. The 2011-15 Affordable Homes Programme – Framework ('the framework') introduces some new ideas and possibilities, which the Housing Minister, in his forward to the framework document, says will make a significant difference (DCLG and HCA, 2011). The following information is based upon the HCA literature, and TSA consultation documents, as such it is not yet clear what the exact position on these provisions will be.

4.1.2 Eligibility

For the purposes of this grant funding there may be two different bodies, one being the developer ('Investment Partner'), and the other, the Housing Association ('Registered Provider' or RP), alternatively, the two roles may be combined in one body. Those Housing Associations who are not registered with the TSA are required to begin the process of registering at the time of application, where they are to manage HCA funded properties. Likewise, Investment Partners will need to be registered with the HCA, if they are not already, before they can receive funding.

4.1.3 Affordable rent product

The key to the effectiveness of this new funding scheme is the 'Affordable Rent Product' (DCLG and HCA, 2011), which is intended to allow increased borrowing against proposed and existing housing stock, by increasing the value of the tenancies provided (Shapps, 2010). No new type of statutory tenancy is to be created (yet), rather the TSA, under its HRA08 section 197 powers, will authorise a new rental scheme for non Local Authority RPs with rents based upon up to 80% of market rental value. The TSA in partnership with the RICS has issued guidance on how this value would be assessed (TSA, 2011). In addition to the relaxation on the rental basis, the RPs will also be able to offer tenancies at a minimum term of two years, instead of the current assured tenancy (TSA, 2010). It would appear then, that it will be possible for RPs to grant assured shorthold tenancies, provided they contain sufficient safeguards for the tenant to pass the TSA standards (TSA, 2010). It will also be possible to convert existing empty lets into affordable rent properties (*Journal of Housing Law*, 2011); however there seems to be no question of converting existing tenancies into the new product, unless by consent.

4.1.4 Planning policy

The combined effect of PPS3 (DCLG, 2010b), and the policy document 'Delivering Affordable Housing' (DCLG, 2006), is that 'affordable housing' is considered as such for the purposes of rural exception sites. Rural exception sites are those where planning permission would not normally be granted, but there is an identified local need for affordable housing. However, the new affordable rent product is not specifically included in this definition, so a consultation (now closed) was started on whether such tenancies should be included (DCLG, 2011). If they are, this would make a difference to the funding of developments on rural exception sites, making more business sense.

4.1.5 Funding for shared ownership and social housing

Whilst affordable rent is expected to be the mainstay of the latest funding drive, the Framework also invites applications for shared ownership schemes and social rent schemes (DCLG and HCA, 2011). To clarify, social rent will be any housing let on the pre 'affordable rent' scheme basis; funding for such schemes will require *"exceptional"* circumstances and *"a strong case"* to be put forward (DCLG and HCA, 2011). The provision of affordable home ownership schemes will not attract funding unless they are a part of a wider 'affordable rent' scheme.

4.2 Section 106 agreements

Most practitioners will be familiar with the idea of agreements under section 106 of the Town and Country Planning Act 1990. The framework envisages that affordable housing schemes funded under section 106 should be financed without the need for HCA grants, the intention being that the increased value of the 'Affordable rent product' with improve viability. However, the HCA will consider such schemes on a necessity basis (DCLG and HCA, 2011).

4.3 Local Authority 'gifts' and loans, and other miscellaneous funding

There is evidence of Local Authorities disposing of land under sections 32 and 34 of the HA85 to enable provision of affordable homes (Improvement and Development Agency, 2008). Local Authorities are also able to give loans or grants to RSLs (HA96 section 22) and RSLs are able to borrow from the Public Works Loans Commissioners (HA96 section 23). All of these provisions are likely to be subject to approval from the Secretary of State. There are also mechanisms whereby certain receipts from disposals, grant surpluses and rent surpluses can be recycled into funding certain projects (see Alder and Handy, 2003).

4.4 New homes bonus

The new homes bonus is intended to encourage Local Authorities to promote housing schemes in their areas, to mitigate any disadvantages caused by having more homes to service with the council tax revenues, and encourage local people to be more supportive of new schemes (DCLG and HCA, 2011). The bonus will come from Central Government, will match Council Tax income for each dwelling and will be paid to the Local Authority for a period of six years (BBC News, 2010).

5 Key themes for delivery of affordable housing on or by the rural estate

The options for the rural estate will depend upon what objectives are desirable or need to be fulfilled in the management of the estate. The following thoughts are intended to provoke discussion leading to a better understanding of the possibilities for delivery of affordable housing on or by the rural estate.

5.1 Control

It is clear from the above that the general rule in affordable housing, as in many other areas, is the more funding given, the more regulatory oversight taken. So to some extent there is a trade off between funding and control. This control affects allocation decisions, management policies, finances, reporting and transfer of interests. An example might be that a landowner may not wish to fully divest control of a site to a co-

operative housing association; for fear that a monster is created on his doorstep. Another is that a landowner may need some housing for staff, but may not have an appropriate interface with the association to get his allocations.

5.2 Business sense

Whilst it is not contended that estates only operate on profit making principles, they are clearly important. The management of existing housing and land for housing has to be cost effective in terms of revenue, capital, and taxation. Are there problems with the taxation treatment of rural housing assets which affordable housing provision can assist or would hinder? Would divesting the management of a proportion of estate housing stock to a housing association improve management efficiency?

5.3 Ongoing commitment

The flip side of control is that a landowner may wish to rid himself of costly and time consuming property management, or may wish to keep a housing association at arm's length. By convention estates usually wish to retain their land, at least whilst it meets their wider objectives, so is there a fear that becoming involved in the provision of affordable housing will mean a heavy ongoing commitment, if the land is retained?

5.4 Complexity

Having attempted to explain provision of affordable housing for the last ten pages, it would be wrong to claim it is not complicated! Is it the case that estate managers are satisfied with the management structures they have for their housing, and do not wish to become tangled in this web of regulation and oversight?

5.5 Philanthropy

There are some estates that are either already run as charities, or where certain areas of housing provision are tantamount to charities. Might the use of a charitable housing association structures improve the management and objects of these estates? There is also a matter of degree here; philanthropic aspirations may not extend fully to the running of a charity, how possible is this?

6 Conclusions

Many of these problems may be solved by employing the correct choice of housing association structure, and putting in place appropriate management procedures. The next step in this research will be to establish whether the themes outlined above are 'real world' accurate and establish the degree to which they are, or are not, through qualitative data collection. Following this, an in depth analysis will be conducted into appropriate structures, or changes in law or policy which may assist.

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Sustainable real estate development

Adaptive Reuse of Heritage Buildings: Sustaining an Icon or Eyesore

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Abstract:
There is growing acceptance that heritage buildings are an important element of Australia's social capital and that heritage conservation provides economic, cultural and social benefits to urban communities. The decision whether to reuse a building entails a complex set of considerations including location, heritage, architectural assets, and market trends. The role of building conservation has changed from preservation to being part of a broader strategy for urban regeneration and sustainability. A growing body of opinion supports the view that adaptive reuse is a powerful strategy for handling this change. Urban development and subsequent redevelopment has a significant impact on the environment and this research investigates how the conservation of heritage buildings may contribute to a more sustainable urban environment. This paper examines practitioners' views and experiences associated with adaptive reuse of heritage buildings within the context of urban regeneration, conservation and sustainability.

Keywords:
adaptive reuse, heritage, conservation, urban regeneration, sustainability

8 Introduction

Heritage buildings form an integral part of Australia's social capital. There is growing acceptance within Australia that conserving heritage buildings provides significant economic, cultural and social benefits (Bullen and Love, 2010). According to the Department of Environment and Heritage (DEH, 2004) heritage buildings provide a valuable glimpse of the past and lend character to communities and therefore should be conserved for future generations. The integration of historic conservation with environmental concerns has become an innate feature of an agenda to support sustainability (Stubbs, 2004; Bullen and Love, 2010). As part of a wider revitalisation strategy to promote sustainability within the built environment, many buildings of cultural and historical significance are being adapted and reused rather than being subjected to demolition (Ball, 1999; DEH, 2004; Wilkinson and Reed, 2008; Wilkinson *et al*., 2009; Bullen and Love, 2009).

To date there has been limited research that has examined the economic benefits of heritage buildings (Bullen and Love, 2010). As a result, the retention of heritage buildings are often viewed as being 'investment sinkholes' with issues associated with

social and environment sustainability being ignored. In Western Australia (WA), for example, the City of Perth (2011) has been advocating that significant financial savings and returns that can be made from the adaptive reuse of historic buildings in an attempt to preserve the past for the future.

Adaptive reuse may help communities, governments and developers in the quest to reduce the environmental, social and economic costs of continued urban development and expansion (Ball, 1999; Wilkinson and Reed, 2008; Bullen and Love, 2009). Adaptive reuse can transform heritage buildings into accessible and useable places as well as provide the added benefit of regenerating an area in a sustainable manner. Many cities have begun to realise that reusing heritage buildings is an important part of any regeneration program (Ball, 1999). Yet, many building owners and developers still regard the reuse of heritage buildings as being an unviable option as planning and building regulations may restrict their functioning (Bullen and Love, 2010). In addressing this issue, the Property Council of Australia (2005) has advocated that heritage regulations should require the retention of only the best and most useful features of an historic building. This paper examines practitioners' views and experiences associated with adaptive reuse of heritage buildings within the context of urban regeneration, conservation and sustainability.

9 Adaptive reuse and the Conservation of Heritage Buildings

Adaptive reuse involves converting a building to undertake a change of use required by new or existing owners (Latham, 2000; Wilkinson *et al*., 2009). The change of use may require refurbishment and/or complete renovation of existing buildings or structures. In most States of Australia, adaptive reuse is a process that invariably involves physically changing the function of a disused or ineffective building (DEH, 2004). Changes to buildings can involve major internal space reorganisation and service upgrades or replacement. Alternatively, adaptive reuse may simply require minor restoration works where nothing changes except the building's functional use.

When adaptive reuse is applied to heritage buildings, it not only retains the building but conserves the effort, skill and dedication of the original builders (Love and Bullen, 2009). Adaptive reuse also conserves the architectural, social, cultural and historical values (Latham, 2000). Accordingly Bromley *et al*. (2005) have advocated that adaptive reuse is essentially a form of heritage conservation (Bromley *et al*., 2005). There has been a shift away from confining heritage value to prestigious, monumental or historically significant buildings. Buildings of more vernacular origins such as redundant offices or obsolete community halls are seen to have heritage value (Hamer, 2000). The practical outcomes of adaptive reuse and the conceptual values of conservation support the reuse of heritage buildings as a sustainable strategy. Cooper (2001) suggests that the outcomes of adaptive reuse include improvements in material and resource efficiency (environmental sustainability), cost reductions (economic sustainability) and retention (social sustainability).

9.1 Maintaining Heritage Buildings

The act of conserving parts of cities as history, and then reusing those spaces for a variety of uses, is being driven by growing calls for urban regeneration (Ball, 1999; Ball, 2002; Bullen and Love, 2010). The conservation of heritage buildings has become a key driver of regeneration (Pendlebury 2002; Strange and Whitney 2003,). Pickard (2001) contends that sustainable historic environments should:

- reflect local life;
- improve quality of life;
- maintain local identity, diversity and vitality;
- minimise the depletion of non-renewal heritage assets;
- develop collective responsibility for heritage assets;
- empower community action and involvement;
- provide a robust policy framework for integrating conservation objectives with the aims of sustainable development more generally; and
- define the capacity by which historic centres can permit change.

In terms of environmental performance, heritage buildings even after adaptive reuse may not reach the desired standards of new buildings. They may also have reached a state where adaptive reuse is uneconomical or their layout may be inappropriate for any change of function, particularly commercial buildings (Wilkinson *et al.*, 2009; Bullen and Love, 2011a,b). Re-using rather than replacing buildings is generally the most resource effective strategy to provide accommodation, especially if a conservation strategy is incorporated into the design (Ball 1999; Douglas 2002). The most successful adaptive reuse projects are those that respect and retain a building's heritage significance as well as add a contemporary layer that provides value for the future. When a building can no longer function with its original use, adaption is the only way that a building's fabric heritage significance can be preserved and maintained. Some State agencies in Australia, such as WA, are enacting policies for the adaptive reuse of heritage buildings. Such policies contain standard criteria to ensure that an adaptive reuse project has minimal impact on a building's heritage values, such as:

- discouraging "façadism"—that is, gutting the building and retaining its façade;
- requiring new work to be recognisable as contemporary, rather than a poor imitation of the original historic style of the building; and
- seeking a new use for the building that is compatible with the immediate area.

10 Research Methodology

The decision-making processes that owners and practitioners are confronted with when considering adaptive reuse and issues pertaining to sustainability are diverse. An interpretative research approach was therefore adopted as it can capture information about the beliefs, actions, and experiences of stakeholders involved in the decision-making process surrounding adaptive reuse. Moreover, in considering the viability of adaptive reuse, it is necessary to consider the 'context' of the building in terms of its impact on social and natural environments as well as those of an economic nature.

10.1 Data Collection

Interviews were chosen as the primary data collection mechanism as they an effective tool for learning about matters that cannot be directly observed (Taylor and Bogdan, 1984). Interviews were used to understand the views and experiences associated with adaptive reuse, which allowed a channel for 'context' to be captured (Kvale, 1996). The interview guide is the most widely used format for qualitative interviewing and was adopted for this research (Patton, 1991). In this approach, the interviewer has an outline of topics or issues to be covered, but is free to vary the wording and order of the questions to some extent. The general themes that the interviewer focused on were:

- effectiveness of adaptive reuse of heritage buildings as a strategy to achieve sustainability;
- attributes that make a heritage building suitable or unsuitable for adaptive reuse;
- impact of various factors on the decision to reuse heritage buildings; and
- the barriers and opportunities surrounding adaptive reuse of heritage buildings.

