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Preface

Long-term collaboration in the FM sector is the subject of the project on *Inter-firm Collaboration in Facilities Management* conducted by SBi in cooperation with Centre for Facilities Management-Realdania Research, DTU Management Engineering.

This report presents the result of the project's first phase, literature studies. Theories and concepts of relevance for long-term collaboration in operational partnerships are discussed. The report is based on the report written in Danish: *Driftspartnerskaber og strategisk samarbejde. Længerevarende samarbejder inden for Facilities Management. Teorier og begreber*, (SBi 2010).

The report was written by Kresten Storgaard (projekt leader), Jacob Norvig Larsen and Ib Steen Olsen.

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Content

Organisation

Company Collaboration

Long-term collaboration have been known for a long time in most businesses, e.g. outsourcing, supply-chain-management (see e.g. Hoecht & Trott 2006, Bechtel and Jayaram 1997), learning and innovation in networks (Grabher 2004, Håkansson and Ford 2002, Gadde et al. 2003), and open innovation (Chesbrough, Vanhaverbeke & West 2006).

There are many examples of close collaboration between companies without formal agreements. This specific type of collaboration is highly valued within network-focused innovation theory (Arya & Lin 2007, Chesbrough, Vanhaverbeke & West 2006, Hoecht and Trott 2006, Wagner S.M. & Bukó C. 2005, Cooke and Morgan 1998, Braczyk, Cooke, Heydenreich 1998, Lundvall 1992, et al.).

In these theories, the nature of partner relations supports competitiveness and the theories are applied to understand why some companies or complexes of companies grow strong, thus enabling innovation, and why others do not.
An explanation of this has not only to be found in the efficiency of delivering goods and services. The firms' ability to collaborate is also part of the explanation. Collaboration based on trust, knowledge sharing and ability to mobilize existing organisational resources carries advantages not always contractually stipulated or governed.

At the agglomerational or industrial district level Michal Storper refers to untraded interdependencies between organisations or enterprises (Storper 1995).

Hardy, Phillips and Lawrence (2003) examined the interaction between strategic elements as management of critical resources and knowledge sharing, learning and knowledge transmission between organisations and organisation