Sixty semi-structured interviews were conducted over a four month period with a stakeholder group comprising such as architects, developers and building managers. Interviewees were chosen for their ability to contribute towards this study through both tacit and explicit knowledge of adaptive reuse. Individual representatives from firms from the metropolitan area of Perth were selected using the technique of stratified random sampling and invited to participate in the research.

Content analysis was used as the primary analysis technique on the collected data. In its simplest form this technique is the extraction and categorization of information from documents. Inferences from the data can only be drawn from the relationship with what the data with their institutional, societal and cultural contexts (Krippendorf, 1980). The text derived from the interviews was analysed using QSR NVivo 9.0, which enabled the development of themes and additional data sources and journal notes to be incorporated into the analysis. Using NVivo enabled the researchers to develop an organic approach to coding as it enabled triggers or categories of interest in the text to be coded and used to keep track of emerging and developing ideas (Kvale, 1996). These codings can be modified, integrated or migrated as the analysis progresses and the generation of reports, using Boolean search, facilitates the recognition of conflicts and contradictions. This process enabled the key themes needed to be considered during the adaptive reuse or demolition decision-making process to be identified.

11 Findings and Discussion

The use of the coding mechanism within NVivo enabled a number of criteria to be identified and quantified. Criteria that were identified as being important reasons for implementing an adaptive reuse strategy for heritage buildings by interviews were: ‘encouraging further conservation’ (92%), ‘enhancing the quality of the built environment’ (78%), ‘reducing the use of private transport’ (76%), ‘maintaining cultural identity of a community’ (72%). Issues that were considered to be the most important when deciding whether or not to carry out conservation of a particular building were the: ‘need to respond to changes in the urban environment’ (98%), ‘Incorporation of sustainability principles’ (95%) and ‘ need to treat old buildings as renewable resources’ (95%).

The interview process required respondents to determine their level of agreement to a range of statements. All respondents agreed that ‘enabling a building to accommodate changes over time increases value’, and ‘the age of a building does not necessarily impact on usefulness’. Opinion was equally divided amongst interviewees pertaining to whether obsolescence of a building was a valid reason for disposal. Similarly, respondents perceived the obsolescence of a building provided the potential for refurbishment or redevelopment as well as disposal.

Interviews identified the most significant outcome considerations of a building that was subjected to adaptive reuse were: ‘ease of access for disabled or elderly’, ‘ability to provide a safe and healthy environment’, ‘convenience of the building location’, ‘ability

of the building to assimilate future changes' and 'how the building fits in with the streetscape'. Incentives were identified as one of the measures that could be used to encourage building owners and developers to conserve buildings rather than demolition and redevelop. The incentives that were deemed to be the most persuasive included 'relaxation of building requirements for heritage listed buildings' and 'monetary contributions to construction works'. Development bonuses such as density and plot ratio bonuses' and 'flexibility in meeting current construction regulations' were also identified. Noteworthy, 'speeding up the planning processes was considered the least influential incentive. Interviewees were highly supportive of adaptive (building) reuse and refurbishment as opposed to demolition and re-building. There appeared to be a great understanding of the concepts relating to the need to initially plan and design buildings well so that they could be preserved and refitted later in their lifecycle.

11.1 Adaptive reuse Decision-making

Respondents identified various factors that should be considered during the feasibility stage of the decision process (Figure 1). Respondents identified that 'cultural significance' (68%) and 'heritage significance' (83%) should be assessed collaboratively with stakeholders. In addition, the practical aspects of various use options should be fully explored while keeping community values and heritage values in mind.

Feasibility studies should determine whether projected outcomes can meet sustainability benchmarks and whether demolition and subsequent rebuilding would increase density and plot ratio. 74% of respondents perceived it to be necessary to explicitly determine the technical and economical challenges of adaptive reuse during the feasibility study. In particular, the determination of how existing components and the intended construction method would maintain the structural integrity of the building was deemed pivotal. In conjunction, a cost benefit analysis that was extended to triple bottom line objectives (including economic, social and environmental sustainability) was also identified as being required.

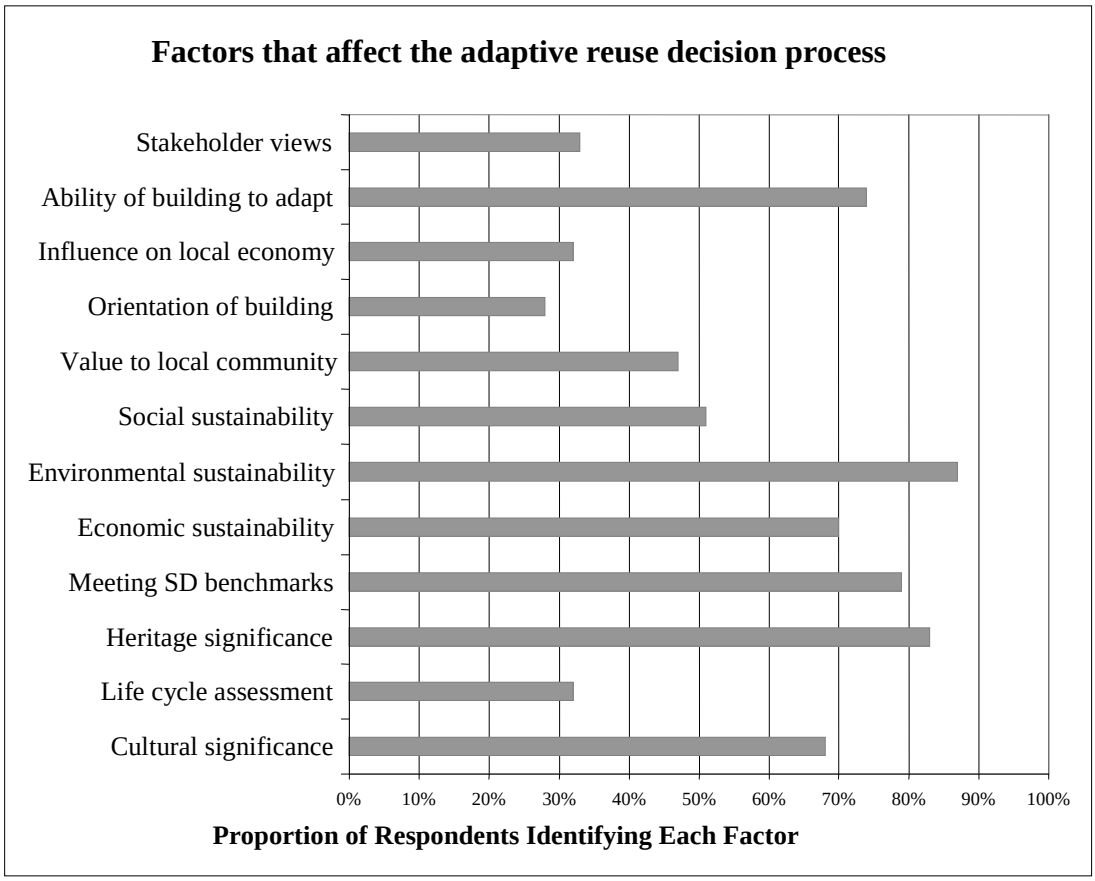

Figure 1. Factors affecting adaptive reuse decision-making

11.2 Opportunities and Barriers of Adaptive reuse

A wide range of barriers and opportunities to adaptive reuse were identified in the interviews (Figures 2 and 3). Although economic considerations were prevalent and of concern to interviewees, there was evidence of a shift, albeit a subtle one, towards the other tenets of sustainability. However, an inability to estimate economic viability of adaptive reuse was considered to be a barrier (53%). This indicates a fairly close division of opinion regarding the difficulty to estimate the costs of adapting a building compared with the costs of constructing a new one. However, the difference in opinion widens when considering environmental and social viability. Here 61% and 77% identified barriers to adaptive reuse to be an inability to estimate environmental and social viability respectively.

Many barriers to adaptive reuse pertain to cost, as a perception existed that it was more economical to demolish and construct a new building than to reuse. Compliance with building codes (59%) was deemed to be problematic as they were too rigid and did not encourage technical innovative to be developed. Adaptive reuse was perceived to be cost effective by 47% of interviews in most cases but the availability and price of materials to match existing elements/fixtures/fittings was an issue of concern. It was

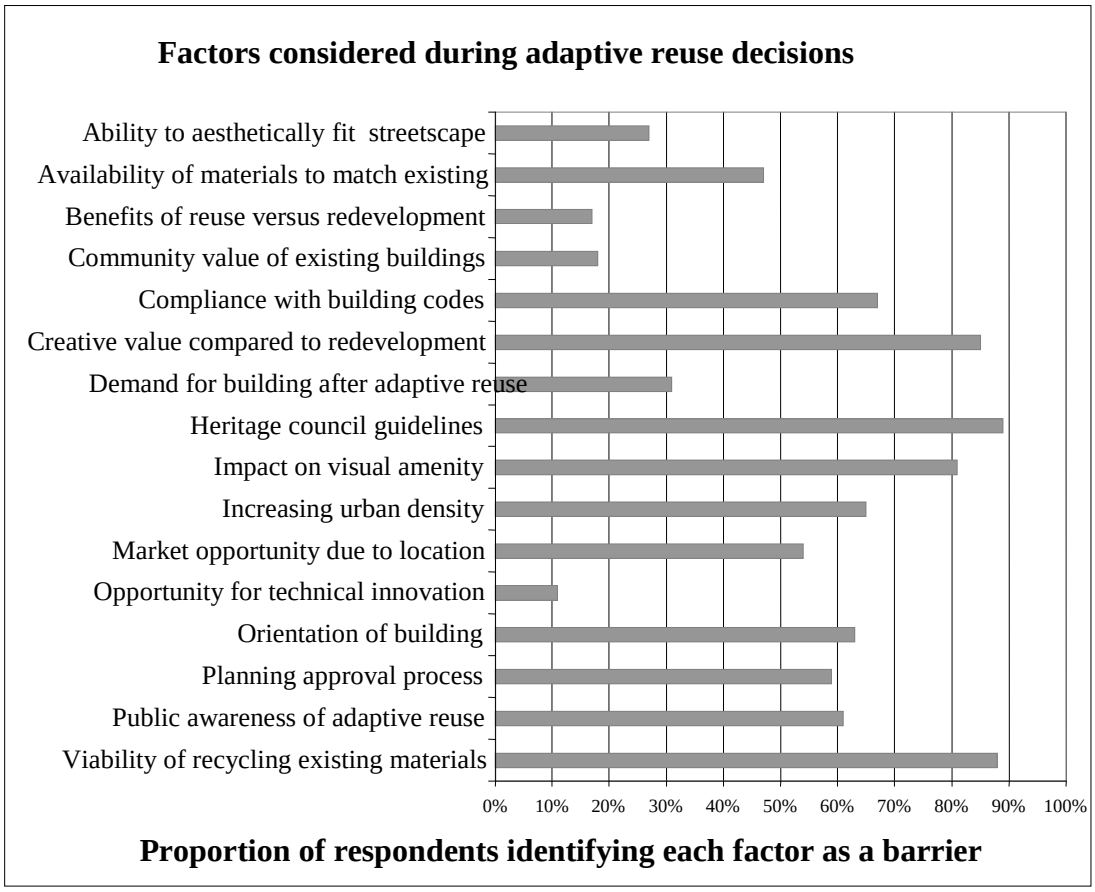

Figure 2. Barriers to implementing adaptive reuse

perceived that retaining older buildings rather than building more new ones would create a more aesthetical environment for the community (58%).

While older commercial buildings often do not support passive environmental techniques, it was perceived that existing buildings do provide opportunity to test many new innovative technologies and develop diverse solutions to enhance sustainability (65%). The location of existing buildings was seen to be a critical component of market opportunity, but opinion was fairly evenly divided with 54% seeing it as a barrier and 46% seeing it as an opportunity for adaptive reuse.

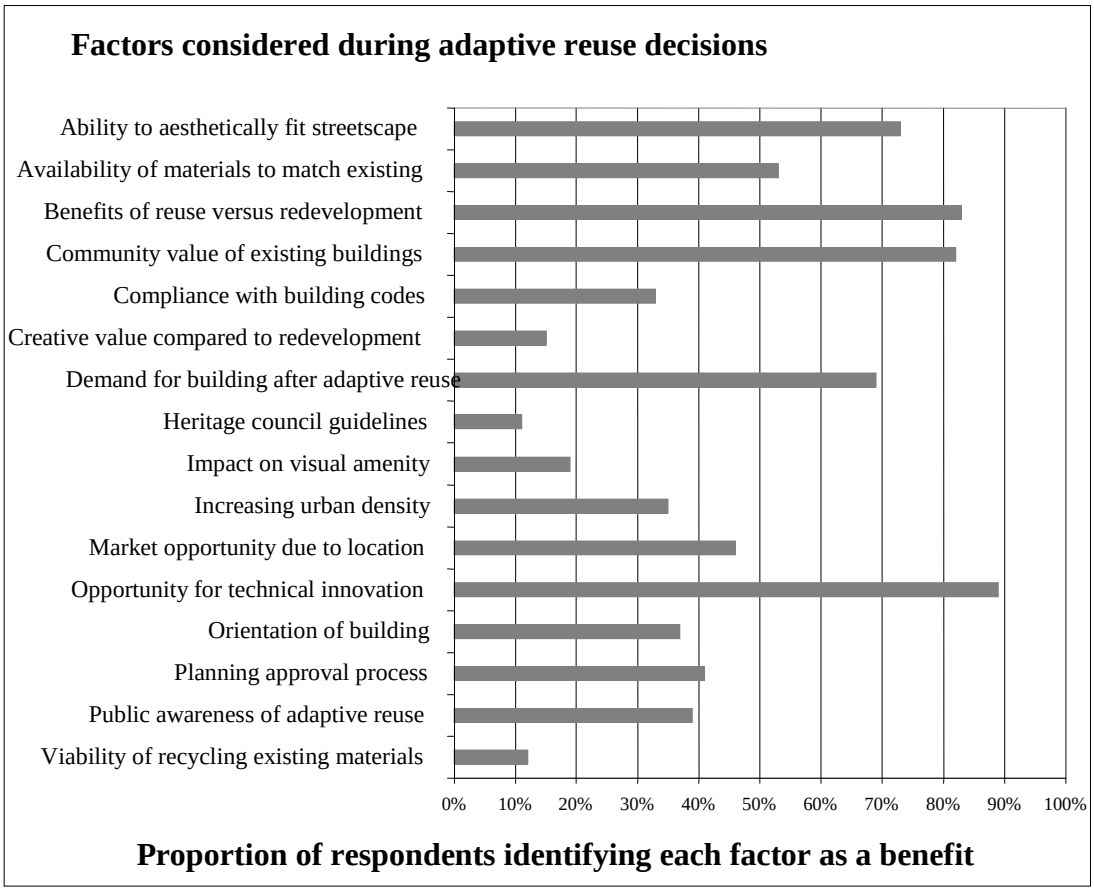

Figure 3. Benefits of implementing adaptive reuse

11.3 Impact of Adaptive reuse on Sustainability

According to 73% of respondents adaptive reuse would impact sustainability by reducing the amount of demolition. However only 61% felt the impact would be beneficial as shown in Figure 5, while 12% felt it would have a negative impact as shown in Figure 4. 77% of respondents felt the economic viability of a building after adaptive reuse would improve and in turn have a positive impact in terms of sustainability objectives. But it would only be viable if costs and benefits were factored in over the life of the building. Although adaptive reuse was seen as a more sustainable option than redevelopment, the decision would be case sensitive, with 41% of respondents, identifying that decisions needed to be based on options that lead to the most effective use of land such as increased density. Only 46% of respondents identifying this factor felt it would have a positive impact on sustainability. Energy efficiency was identified by 76% of respondents as a key factor that would affect sustainability. Although 43% of them felt that in some cases adaptive reuse could inhibit energy efficiency and the opportunity to increase urban density, it had other benefits in this context such as visual amenity and cultural heritage values. Provided the structure of existing buildings is still functional, 53% of respondents felt that adaptive reuse should be a prime consideration in terms of sustainability. The majority of

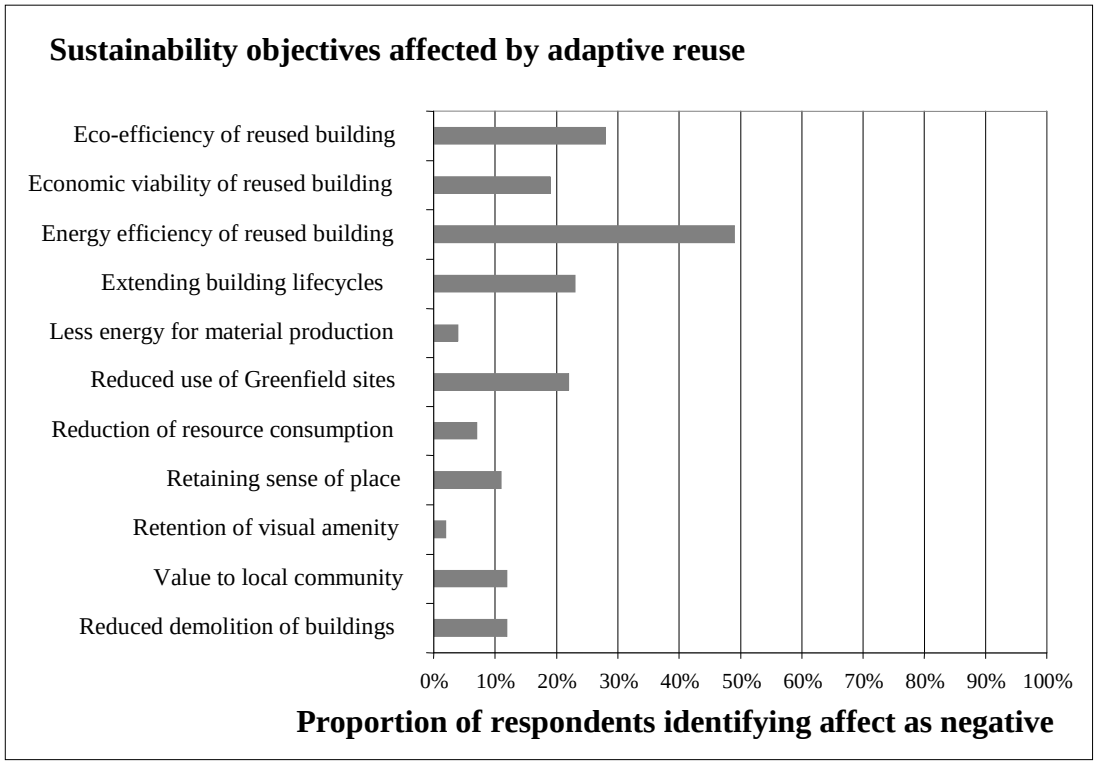

Figure 4. Negative effects of adaptive reuse on sustainability objectives

responses emphasised that it must be assessed on a case by case basis, but with an innovative approach the longer term sustainability of a building should be enhanced by adaptive reuse.

Adaptive reuse was seen to be effective because 75% of the respondents that referred to economic viability, felt the costs to demolish outweighed the costs to improve the building. Out of the 62% of respondents identifying eco-efficiency as a factor, 55% referred to case studies that show eco-efficiency of buildings is increased during adaptive reuse by using efficient heating, insulation and low impact materials. It would appear from the respondents generally that utilising existing buildings through adaptive reuse provides the opportunity to make the total built environment more aesthetically pleasing and productive, while retaining streetscapes and our sense of place.

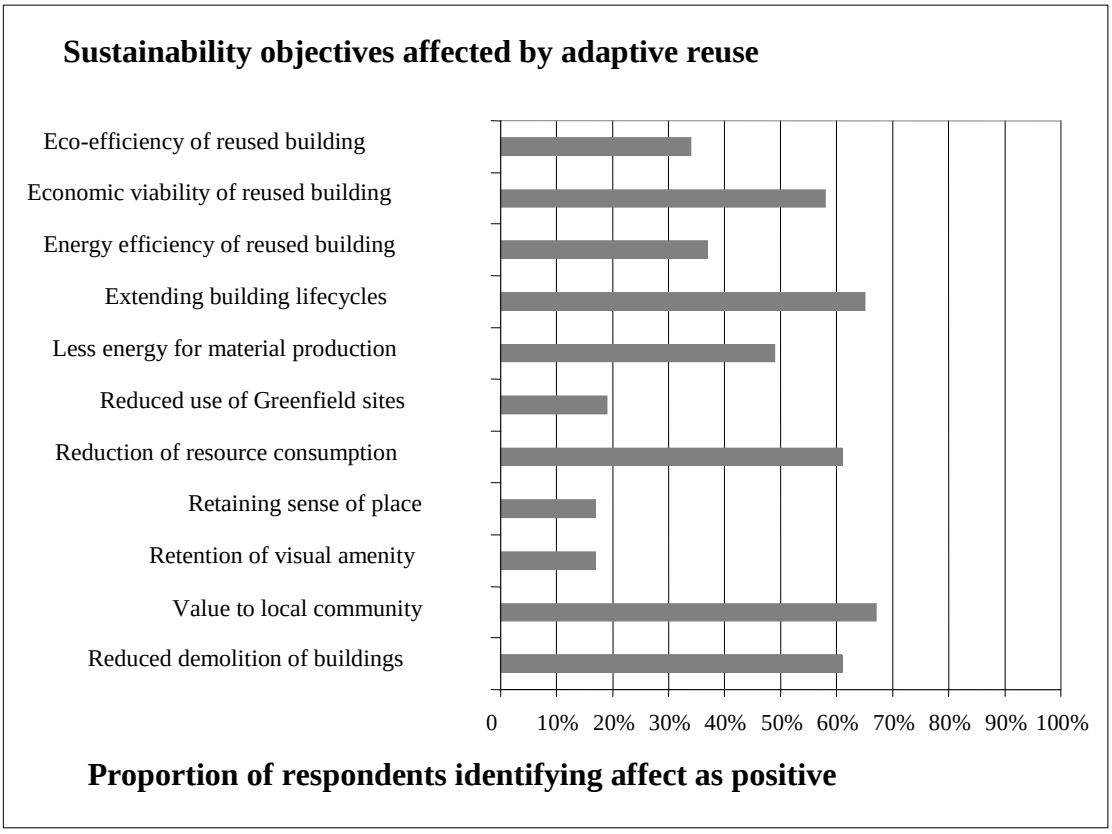

Figure 5. Positive effects of adaptive reuse on sustainability objectives

12 Conclusion

The concept of adaptive reuse of heritage buildings as a component of sustainability was strongly supported by respondents, but doubts remain about viability particularly economic issues. To a large extent, as sustainability of local communities depends on the sense of place and value they place in their local community. Heritage invests local communities with a powerful reason to look after their local environment and lead more sustainable lifestyles as they have a powerful connection to their physical environment through visual amenity and the intrigue and uniqueness offered by heritage buildings and streetscapes. People feel a stronger sense of connection with their local surroundings through heritage, which is quite different to the mentality associated with new building stock, in that it can be, replicated anywhere and therefore lends no specific connection to the local environment. Heritage buildings are cultural icons their preservation impacts on community well-being, sense of place and therefore social sustainability. Due to the importance of these factors, it is preferable to reuse heritage buildings rather than replace them regardless of bad plot ratios and lack of efficiency. Heritage invests local communities with a powerful reason to look after their local environment and lead more sustainable lifestyles. Old buildings can be a visual amenity that provides a sense of connection with local surroundings through heritage.

Heritage buildings are cultural icons that impact on community well-being, sense of place and therefore social sustainability. Due to the importance of these factors, it is preferable to retrofit heritage buildings rather than replacing them regardless of bad plot ratios and lack of efficiency or the perception that they have become eyesores for disposal. Heritage invests local communities with a powerful reason to look after their

local environment and lead more sustainable lifestyles. Old buildings can be a visual amenity that provides a sense of connection with local surroundings through heritage.

The contribution of heritage buildings to the three tenets of sustainability has not been explored comprehensively and as a result there is a conflict of interest between the preservation of heritage values and progression of the sustainable urban design agenda. In some cases it appears that the heritage requirements attached to buildings may obstruct the use of new materials or techniques needed for adaptive reuse.

Any assessment that considers the reuse of heritage buildings should also incorporate criteria that ensure the adaptive reuse will not affect heritage values of the building. Despite presenting many positive outcomes in terms of sustainability, the adaptive reuse of heritage buildings creates many problems. These tend to concentrate around the technical difficulties that working on heritage buildings will generate. Many of the materials and components used in heritage buildings are no longer readily available and may have to be manufactured to special order. Even if the materials are obtained there is no guarantee that suitably qualified craftsmen will be available locally or even nationally. These problems will impact on the economic viability of carrying out an adaptive reuse project and may prove totally impractical for developers as an investment. In many cases, the only way that a heritage building will present a viable opportunity as an adaptive refuse project will be if incentives are available for developers. The ability to make heritage buildings attractive to developers as viable reuse projects relies heavily on the introduction of legislation that reduces building code and planning requirements and offers substantial financial incentives in the form of tax concessions. The research has highlighted several broad questions concerning the decision process for the adaptive reuse of heritage buildings not the least of which is whether heritage buildings are icons that should be conserved or whether they in fact eventually become eyesores that are liabilities.

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Role of Policy development and implementation in the creation of sustainable affordable housing in Nigeria

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Abstract:
There is a need for partnering as the policies implemented have to be profitable to all. This could raise a dilemma for the government who on the one hand want to be strict and regimental and on the other need to create an enabling environment for construction to flourish. Flexibility and efficiency is needed as is a collaborative approach to policy implementation.

With government asset stripping the public sector at the moment, it means government building at a scale required to tackle the housing problem is not possible. The government however has a big part to play in ensuring that the housing providers deliver sustainable affordable houses. They are either commercial developers looking to maximize profit or individual home owners. The policies, legal requirements and building regulations need to be enforced and also incentives given to guarantee the occupiers and buyers a home of the future, which can be referred to as sustainable.

Should we expect such high sustainable standards from a developing government trying to empower the people and gratify its population with basic amenities of shelter? The impact of construction is felt by all and Nigeria is a country with a huge housing shortfall, where everyone gets involved in self build.

This research aims to answer questions raised and analyze the challenges and opportunities facing the government in its policy implementation as well as individuals and developers providing sustainable affordable housing in Nigeria. It would aim to create a decision support toolkit that could assist the government.

Keywords:
affordable housing, building regulations, government policy, sustainability

1 Introduction

Policy development 'basic shelter is what we all need initially' (Maslow, 1943) shortfall is huge, speed is essential. The government has a huge problem to resolve and not enough resources to deal with it. However housing is at the top of the scale as it creates

other issues and if not catered for adequately could make the government very unpopular.

This paper will appraise impact of government policy in the provision of sustainable affordable housing units for a fast growing Nigerian population. It is hoped this will identify some areas for change. Key questions arise such as: *With climate change and new policies can we equally provide affordable housing? Is it fair to expect the same standards for affordable housing in a developing country like Nigeria as one would ask for in UK a developed country with tried and tested policies in place?*

The aim of the research would be to try to answer the above proposed questions including 'Is affordable housing in a developing country like Nigeria sustainable or is there a need in total shift from old policies and a price to pay?'

In the pursuit of the aim of this research the study would seek to achieve the following objectives: (1)Conduct a literature review; (2)Collect data that are relevant to the research questions; (3)Analyze same and finally (4)develop a framework model or toolkit that can aid policy development and implementation of sustainable affordable housing in Nigeria.

African leaders have learned from their own experiences that, peace, security, democracy, good governance, human rights and sound economic management are conditions for sustainable development. They are making a pledge to work, both individually and collectively, to promote these principles in their countries and sub regions and on the continent. (Nepad 2001)

1.1 Partnering and profiting

The government has over the years tried many forms of housing provision for example in the UK partnering with major house builders in a joint venture that would create a profit sharing structure. The contractors and house builders would always be utilized as government cannot build this number of houses without external assistance. In the past they employed the labour directly themselves through the Nigerian ministry of works and housing. The huge overheads created by such a large workforce normally defeats the purpose going past a number of housing units desired to be built. There is however now a need to have an arrangement that would work for everyone involved.

1.2 Housing Issues and affordability

The low income of the average Nigerian makes home ownership challenging. A third of the nation in the lower income bracket can't get on the housing ladder. A fifth earns less than £30.00 per month (Oluwaluyi, 2008) with Lagos being one of the worst in the country. Land prices are highest in Lagos and unaffordable to a good proportion. There are no jobs and the population is rising. Waiting lists are long for rental apartments, and landlords charge a premium with tenants paying almost half their salaries on rent. (Daramola S and Aina, 2004)

Affordability is generally accepted as a household paying no more than 30% income for their housing, and the populace are considered cost burdened otherwise, as difficulties can arise in paying for other things like food, clothing, transport and medical care. (US dept of housing and urban devt. 2011)

The Minister of State Works and Housing and Urban Development in 2009, Mrs. Grace Ekpiwhere, was quoted as saying that Nigeria had an estimated 16 million housing shortfall. (This day, 2009) Also a claim that housing production would catch up by government and the private sector partnering to build at a rate of 400,000 new units per year seems untenable and unjustifiable. Building pace has been nowhere near that and present indications don't show any improvement on how the policy would bring that about. Acquiring mortgage debt is an insidious problem in Nigeria because of the imbalance of cost of building to an individuals earning power. Since the majority of the methods required in constructing a house are monopolised. As it were, these companies can fix the prices for the bricks, blocks and cement needed for construction (Nnanna, 2010)

The Nigerian building and construction industry last year contributed 2.00% to the GDP the highest contributor at 18.7% was the wholesale and retail arm closely followed by the oil and gas industry at 15.85% contributions (The National bureau of statistics, 2011). There is therefore the need for higher contribution from the housing sector and a need to make it a more sustainable process.

Present governments in developing countries like Nigeria do not take on this responsibility adequately to provide social housing. For example the Lagos state property development corporation (LSDPC) is an organisation in Lagos which has become a government enterprise that's solely profit driven. They have adopted a policy to only build in areas that would generate the highest returns. The organisation commenced as a government parastatal and is now an autonomous organisation.

Nigeria has a long unenviable history of civil-military political cycles, the state seems to be perpetually in crisis. The country's several democratization attempts and the interchange with military rule, most of which often come with great promises, have failed with the result that both forms of government are now largely doubted by majority of the ordinary citizens. (Yagboyaju, 2010)

1.3 Self builders – the majority

In Nigeria it's popular for the individual to want to build his own home. There is a feeling of pride and achievement that this gives him or her and a new status in their immediate family and society.

Almost every Nigerian has grown up surrounded by cement block manufacturers parading their products in their vicinity and understanding the concept of purchasing a plot of land. This land is usually bought at great cost and left to wallow for a while until the individual is able to either clear and fence it or continue to commence construction works on it.

It's not unusual for a construction project to commence and take up to ten years to complete. It's usually as the self builder has funds that he progresses the works and building materials are often left idle on the site for months on end awaiting the next phase of development. 30-40% of the population lives in urban areas, with an average household of 5 persons. The occupancy ratios of houses in Nigeria is 6 persons for a room of 20 sq m. 60% of Nigerians are without adequate shelter (under-housed and no housing). Residential home ownership is less than 25% compared with 75% internationally. (ERSO UN Habitat 2008)

1.4 House developers

In Nigeria house developers are a growing industry fed by services, society, safety and land security seekers. As issues surrounding landed property being sold to multiple buyers continue to be common in the high courts, it makes buyers wary of family land owners who purport to be the scion of the families and attempt to sell plots of to unknowing buyers keen to jump on the self build bandwagon.

House developers are trying to tap into this market of the populace suffering from a fear of falling into the hands of fraudsters. Also they are providing infrastructure which the government is meant to provide but are usually not able to. The provision of services infrastructure is a key requirement in any housing development as adequate roads, drainage network, water, electricity (if possible) and sanitation is key to creating a good sustainable development that would add value to the property.

1.5 Enabling environment

The government's policies need to create an atmosphere that draws in external and internal investors, developers, self builders, material manufacturers/suppliers and all parties. Land use decree is been discussed over the years as a cog in the wheel of speedy, safe land acquisition. The deficiency of this part of the system is notorious. Also increasing cost of building materials with cement being the main culprit is another problem. The industry feels the government can and should ensure that the price of cement is lowered by allowing greater competition and also investing in research that would allow other materials to compete effectively on the same playing field. Government is also asset stripping and a good example is cement factories being sold off to private companies. The cost of cement is still not reducing rather a monopoly seems to be created.

1.6 Government policy history

The Nigerian National Housing policy was formulated in 1991 with the aim of providing affordable housing to the populace and an example of government initiatives to improve the system. However the policies are not being properly implemented and where they are, they are not being well monitored. This policy was revised in 2004 to resolve problems in usage. A presidential technical committee on housing and urban development was set up by government to address these new housing reforms. It recommended the restructuring of the federal mortgage bank of Nigeria (FMBN) and the creation of real estate developers association of Nigeria (REDAN), and building materials producers association of Nigeria (BUMPAN). The new housing reforms created financial mechanisms and institutions that will make available to the private sector (developers) funds for the production of mass houses, and allow purchasers (mortgagors) to have easy access to borrowed money through the primary mortgage institutions (Ebie 2004)

Principal organizations on whose shoulders rest the mass housing delivery mechanism under the national housing fund (NHF) scheme include:-

- The real estate developers association of Nigeria (REDAN) formed on 9th May, 2002.
- The federal mortgage bank of Nigeria (FMBN) – Act No 7 of 1977 and updated Act No 82 of 1993.

- The primary mortgage Institutions under the umbrella body of the mortgage banking association of Nigeria (MBAN).
- The building materials producers association of Nigeria (BUMPAN) formed on 4th March, 2004. (Ozili, 2009)

1.7 Policy Implementation

One area to improve government policy would be in the building regulations or building code as it's referred to in Nigeria. It's aimed at curbing the anomalies such as the use of fake and untested building materials, lack of adequate building regulations. This would invariably arrest the incessant waves of building collapse. (Mosaku, 2006) There are still a number of cases of collapsed buildings and poorly built structures due to a poor implementation and monitoring. The building officers don't do their jobs adequately and there is corruption in the various sectors in charge of overseeing building works.

The sustainability code in the UK has also been newly created to enable a sustainable development that would minimize high carbon production. In its creation in Nigeria it would be required to be flexible and collaborative in its delivery approach.

In order to strengthen political governance and build capacity to meet these commitments, the leader of the new partnership for Africa's development will undertake a process of targeted capacity building initiatives. These institutional reforms will focus on: Administrative and civil service, strengthening parliamentary oversight, promoting participatory decision making, adopting effective measures to combat corruption and embezzlement, undertaking judicial reforms (NEPAD 2001)

1.8 Monitoring sustainable delivery

Globally building construction is responsible for the current atmospheric pollution and wastes generation. Globally, building construction is responsible for the current consumption of 25% of wood and 40% of aggregates, 16% of water and 40% of the energy annually spent (Braganca et al., 2002) It is however observed also that the rising cost of building construction in Nigeria can be attributed to some other factors, which include high transportation cost, devaluation of national currency (Naira), uncontrollable prices of building materials and the over dependency on the importation of building materials (Fasakin and Ogunsemi, 2003) Starting with Lagos state in Nigeria the federal government have created a carbon awareness campaign,(Tribune 2010) however there is the need to take it to the next level by ensuring that the populace have a thorough understanding of what not doing things appropriately could involve and the dangers for the future generations. Sustainable delivery is defined also as cutting back now to ensure that the future would have enough. There needs to be a committee or appointments made by the president and his cabinet to give the public the understanding that this is being driven right from the leadership and authorities.

One accepted definition of sustainability is that proposed by the World commission on environment and development in their 1987 study commonly known as the Bruntland commission report (WCED 1987). Most advocates of sustainable development recognize that, for it to be realized, would require changes in human values, attitudes and behaviors. Raskin et al (2002) suggest that such critical value changes are needed to promote new quality of life, human solidarity and ecological sensibility to counter the

present value system that places much emphasis on consumerism, individualism and the domination of nature (Mabogunje 2004)

1.9 Government challenges

The government has major challenges as the millennium development goals set and accepted by the present government has highlighted some other key issues which are yet to be tackled by them. Millenium goal 7 focuses on integrating the principles of sustainable development into country policies and programs; reverse loss of environmental resources. Nigeria has become increasingly urbanised in the past five decades. The proportion of the population living in urban areas rose from 15% in 1950 to 23.4% in 1975 and to 43.3 % in 2000 and projections indicated that more than 60% will live in the urban area by 2025. A sizeable proportion is likely to live in slums if care is not taken. (Millennium development report 2010) The issue of primary education which if properly implemented would go a long way in helping to educate the masses about the dangers of indiscriminate energy consumption and the advantages of recycling. Although the economic situation has created a country of forced recyclers, there are still other issues of primary healthcare, gender equality, water, sanitation and Aids. The government can be made to realize that by creating a good housing infrastructure it would alleviate some of these issues especially water provision, sanitation and better healthcare. It would also reduce the transference of disease as less people crammed into a room or house and reduction in urban slums always minimizes transference of illnesses. In line with the MDG targets, financing focuses on developing city wide infrastructure and upgrading slums to improve living conditions and enhance economically productive activities. (Millennium development report 2010)

Another challenge is that Africa has become increasingly uncompetitive, as a result of its weaknesses in governance and infrastructure, low capacity in science and technology and lack of innovation and diversification from primary products. (Commission for Africa 2005)

1.10 Government opportunities

Just as the country did and played catch up to the telecommunications age it's hoped that Nigeria can play catch up to the housing delivery in a sustainable manner. Developed countries seem to be going back to basics in terms of using local materials and reducing drastically energy each house is consuming. The need to create warmth for example in a cold region demands a higher amount of energy. Hence it's hoped that Nigeria a developing country in the tropics which needs to cool its interiors mainly can design buildings and use materials that would be sympathetic to this area and climate.

If the rural areas utilized the local materials available to them and it was developed effectively by the NBRRI to a sufficient standard, it would be more attractive in terms of looks and cost for the local populace. The uptake would be massive and there would then be a fall in demand for cement like materials. These local materials like mud, clay and laterite would become growing industries for manufacturers and suppliers. This would create an income for this group and would encourage further research into uses and development of the material.

Government need to give incentives to the developers and self builders to use local materials as opposed to what they have been used to for years. Incentives would include, tax incentives, government subsidies on rates.

As capital is highly mobile investors will favour the sectors/locations that provide the best risk/reward profile. Short term and overly complex public policies with limited effects on the profitability of investment projects are unlikely to attract private financial flows. On the other hand overly generous tax credits and regulatory incentives in the form of exceptions from environmental or labour laws could create economic distortions and harmful distribution effects. (Glemarec & UNDP, 2011)

Effective states – those that can promote and protect human rights and can deliver services to their people and a climate for entrepreneurship and growth – are the foundation of development. Without progress in governance, all other reforms will have limited impact. While there have been improvements in many African countries, weakness in governance and capacity is the central cause of Africa's difficult experience over the last decades. Improvements in governance, including democracy, are first and foremost the responsibility of African countries and people, and they take time and commitment. (Commission for Africa, 2005)

2 Research method

Structured interviews with key government officials, developers and self builders. Also interviews with tenants looking to get on the housing ladder, questionnaire will be sent to all this groups, statistical surveys, case studies of housing estates built by developers etc. Also using the qualitative and quantitative methods and using spss packages.

The quantitative research approach offers results in precise measurements and tends to be good for confirmation and deduction. Determining the relationship between one and the other is usually achievable. It's found to be good for knowing how many or how much, as some data is in the form of numbers and statistics. Quantitative research is objective and seeks precise measurements & analysis of target concepts. It's been employed for the user's surveys and questionnaires as it's more efficient and able to test hypothesis.

Qualitative – As this is usually recommended during the earlier phases of the research project, (Neill, J 2007) the design would emerge as the study unfolds. The data is in the form of words, pictures or objects. Qualitative research is subjective and individual's interpretation of events is important, e.g. uses participant observations and in depth interviews. This has commenced and is proceeding well. The qualitative method is also richer though time consuming, but less able to be generalized. The case study type of qualitative was also selected. Creswell (1998) defines the case study as an exportation of a bounded system or a case (multiple cases) over time through detailed in depth data collection involving multiple sources of information rich in context. Some consider "the case" as an object of study (e.g. Stake, 1995) while others consider it a methodology (e.g. Merriam 1998) According to Creswell, the bounded system is bounded by time and place and it is the case being studied.

2.1 The Code for Sustainable Home

Launched by the Government in 2007 the Code for Sustainable Homes replaces EcoHomes as the National standard to be used in the design and construction of new-build residential properties in England. The code is a set of sustainable design principles covering performance in 9 key areas: 1.) Energy & CO2 emissions, 2.) Water, 3.) Materials, 4.) Surface water run-off, 5.) Waste, 6.) Pollution, 7.) Health & well-being, 8.) Management, 9.) Ecology. The code uses a rating system of 1-6 stars and involves a

Design Stage Report and a Post Construction Report which is submitted to the Building Research Establishment to provide a final code certificate. Formal code assessment of new-build dwellings can only be carried out by a suitably qualified licensed and registered, Code Assessor. Developers wishing to lead the field in sustainable development will want to have their developments assessed under the code as soon as possible in the project life cycle to achieve as high a code as possible. (Department for communities and local government, 2007)

These codes need to be adopted by the developing countries like Nigeria and even though they are beginning to realize the importance of sustainable development it's been difficult to get out of the starting blocks due to other more pressing issues like rapid development of slums, transportation and ensuring reduction of building collapses prevalent in the country as an outcome of poor adherence to existing policies and codes. There is therefore a need to police the builders further and also to weed out corrupt practices amongst the officials, as a result of slack supervision and unprofessional conduct at different levels.

The code focuses on how these problems highlighted can be tackled right from the onset in the design aspect before the building gets to the construction phase. Analysis of existing regulations indicates that developing countries need to ensure that these requirements are adhered to as long time development can only be sustained if the design and materials are coordinated adequately with the right supervision for an efficient delivery. Inefficiency is the bedrock of failure in trying to create a guideline.

Adequate design will improve production taking cognizance of locality and culture. There is waste generated in energy, in developing countries inadequate power supply, an influx of individually generated power from home owners. The desire to create a thermal environment that would satisfy the human body condition has created the need for air conditioners in every room in the house, This is obviously not viable for affordable housing. Good design and usage of materials would eliminate this and make the house more affordable to run and maintain. Shared water supply source would negate the need for each home to have a borehole and a shared filtered ground source would supply a maximum number of householders creating a good economy of scale in delivery. A mix of climate appropriate design will make the delivery better and reduce running costs of buildings. Solar orientation of buildings to allow good cross ventilation, reduction in water usage, rainwater harvesting techniques and good sanitation are some of the all-important infrastructure and service requirements.

2.2 Toolkit

A toolkit is being proposed and its likely to be developed in three parts namely (a) the principles will be highlighted, (b) the process will be shown and finally (c) case studies will be used to highlight the practical resource aspects. It's meant to help interpret the findings based on the information gathered using the 9 key areas of the sustainable code. This would be used as the key resource to draw conclusions on the way forward. It will serve to aid the users namely government planners and decision makers, house builders and home owners to make decisions. The toolkit can be defined as something focused around conscious, repeatable methods for gathering raw research from multiple sources in specific contexts and transforming it into real insight & information. (Beecher, 2008) It's proposed that the toolkit will have a sustainability and affordability checklist as well as a menu of potential performance indicators.

This would be a systematic analysis of the prevailing surrounding situation to come to the most appropriate technological sustainable design policy for any proposed project. The toolkit as said will aim to look at the 9 key areas of the sustainable code focusing on design and technology of the materials as well as other factors surrounding creating affordable housing in a sustainable way. Energy & CO2 emissions is one of the bigger issues for sustainability and good designs can be created for the varied Nigerian climate by combining energy efficient construction with passive heating and cooling to achieve a sustainable society. Future buildings must be energy efficient, and energy conservation measures must be adopted in existing buildings.

The adaptation to natural surroundings and the people in the area is also significant to forming a seamless relationship with all parties involved in the development.

In the UK the code for sustainable homes and the ever tightening building regulations have had a big impact on house builders and ensured changed building practices. Likewise legislation needs to drive the move towards sustainability in the built environment in Nigeria.

The government needs to give incentives to consumers reducing their cost and to producers making it more viable to produce. As research meliorates the range of innovative materials and solutions for house builders to choose from also improves and helps to satisfy discerning consumers.

By 2020 45% of global construction is projected will be in emerging markets like Nigeria. Over the next decade infrastructure construction is expected to grow by 128% in emerging markets compared with 18% projected growth in developed markets.(RICS 2010) While 70% of the global population will live in urban areas by 2050, (World fact book 2010) affordable housing is therefore a key issue to target to avoid urban slums.

3 Conclusion

Policy formulation must be centered on national interest. While designing policies that will promote investments and trade, indigenous businesses must not be exposed to harsh and unfair competition from better advantaged foreign peers. Thus policies must be designed that will give indigenous entrepreneurs a fair chance to build capacity and expertise. A strong illustration of this is the petroleum sector local content policy and this could be replicated across selected sectors where there is high job creation potential and Nigeria has a strong competitive advantage. (National committee on Job creation, 2011) The house building industry definitely falls into this category and would benefit tremendously especially in the construction of affordable housing which requires various levels of skill sets.

A frame work toolkit will be created to assist the government and the officials assess the benefits and performance indicators for the policies to enable a proper delivery of a plan of action in line with the nation’s sustainability agenda.

Emphasis is being given to providing nationwide infrastructure and basic services in poor communities across Nigeria under the community based urban development program. This is in addition to the implementation of a national urban renewal and slum upgrading programme (MDG report 2010)

With the country in a new dispensation with the just concluded national and local elections, it's hoped that the policies that are in place and new ones to be passed will be geared towards the national interest and effective speedy delivery of much needed services and infrastructure to the populace.

Its hoped as this research progresses for structured interviews, questionnaires to be sent out and further information gathered and analyzed to assist in coming to some reasonable outcomes that would be useful in creating policies of national interest, that would ensure that the financial, social, environmental and knowledge transfer requirements are met. There needs to be cooperation across the board amongst the building professionals and the policy makers allowing a proper synergy of both parties to work for the common good.

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Winning in the Long Run? The measurable impact of sustainability characteristics on the financial performance of office and retail properties in Europe (Working Paper 6)

Bernet J, Sayce S, Ledl R, Vermeulen M

Abstract:
This paper reports on the first empirical findings of a RISC ET supported project aimed at establishing data which links the financial performance of standing commercial property investments within a range of European property portfolios, with their sustainability characteristics. The conceptual model for the work was established last year in a series of working papers including a presentation at COBRA 2010 (Bernet et al, 2010). It is important that this model is not reliant on any building being analysed having a 'green' certification as few buildings in continental Europe are so rated and rating systems where used vary in their composition.

The project is in response to the requirement for investors, many of whom have now adopted a policy of moving towards responsible investment, to better understand the financial implications of their adopted strategies. Since the authors, a team from Danube Krems University and Kingston University, set up the project last year, investors from across Europe have supplied data from real assets of institutional investment portfolios across Europe, from Portugal to Denmark and from Scotland to Hungary.

This data is being supplemented by location and economic data and the sustainability indicators chosen are building on previous research and using the Sustainability Reporting Guidelines of the Global Reporting Initiative GRI (Version 3) and the Construction and Real Estate Sector Supplement CRESS (Final Draft). The environmental aspects are measured in accordance with the Best Practice Recommendations on Sustainability BPR of the European Public Real Estate Association EPRA (Draft Version), referring to the common metrics identified by the Green Property Alliance GPA (Ground Rules for Property).

The sustainability and financial data is being analysed using customised investment software and standard data mining tools such as SPSS Statistics in order to present first findings in a quest to establish whether or not, currently, there is indeed a 'Green Alpha'.

Keywords:
real estate; sustainable investment; financial performance; empirical analysis; green alpha

Urban real estate and land economics

1893

Reflections on an institutional analysis of customary tenure in Uganda

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Abstract:
This paper is grounded in a project supported by RICS Education Trust related to UNDP's Territorial Approach to Climate Change (TACC). Following pilot interviews with members of the Bagisu tribe in Eastern Uganda we posited a hypothesis that secure tenure does not necessarily require land registration [cf. de Soto] and that good governance of land does not require a [formal or indeed any] market.

This paper reports subsequent encounters with members of the Acholi, Langi and Iteso tribes that begin to test the hypothesis; it reports discussions with LEMU (the Land and Equity Movement in Uganda) on complimentary research funded by USAid and, finally, it reports the early experiences of the TACC project in developing an Integrated Territorial Climate Plan in a context where customary forms of land tenure dominate.

These various reports form the context for a theoretical discussion of the nature and trajectory of the customary property relations that are so extensive in sub-Saharan Africa. The paper seeks to explore whether replacing the customary forms observed here with 'free markets' may be a loss of socio-diversity as damaging for human futures as a loss of bio-diversity. Markets are primarily concerned with allocative efficiency, but here we ask whether the enormity of the land crisis demands forms of adaptive efficiency that transcend the market mechanism.

We make no firm conclusion other than affirming Montagu's dictum (1976) that, “In humans... the rules governing property are culturally determined and are learned; there is no pattern of signals common to the whole species.”

Keywords:
institutions, customary tenure, Uganda

1 Introduction

In an earlier paper (Jenkins et al, 2009) we reported on a three day workshop that aimed to define sustainable development as a set of principles, a strategy and an action plan with the people of Mbale, Uganda under the auspices of the Coalition Against Poverty (CAP). In a subsequent paper (Jenkins et al, 2010) we reported how the emerging sustainable development strategy began to dovetail with the UNDP Territorial Approach to Climate Change (TACC) pilot project in Uganda. And we undertook primary research among the largest people group in the region, the Bagisu, in order to discover

whether the customary tenures would be a help or hindrance to sustainable development aspirations. In this paper we discuss the nature and trajectory of the customary property relations that are so extensive in sub-Saharan Africa consequent on the institutional analysis of the forms of customary tenure that we have identified among other people groups in this region.

The preliminary conclusions of our earlier publications provide working hypotheses for the research reported here. Contrary to expectations, we discovered a well developed tendency to privatised rather than communal property institutions among Bagisu. This tendency co-existed with a deep trust in customary, informal property relations. The experiences of the Bagisu suggested that secure tenure does not require land registration and that good governance of land does not require a market, at least not a well developed market. It seems that some forms of investment, like the early action portfolio within TACC, are no more at risk in areas of customary tenure than areas where land is registered. Indeed, paradoxically, large tracts of customary land are held and transferred peaceably in the Bagisu region, whereas more acute and frequent disputes predominate in Kampala and the Baganda heartlands where social capital is focussed and most registered land is to be found. Nevertheless we discovered in our discussions with Bagisu a worrying trend to land fragmentation and an expectation of increasing disputes over land.

We were also concerned about the assumption in earlier versions of the UN FAO discussion document, Towards Voluntary Guidelines on Responsible Governance of Tenure of Land and Other Natural Resources (2009) that

> Essentially, the existence of communal and customary tenures must be respected but somehow this must occur within "properly functioning land markets." (Pratt, 2010)

As we previously suggested, it is only in western economies that institutional analysis invariably encounters 'the market' (Ball, 2006, Dale et al., 2002, Viruly, 2009). While the view from the 20th century seemed to confirm a movement towards markets, we doubted that this is inevitable. Partly ours was a theoretical understanding inherited from social anthropology

> In humans... the rules governing property are culturally determined and are learned; there is no pattern of signals common to the whole species. (Montagu, 1976)

But partly because empirically we know that the root of all property systems is not markets but power relations (FAO, 2009, p5).

In fact the UN FAO has removed this tension between 'respect for communal and customary tenures' and 'properly functioning land markets' from more recent versions of the emerging Voluntary Guidelines. As will become apparent, our subsequent journey through eastern Uganda and our encounters with Land and Equity Movement of Uganda (LEMU) identified institutional frameworks that were more communal and less marketised yet than those of the Bagisu. Out of 'respect for communal and customary tenures' it would be wholly inappropriate to demand 'properly functioning land markets' in these contexts. Nevertheless, we envisage that the customary tenures are at significant risk. We identify this dynamic and in turn raise some new questions.

2 Research Methodology

The whole data collection process was intended to elucidate the mechanisms that are in use for the management and transfer of lands; to better understand the positive dimensions of customary tenure elucidated by those practitioners; to identify forms of risk that may compromise proposed investments, especially with TACC in mind, and establish community intentions in relation to perceived environmental and social threats.

There are three principal methods of research used here: documentary analysis, interviews and reflexive practice.

We previously reported significant documentation within the United Nations[1] (UNDP, UNEP & FAO specifically), within the Ugandan Government[2] and among Ugandan academics related to environmental degradation and climate change and their impacts on land. This is augmented appreciably by international sources, primarily the development departments of governments (DfID, SIDA and DANIDA are particularly active in Uganda) and international NGO's like IUCN, IISD etc. (A full bibliography will be published with an RICS Education Trust report). Additionally, the regional governments of Mbale have developed a Sustainable Development Action Plan and other documentation that integrates scientific and technical information about the region's economy, infrastructure, governance, climate and environment.

Since the publication of the earlier paper (Jenkins et al, 2010) we discovered the works of LEMU (Adoko and Levine, 2004, 2005a and b, 2007). This was particularly significant for the research program we identified in that paper, because it transpired that LEMU had undertaken a noteworthy research program of adjacent regions on related topics over a period of several years, funded by USAID and a private UK foundation. This allowed us to modify the original scope of the proposed research, specifically to trim some of the intended program (leaving sufficient to test LEMU's evidence in relation to the Langi, Acholi and Iteso people groups) and creating opportunity to encounter groups over a wider geographic area.

The scale of LEMU's research is significant. Over a period of several years between 2002 and 2007 Adoko and Levine undertook extensive investigations into land rights issues among the Acholi, Langi and Iteso peoples. They were able to survey all land owners in a series of randomly selected counties using qualitative research tools. They have also been engaged in a critique of the government's land policy and legislation and have made several submissions to the government's consultative process on land reform. They campaign for land justice in Uganda and provide enabling services to communities.

They point to the monetising of the economy and the way in which "commoditisation undermines social ties in subtle ways." They point to the weakening of the clan structure and the gradual usurpation of its social and administrative roles by the Local Councillor (LC) framework. Their chief claim relating to land policy and legislative framework in Uganda is:

1 Charting a New Low-Carbon Route to Development: A Primer on Integrated Climate Change Planning for Regional Governments (2009) UNDP provides a useful bibliography.

[2] The UNDP TACC Project Document (January, 2010) compiles Ugandan government publications and programme plans.

> Despite a legal context, which is very favourable to customary tenure, Government policy has been seen most clearly in its practice, and it has clearly shown no interest at all in customary tenure. Whatever the intentions of Parliament in passing the 1998 Land Act, the Government's interest in recognising customary tenure was in order to facilitate the privatisation (their emphasis) of land, to enable the growth of a land market, and the acquisition of land by "investors". Various provisions made in the 1998 act to support and protect customary tenure have never been implemented (see below). The Government has taken away the authority of 'customary' institutions of land administration for administering land held under customary tenure, despite the clear statement of the 1998 Land Act. Given that one of the rules of customary ownership is that land sales are prima facie not allowed (though a sale can be accepted if good reason is shown for allowing it), it is clear that giving authority on land disputes to state institutions will tend to accelerate the privatisation of land and undermine the protections built into customary tenure. (Adoko and Levine, 2005, p3)

While we have no quarrel with this analysis in general terms, we are impressed by the resilience of customary tenures. Our analysis of LEMU's data, verified by our own relatively modest efforts, is that it discloses a multiplicity of land institutions that varies between and within people groups. We see evidence of emerging markets; we observe strong traditional clan structures in some places; we see examples where the LC system has come to dominate: we see examples where, in all this variety, hybrid systems of institutions exist that have little to do with tradition and even less to do with the actual law. We find that there are often competing authorities: for examples disputes may be referred to clan elders, or LC's or the courts.

The chief source of primary data was interviews, including several group interviews with tribal and community leaders collectively, based on the model of the pilot conducted in 2010. Such group interviews have the distinct advantage that consensus can likely be taken as factual for the participants, even if this falls short of objective proof. Sometimes this involved the bringing together of participants who knew each other (as when the interview took place with village elders ~ and twice in the company of the whole village) and sometimes we brought strangers together so that their corroboration of facts or events suggested a high degree of reliability. In the event, we interviewed along the eastern/ northern axis of Uganda between Mbale and Gulu, as well as within greater Mbale.

For the study as a whole, land owners from the Bagisu, Langi, Iteso and Acholi people groups were approached to ascertain land institutions[1] and something of their cultural context. We attempted to create a form of group interview that approached a natural conversation, but structured in the sense that thematic areas were systematically pursued: on ownership and control over lands; on land financing; on land sales etc.

It was important for the group to select the setting. The interviewer acted as facilitator, prompting the discussion as necessary. The purpose of the interview would be explained in general terms. Consent and anonymity were discussed prior to the

[1] To include modes of land transfer, land use allocation and management

'conversation.' Consent was always granted to publish (sometimes anonymity was requested) and consent was usually granted to tape conversations. Culturally it was important to thank the participants in some way: this included the provision of soft drinks as well as small monetary payments. The 2010 pilot interviews were conducted in English and transcribed and analysed using Nvivo. Subsequent rounds of interviews with landowners were conducted in February, March, April and May 2011. These interviews were conducted through interpreters in five languages and the findings depend on translations that were provided at the time of interview and recorded on tape together with written field notes.

Eight group interviews were conducted. Interviews also took place with

- Individual landowners
- The Secretary of the District Land Board in Mbale regarding formally registered lands, informal tenures and points of conflict and their nature.
- A selection of natural resources officers and planning officers of Mbale, Manafwa and Bududa district councils.
- Representatives of two international firms of Chartered Surveyors based in Kampala.
- Judy Adoko of LEMU.
- The following were also important in contributing to the picture provided here
- Lectures were presented on the subject matter to Students and Faculty of Makerere, Kyambogo and Uganda Christian Universities. Formal and informal feedback was illuminating.
- A CPD lecture on the TACC process was presented to the Institution of Surveyors of Uganda (5th May, 2010) together with a feedback session regarding tenure related risk.
- Site visits and meetings with 3 of the 4 NGOs that are implementing the series of A/R[1] projects identified within the TACC process and a subsequent seminar with all 4 NGOs.
- Meetings that formed part of the TACC process. This includes discussions with the Programmes Director and staff of the UNDP in Kampala, a TACC donors meeting, meetings with DfID Uganda, and two TACC Project Board meetings.

A further twist to the original research intention occurred when one of the authors acquired roles in the TACC process beyond that envisaged when the research was engaged : the transition from observer to participant bringing with it a personal and epistemological reflexive element.

3 Findings

3.1 Findings on tenure

Ugandan land law is embedded in the 1998 Land Act that

> … recognises customary tenure as a legal form of tenure and customary rights holders can be individuals, families or communities. Palmer et al (2009)

[1] Afforestation/ Reforestation

The amount of land under customary tenure is said to exceed 80% for Uganda as a whole (Batungi, 2008). As regards the study region, almost the whole is subject to customary tenure. The legislation establishes a method of registration for freehold and leasehold tenure but the rate of conversion is very slow. According to the Secretary to the Land Board in Mbale only a few hundred small parcels of land are registered each year. The governance of this is quite complex, expensive and open to abuse (Jenkins et al, 2010). Even a fast track approach known as systematic land demarcation that was introduced to Mbale in 2009 appears very slow.

There are variations in the model of tenure between people groups: variations include the extent to which the forms of property are privatised versus communal; who can own land; the ways in which land use is managed; rules of inheritance; dispute resolution processes; the extent to which the local state has been permitted to engage with the regulation of land ownership.

As we travelled north from Mbale to Gulu and examined the different tribal land institutions, there was a sense of sedimentary analysis: different layers exposed as if an auger had taken a sample core. And as we examined the deeper levels of the core we found a tendency for greater communal traditions of land holding and inheritance. In the pilot study we heard Bagisu perceptions of Iteso and Acholi ways with the land. As we encountered these peoples directly we were able to confirm some of these perceptions. However, care needs to be taken here to avoid a romantic and generalising trap. The reality is that different clans within tribes have developed different institutions and the outcome is a complex patchwork.

As an example of this, we reported how for Bagisu inheritance operates after death through the "heir" (pronounced "hair"). Literacy and competence feature in the selection of the heir, which involves *consultations* within the clan. However, it is the heir's task to distribute the land between those entitled: all sons. Bagisu own and hold their land individually. Where wealth is held in landed assets their distribution on inheritance leads to fragmentation. This has become a significant problem for Bagisu. Among the neighbouring Iteso, whose practice is much more varied, we engaged with one village near the town of Kumi, where inheritance was *decided with* the clan. Indeed, we discovered from two elders that their land had been redistributed though they were still alive. No heir was appointed, perhaps unusually among the Iteso (Adoko and Levine, 2007) and this gave them greater say in how the land would be allocated. Nevertheless this was a collective decision. And this was traditional: they too had inherited the land from fathers who had still been alive. It was apparent that they were polygamous and they saw this as a way of avoiding disputes later. Further north, one farmer of the Langi people explained to us that the matter of inheritance was *decided by* the elders. His father's land had been inherited by four sons but it had not been distributed between them but was owned jointly and managed co-operatively. Among the Acholi in the north, we heard that while farmers managed land as individuals or families, the tenure was depicted as being communally owned and land holdings are kept together on inheritance. Nor are decisions matter for elders, but the clans come together and *collectively decide.*

In regard to these communal tenures, we need to make further enquiries about the substance of decision making. It was not suggested for instance that land is allocated by elders on the basis that services might be provided as in a feudal system. Nor does it seem that land is allocated according to some arbitrary (ab)use of power: among the Langi clan elders are elected at sub-county level and held accountable.

In relation to security of tenure there was no mention made among the Langi and Acholi of the kinds of disputes that disrupt quiet enjoyment among the Bagisu. Among the Langi disputes over land are resolved via a judicial process. Such disputes are resolved peaceably by and large, though sometimes there is frustration at the length of the dispute process. Among the Acholi, the idea that someone would grab land was greeted with mirth. Disputes do occur within the clan gathering but they are also settled there. No appeal is made to district officials as is common in the immediate area around Mbale. ACODE[1] also confirm that the corridor North West from Mbale through Kumi and Siroti toward Gulu is not one that is associated with land conflicts.

To all intent and purposes these tenures are securely held and very little land is registered.

There was far less population pressure among the Langi and Acholi than Bagisu and everyone had plenty of land to farm that wanted it. One developing issue for the Langi concerned 'no man's land.' These communal lands had once been plentiful and hunting and grazing occurred over large areas. In recent times encroachment on these lands was the source of increasing disputes. Among the Iteso we discovered exactly the same phenomenon but here we heard from a council official that was attempting to reclaim 40 square miles of such land. The Acholi also enjoyed 'free land' without the difficulties described in Lango and Iteso.

3.2 Findings on land markets

As regards land markets our research establishes that institutions about disposition of land assets exhibit similar variety. Already we identified very thin markets among the Bagisu. One well known western aphorism may help here: two people may trade, but it takes three persons to have a market.

The rural Bagisu are reluctant to sell land and essentially it requires that people fall on hard times. When this happens, the seller seeks to trade. The pecking order appears to relate not to price but to trust: the preference is for a family member, a clan neighbour and finally someone drawn more widely from the clan. There also seems to be tacit recognition that if someone recovers their personal situation, there may be a buy-back.

In Mbale town, while there are no professional estate agency services[2] (apart from survey), it is not unknown for outsiders to acquire property, though this is a more precarious business, and for true foreigners (muzungus) any interest acquired in land is subject to the restrictions imposed by the Uganda Investment Authority.[3] However, we are aware that wealthy investors are engaged in acquiring portfolios of urban land and that as a consequence there is a growing awareness of land value and much discussion about rising real estate prices. The value of land was particularly high in trading centres, where the returns to land from small 'lock-up' premises are high. The competitive exchange of small scale land assets between strangers is still a rarity and given the customary nature of the tenure, such incipient markets remain informal.

[1] http://www.acode-u.org/

[2] We noted earlier (Jenkins et al 2010) via interviews with chartered surveyors in Kampala and feedback from ISU suggest that there is insufficient commodification of property rights to support estate agency businesses.

[3] There are many cautionary tales about foreign investors subsequently losing property to native claimants.

Among the Iteso the acquisition of land by outsiders is far less likely. Among the Langi, landowners have no right to sell without due process and permission from the clan elders. One respondent told us that he would not be able to sell land to meet school fees, though he might be granted permission to trade land if one of his children showed sufficient promise to go to University. This might bring clan benefits. While the price of a hectare of arable land varied between £150 and £250 in this gentleman's village, dependent mostly on location ie distance to the land from the village, most people would not have cash to acquire the land, borrowing money was very unlikely and bartering was common, a cow being worth £130 or so.

Among the Acholi, the clan is dominant. The clan or koch is comprised of extended family units, and within the family unit 'everyone' of age has a 'garden' to tend. The proceeds of the gardens are pooled and surpluses are sold by the family. We talked to a successful lady farmer who has 30 acres under cultivation with 16 family members. She explained that she did not truly own the land; that no individuals own land. Ownership remains with the koch who would theoretically make any decision to sell. It does not countenance sales of land. Where the kind of problem arises that among the Bagisu prompt land sales, the Acholi would have a clan meeting and make a collection to assist the one in need. She described a case in which a brother had killed someone from a neighbouring clan. In this case her koch raised the money and paid compensation to the dead man's clan. She acknowledged that in rare cases some clans, if weakened, for example family size had shrunk because of illness and death, may trade land.

Such tenurial forms are complex: no single owner enjoys all the rights in land. We disagree with LEMU's analysis on this point. They suggest (Adoko and Levine, 2005, p5) that because the farmer controls the use of the land, that the land should be regarded as privately owned.[1] But in circumstances where the farmer cannot buy or sell, their position is analogous to a tenant farmer. Of course, in the exceptional case where land is sold, the proceeds belong to the farmer and their position is analogous to private ownership. In the future, if clan structures weaken as LEMU predict, more land might be privatised, though it needs to be remembered that the outcome of a decision to sell is usually a trade within the clan and not an open market sale.

The lady farmer had also acquired a 'lock-up' shop in town where the surplus was sold and where she traded in other goods acquired from past surplus. The clan's jurisdiction did not run over the urban land. A lawyer had verified papers relating to it, though from the description of the process it is unlikely that this was registered. In relation to this business she would consider a commercial loan from a bank to acquire more land: this would not happen to clan owned land.

Our preliminary hypothesis was that good governance of land does not require a formal [or indeed any] market. We have not encountered evidence that contradicts this. Nor have we encountered evidence to suggest in relation to the farming of land, that the practices of these tribes people are sub-optimal. Once upon a time the World Bank and others would have argued that there was insufficient investment in the land and that underinvestment was due in part to communal ownership that was problematic as collateral. However, there was little real evidence of this historically and most lenders have moved on. What we can say is that most of these peoples exhibit a preference for forms of polyculture over monoculture.

[1] This assists them to build a case for investment in customarily held land.

3.3 Findings on investment risk in relation to ITCP

The TACC project identifies the need for an Integrated Territorial Climate Plan (ITCP) that in turn identifies strategic projects that lead to sustainable forms of economic development. These projects will be medium to large scale, aimed at infrastructure provision and suitable for funding by carbon markets. In order to give confidence to the communities a number of lesser scale, quick win projects have already been established. Chief among these[1] were four reforestation projects that would require extensive planting on customary lands.

Jenkins et al (2010) established that a presumption of increased investment risk due to the customary nature of tenure is not warranted. We noted how fears about land disputes have receded as have worries that customary tenures might be too transient for stable management. In relation to reforestation projects the real problem for sustainability comes from population pressures that may jeopardise growth-to-maturity, but they are thought to be tenure neutral.

One tenure related challenge remains: the rules regarding certification of reforestation schemes within the Clean Development Mechanism are complex and although "projects with different land tenure situations can effectively participate in the CDM" (BioCarbon Fund, 2011) in practice there are many obstacles. This is a shame in that the operation of the CDM can lead to enhanced security of tenure for land owners and the BioCarbon Fund has suggested a series of recommendations to ease restrictive rules (ibid.).

Furthermore Kerr et al (2006) have demonstrated that the Land Use, Land-Use Change and Forestry (LULUCF) sector does not favour poor communities. Nevertheless there are alternative possibilities on voluntary carbon markets and as the TACC Project Board has heard "Under Ugandan legislation, customary tenure (either inherited or granted by customary authorities) will generally suffice in terms of the tenure requirements for the carbon methodology" of some schemes.[2]

4 Discussion

At the micro level we identified a rich variety of institutions and meanings and were able to get some understanding of the interactions that we encountered by reference to some familiar labels and one or two not so familiar labels (muzungu, koch). An explanation for these differences is more difficult to establish. Culture is clearly important. We noted how the Bagisu described themselves as being business-like and entrepreneurial and it might therefore come as no surprise to see them in the vanguard of privatising tendencies as regards land. Many of them do not necessarily like what they now experience in the land as a consequence of this disposition and it is equally unsurprising to see some envy their northern neighbours.

The situation of their northern neighbours is also culturally conditioned. For example, the Acholi are seen as war-like, the Iteso as pragmatic. The long exposure to and experience of the Acholi in the northern conflict helps explain this. We can speculate that the stronger bonds of the clan are an outcome of social organisation required to survive conflict.

[1] Other projects concerning fuel efficient stoves and soil stabilised brick manufacture are less impacted by considerations of tenure.
[2] Technical feasibility assessment of the TACC project for the Mbale Region of Uganda.

Clearly also environment will have a significant impact on cultural development. We were able to note differences between urban and rural institutions. There is prima facie evidence of the town as the catalyst of social and cultural change. The experience of Bagisu in the crowded foothills of Mount Elgon is quite other than the experience of the peoples of the northern plains.

We hope to extend our understanding of this micro-scale variety and we are developing a greater multi-disciplinarity in the pursuit. But our purpose in this discussion is to approach the issue from a macro level. We do not approach this from classical perspectives within social theory: the analysis is not functionalist, or bedded in conflict theory. We aim more modestly to provide a narrative account that contextualises our findings.

In this narrative, advanced capitalism brings its land systems to Africa ~ its own norms and institutions, the norms of privatised and commodified property relations. Of course these are not static and the innovative forms that they bring may well find fertile soil or new syntheses in Africa (derivates in customary tenures for example). However, these property forms meet with resistance ~ the norms and institutions of tribal and customary tenure. Competition between jurisdictions is mostly carried on using peaceful means, though in the postcolonial as well as in the colonial period, this erupts periodically in violence. Ultimately the new property relations are and are seen to be the more powerful: they are supported by the institutional apparatus of global finance. These property relations are identiied with progress and they spread, but unevenly, in part dependent on the culture and power of indigenous groups. Metropolitan elites, representing the dominant global system, vie with or negotiate with powerful tribes and nations. Ultimately the global system is likely to predominate: the condition for this is its internal credibility.

Placing Uganda in this scenario is relatively straightforward. We begun the process with a discussion of the hisorical development of land institutions in Uganda (Jenkins et al, 2009) noting the British influences. Indeed Uganda's current property systems were much influenced by officials from the UK (see McAuslan 2003). This system dominates in the metropolitan heartlands, where there is resistance from the traditional Buganda kingdom, though this resistance is now perhaps more to do with who manages the new system than the competition between jurisdictions. Nevertheless we have made mention that the writ of customary tenures still runs over 80% of the Ugandan nation. This is a significant testimony to the enduring strength of tradition, but arguably today that strength is more apparent than real. To different degrees among different people groups the 'progressive' system is leading to pressures that privatise and commodify land *within* traditional strongholds. If LEMU is right, even a strong self confident culture like the Acholi, with its taboo on sex before marriage and consequently low population growth and stable land availability, has been undermined by war and the culture of the IDP camps.

Our estimate is that this lengthy period of stalemate between the juridictions is coming to an end. The dynamic is not driven primarily by internal pressures, but by the global land crisis [Jenkins, 2009] and the particular expressions of that crisis that pertain in Sub Saharan Africa and that we have described in Uganda. The world's land crisis is driving higher prices and ever bigger transactions on continental Africa (Smaller and Mann, 2009). Moreover, it seems that global jurisdictions will take precedence over local, regional and national jurisdictions (ibid.).

In our futures, a generalised problem of land supply will be the source of intensifying conflicts unless imaginative solutions are heard and demonstrated. Part of our concern is peacekeeping and peacemaking. It is clear that disputes over land in Uganda will intensify as and when the clan structures weaken further and that an apparatus for conflict resolution is wanting.

But another issue of primary concern is the path dependency of the global system. The lack of socio-diversity is something that humanity might come to regret. And this is something that may have gone unnoticed but for the disaster and disruption to global economy that was caused by its own recent internal crises. These observations suggest the need for further reflection at this particular threshold. Is there something of value that will be lost if the customary systems disappear? Are those systems capable of withstanding the land crisis on their own merit? Do they potentially offer anything back to the dominant system? Are they capable of innovative syntheses?

Note that at this point we are saying nothing about the relative efficiency of global versus customary relations: elsewhere Jenkins identifies North's apologism for the US as a superpower (Jenkins, 2009b). Nor at this stage in the argument are we saying anything about the ethical merits of one system over against the other.

What Hayek (1960), Huxley (1964), amongst others, pointed to, was the necessity of creating an environment in which alternative approaches to problem solving are encouraged: maximising *adaptive* efficiency, in contrast to the *allocative* efficiency that consumes business and government interests. More recently, Sim (2009) suggests that such a 'one size fits all system' is a strategic error. Globalisation is not a tide to be turned, but the form and institutional framework of globalisation is very much at stake. Will it be one dimensional or will it enable diversity in relation to the land among other things?

We can visualise the possibilities of experimentation within nation states within known property forms in the Figure 1.

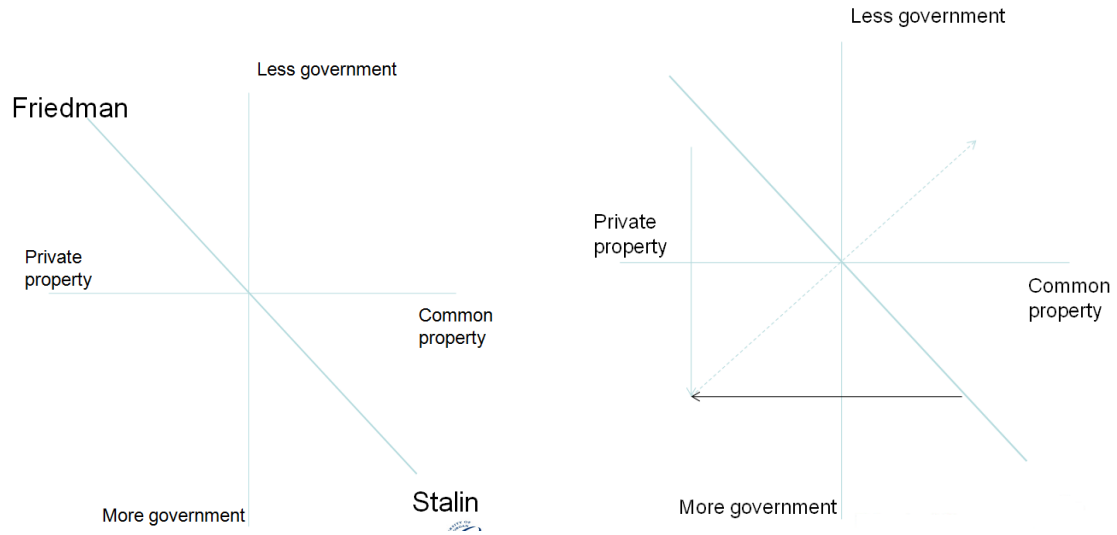

Figure 1 Here we see (left window) the main axis of 'experimentation' in the last half of the twentieth century, and (right window) current trends as a post credit crunch America thinks of big government again, while China thinks about private property.

The customary tenures occupy the top right quadrant. We might identify them as Big Society forms of property tenure. The questions we pose concern their future: will they have one, should they have one?

5 Conclusion

This paper reports encounters with members of several tribes in Uganda as well as with a series of representatives of Ugandan national and local government and non government organisations, as well as international governments and the UNDP engaged in the TACC project.

It describes the rich variety of tenurial forms and relationships that pertain on the land in northern and eastern Uganda. We conclude that these relationships are under threat and primarily because of pressures on global land supply. We invite discussion of our findings.

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Urban regeneration policy and practice

Reconceptualising the management of urban regeneration in the Asian region through resilience.

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Abstract:
Recent thinking amongst conservationists, urban planners, and those in the cultural field, has focused on differences in the views and beliefs about cultural heritage and urban regeneration. Examples include the approaches to and understanding of conservation in the Asian region that tend to rely on total reconstruction or restoration to preserve monuments in the urban environment. This is underpinned by the belief in the importance of intangible values as opposed to tangible, the spiritual aspects of a site or place and the relationship between landscape and monument within the cultural landscape. There have been attempts to address these differences. Conservation guidelines such as the Nara Document on Authenticity and charters such as the Burra Charter provide flexibility in interpretations of cultural significance. However, the debate remains fractured and the solutions provided remain firmly within the Western/Euro-centric mechanistic reductionist worldview. This paper proposes and alternative theoretical framework to understanding and interpreting the process of urban regeneration in the Asian region by adopting the principles of resilience thinking. Resilience thinking engages in a transdisciplinary way the dynamic interconnections and interdependencies amongst the key systems of the urban environment. In summary, the work in the field of resilience thinking has made great gains in providing an understanding of the complex nature of social-ecological systems and how these could be better prepared to deal with disturbances and in the long term be sustainable. From the studies on urban resilience there is potential for an exciting opportunity to rethink our understanding of cultural built heritage and urban regeneration as a social-ecological system developing a more universal approach to its regeneration and ultimately its sustainability.

Keywords:
Urban regeneration, resilience thinking, cultural built heriatge, adaptive cycles.

1 Introduction

Recent thinking amongst conservationists, Architects, urban planners/designers and those in the cultural field, has focused on differences in the views and beliefs about urban regeneration and cultural heritage (Taylor and Altenburg 2006, Seung Jin, 2005, Taylor 2004, Wijesuriya 2004, 2003b, Chen and Aass 1989). Examples include the approaches to and understanding of conservation in the Asian region that tend to rely on total reconstruction or restoration to preserve monuments in urban contexts. This is underpinned by the belief in the importance of intangible values as opposed to tangible.

The spiritual aspects of a site or place or monument rather than any material or tangible evidence are significant. (Taylor and Altenburg 2006, Seung-Jin 2005, 1998, Taylor 2004, Munjeri 2004, Wijesuriya 2003b, 2003c, Mackee and Briffett 2000a).

These approaches often conflict with current conservation practices as stated by bodies such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the World Heritage Centre (WHC). This particular attitude, often attributed to the Asian region, is not supported by the theories of conservation or urban reconstruction founded on the large body of Western/Euro-centric cultural and philosophical traditions adopting the Venice Charter (ICOMOS 1965) and other international and national charters (Chen and Aass 1989, Agrawal 1975). There have been attempts to address these differences. Conservation guidelines such as the Nara Document on Authenticity (Larsen and Marstein 1995, ICOMOS 1994, Stovel 1994), Hoi An Protocols (UNESCO 2005) and charters such as the Burra Charter (Australia ICOMOS 1999) provide flexibility in interpretations of cultural significance. However, the solutions provided remain firmly within the Western/Euro-centric mechanistic reductionist worldview.

Many people researching in this field have written on how these values manifest themselves in the context of interpreting and incorporating cultural heritage into urban regeneration in the Asian region (Taylor and Altenburg 2006, Seung Jin, 2005, Taylor 2004, Wijesuriya 2004, 2003b, Chen and Aass 1989, Agrawal 1975). Fewer people have attempted to explore these differences and how they might translate to an alternative appropriate approach to including cultural heritage in urban regeneration in the East. These attempts have only been within the scope of proposing country specific charters (Seung Jin, 2005, 1998, Taylor 2004, Menon 2003, 1994). MacKee's (2009a, 2009b, 2009c, 2008, 2007, 2006) work attempted to bridge this divide by postulating an approach that used as its starting point the philosophical and cultural traditions of the region linked to established synergies with systems theory. A recommendation for future research from this paper was the potential of resilience thinking to provide the foundation for an alternative approach to urban regeneration and the greater inclusion of cultural built heritage.

This paper seeks to develop the potential for a theoretical framework for the merging of urban regeneration and the field of resilience thinking presenting a literature review and the basis of a theoretical framework and agenda for future research.

2 The notion of Resilience Thinking

Research has shown, in general, systems are holistic, strongly connected, operate cyclically and to support the cyclical processes rely on feedback loops (Macy 1991, Laszlo 1972, Bertalanffy 1968). In studying the changes that occur in natural eco-systems research has led to the notion that these systems are invariably very complex (Walker and Salt 2006). The highest level of complexity is evident in social-ecological systems, that is the relationship between human systems and ecological systems (Berkes and Turner 2006, Walker and Salt 2006, Berkes, Colding and Folke 2003, Holling 2003, Berkes and Folke 1998). Understanding the complexity of these co-evolving systems their interrelationships, change dynamics and transformation has provided the rich foundation for looking at the 'resilience' of these systems (Berkes and Turner 2006, Walker and Salt 2006, Berkes, Colding and Folke 2003, Berkes and Folke 1998). At the heart of resilience thinking is the very simple notion of coherence despite change

and the idea that to ignore change is to increase our vulnerability and forego emerging opportunities (Walker and Salt 2006, pp 9-10). In resilience thinking humans and nature are considered as elements of the one system, as they are interdependent. To think of one in isolation of the other is to come up with only a partial solution (Walker and Salt 2006). In essence, Resilience, defined by Walker and Salt (2006) is a systems capacity to absorb disturbances without a regime shift and they see it as the key to sustainability (Walker and Salt 2006, p38).

2.1 Resilience thinking in the context of urban regeneration and cultural heritage

A component of resilience thinking that has direct links to the notion of urban regeneration is the model of the adaptive cycle (refer figure 1). This has been derived from comparative studies of the dynamics of ecosystems and how they recover and reorganise after catastrophic events. This adaptive cycle has four distinct phases that are representative of ecosystems and more significantly for this study social-ecological systems. These four phases are (Resilience Alliance 2009):

Growth or exploitation (r)

Conservation (K)

Collapse or release (Ω)

Reoganisation (α)

Represented in this cycle are two major phases often referred to as 'transitions'. The first phase or *foreloop* that runs from r to K is characterised by slow incremental phase of growth and accumulation. The second of these phases is the *backloop* from Ω to α and is the rapid phase leading to reorganization and growth (Resilience Alliance 2009). This adaptive cycle model is used in resilience thinking to explain how ecosystems adapt after catastrophic events.

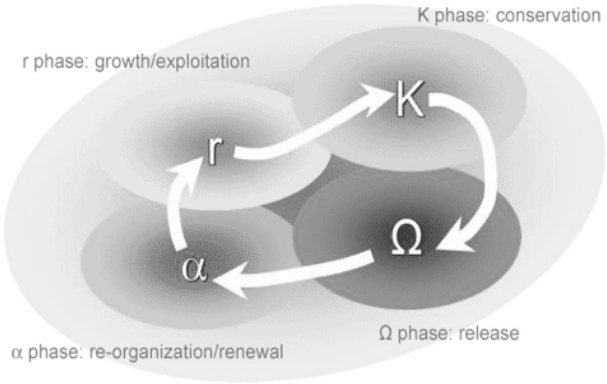

Figure 1: The model of the adaptive cycle developed by the proponents of resilience thinking. (Source: Resilience Alliance http://www.resalliance.org/570.php)

Another link between resilience theory and its potential application for urban regeneration is Redman's (2005) discussion of the notion of resilience thinking in archaeology. He postulates that "*…resilience thinking looks at change transformation and adaptive cycles and archaeology provides the opportunity to study not only one completed cycle but multiple completed cycles* " (Redman 2005, p70). Redman's

contention is that the study of persistence and change in systems is at the heart of resilience thinking and can be verified by archaeology in the study of many systems historically over time. In so doing archaeology confirms the notions of adaptive cycles of change and transformation and the dynamic changes that occur over time in social-ecological systems (Redman 2005). Redman's study has implications for the current research in that, as with archaeology, the conservation of buildings and specifically large areas of aging urban centres is about dealing with persistence despite change and transformation. This changes the temporal, utilisation and management contexts. For cultural built heritage archaeology establishes and confirms the changes and transformations that have occurred to the monument over time. This allows us to understand previous life cycles and to plan for the future.

Redmen and Kinzig (2003) continue the notion of adaptive cycles as evidenced over time in archaeology. This article investigates resilience theory because of its explanation of 'the role of change in adaptive systems'. This is in order to see the transforming stages making it highly relevant to use to understand archaeology, in particular studying the 'resilience of past and present societies' as they are adaptive and changing. They state that this approach is not common in other disciplines. The authors go on to explain resilience theory and then continue to show how when it is used it can have 'complementary or contradictory conclusions' and finally they discuss the idea of a 'long-term integrative perspective for understanding linked social and ecological systems' (2003 p.14). They offer a detail description of the theoretical framework then show that collaboration has occurred with conceptualisation of these cycles in "ecology, archaeology and economics, among other fields" and they concentrate on Holling's (2003) use of the concept in ecology for their study. They show that there are paradoxes of resilience and adaptive capacity and critique the panarchy approach. They also state that resilience can solve problems in 'short run but not in the long term'. In their conclusions they bring in two case studies of archaeological societies to show the similarities in the use of resilience theory to understand ecological changes and show what parts work and what do not in the theory. They show that this theory is being more and more incorporated by archaeologists to "examine their historical processes within a resilience theory framework" (2007 p.14). The work of Redman (2005) and Redman and Kinzig (2003) provides the strongest argument for linking the concepts of resilience thinking to a notion of urban regeneration. The ideas of change, transformations and adaptive cycles are notions that are related to how the urban fabric can be perceived through time and explored in terms of conserving, incorporating and rebuilding.

The work of Childs (2001) looking at settlements and cities as complex systems similar to ecology, while not being explicit has implicit links to resilience. He makes direct reference to buildings and how they develop and evolve similar to a system. Childs (2001) uses 'biological evolutionary theory' to explain this process of change and interactions of buildings between each other 'giving rise to collectively made forms' (2001, p.55). He then considers the city as a civic ecosystem, as a "complex set of interactions among multiple buildings" which may 'give rise to aggregate forms and that these can change over time depending on flow of resources in communities. Here Childs considered 'coherence' and 'resilience', he gives the example of how ruins are a result of disaster and examples of resilience or lack of for cities. He states that not all change is 'cataclysmic' and that "different systems have different degrees and types of resilience" (2001, p.69). Childs concludes to show that buildings are not isolated entities as they "alter each others fitness" (2001, p.70). This work is informative and

useful in looking at how resilience might be considered as a basis for looking at the conservation of cities if they are thought of as complex systems.

This work points toward a method of looking at urban regeneration through the lens of resilience. More specifically for the aims of this research they provide a very useful argument that culture; heritage and built heritage can be considered as systems that are interconnected and interdependent. The application of resilience thinking to the conservation of built heritage provides the opportunity to understand and deal with the persistence and survival of heritage against the persistent forces of physical, social and natural change. That is, resilience thinking engages in a transdisciplinary way the dynamic interconnections and interdependencies amongst the key systems in the built environment.

3 Discussion

Resilience is the capacity of a system to absorb shocks while maintaining function. It provides the capacity for renewal and reorganization. In a resilient system change has the potential to create opportunity for development and innovation. However there are four critical factors that must exist for the success of a resilient system these are presented in table 1.

Table 1: Four Critical Factors for a Resilient system (Source: Folke *etal*, 2002)

	Critical Factor	Description
1	Learning to live with change and uncertainty	Creating a knowledge base for how to relate to and respond to environmental feedback
2	Nurturing diversity for resilience	Functional diversity and redundancy as per nature
3	Combining different types of knowledge for learning	Integration of knowledge and their sources for a holistic approach
4	Creating opportunity for self organisation towards socio-ecological sustainability	Adaptive co-management by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organised process of trial and error

These four critical factors (Folke *etal*, 2002) provide guidance for developing a framework for applying the concept of resilience to the conservation of the cultural built heritage. The first factor would relate to the fact that built environment exists through time which impacts in uncertain unpredictable ways. The idea of a knowledge base provides for trying to deal with the uncertainty, again through the life of the piece of heritage, this implies research.

The second factor requires understanding of the nature of the piece of heritage and the diversity of the built environment within which it has come to exist. A requirement for

this factor in heritage is an understanding of the conditions of redundancy and obsolescence.

Important for the third factor is the in the context of cultural built heritage is the multidisciplinary approach and the knowledge provided by the many stakeholders. This is imperative for a holistic approach that has been suggested as currently lacking in heritage conservation (MacKee 2009a).

Finally the key to attaining the fourth factor is the understanding that urban regeneration can be a sustainable process with the implementation of the appropriate institutional processes. These must acknowledge the dynamic nature of cultural heritage and importance of a suitable management organisation.

Figure 2 shows an initial proposal for a comparative cycle that could be used to describe the life cycle of cultural built heritage. This is developed as a sub-set of the adaptive cycles of resilience to be used as a basis for exploring urban regeneration. In this cycle there are transitions. The first can be shown from the first stage of the cycle 'commission and operation' to 'obsolescence'. This is a long slow transition that is subject to the economic and societal demands of the environment in which the cultural built heritage exists. Similarly this is a phase of growth.

The next transition from 'obsolescence' to 'adaption/renewal' is one of decision-making and significant change. In this phase significant decisions are made about how to adapt the piece of heritage. This decision can be supported by scenario planning as suggested by Peterson (2003). In his paper he proposes scenario planning as a tool for decision-making because it "…offers a framework for developing more resilient conservation policies when faced with uncontrollable, irreducible uncertainty" (Peterson, p358, 2003). The notion of uncertainty describes the future of cultural built heritage in the Asian region in the context of rapid urban development occurring.

The third transition is to the planning and development phase. Once a decision has been made regarding how to deal with the urban fabric then work can proceed on development. Once planning and development is completed then the cycle recommences.

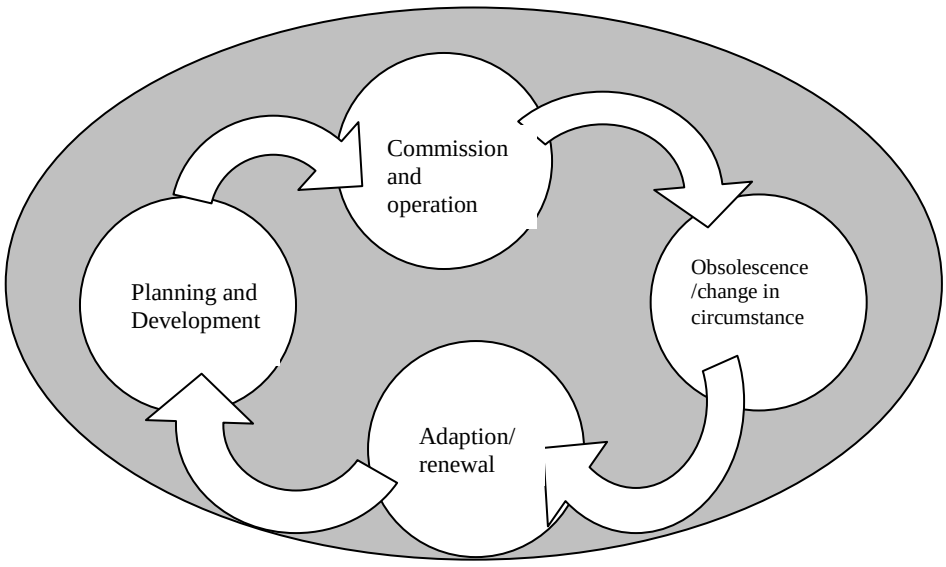

Figure 2: The life cycle of the urban environment. (Source: MacKee 2010)

The description of the life cycle in figure 2 offers the initial proposal for the integration of the adaptive cycles of resilience to urban regeneration. From these very first steps work needs to focus on the further integration of the four critical factors described in table 1. These are important to the success of the integration of resilience and urban regeneration.

4 Conclusion and Further Research

This paper has provided a literature of review of resilience thinking to support the merging of this field and urban regeneration in the Asian region. A number of writers in the field have highlighted discussed the differences that occur in the approaches of western and eastern based indigenous conservation practices (Taylor and Altenburg 2006, Seung Jin, 2005, Taylor 2004, Wijesuriya 2004, 2003b, Chen and Aass 1989, Agrawal 1975). This is evident in the rise of locally based conservation charters and guidelines (Seung Jin, 2005, 1998, Taylor 2004, Menon 2003, 1994). MacKee's (2009a, 2009b, 2009c, 2008, 2007, 2006). Documents such as the Nara Document on Authenticity (Larsen and Marstein 1995, ICOMOS 1994, Stovel 1994), the Hoi An Protocols (UNESCO 2005) and the Burra Charter (Australia ICOMOS 1999) are also evidence of this trend.

MacKee (2009a 2009b, 2009c) proposing an alternative approach to conservation in the Asian region has written on the synergies between traditional Asian philosophies and systems thinking. From this came the notion of resilience as an appropriate approach for developing a framework for an approach to urban regeneration.

The review presented here has outlined the beginnings of a potential theoretical framework for adopting resilience thinking as a way of managing urban regeneration. A component of resilience, adaptive capacity, provides the means for realizing this objective. Further work needs to be done however it would appear from this foundation study that great potential lies in the merging of resilience thinking and the management of urban regeneration. There are lessons in this study for the wider built environment outside the Asian region.

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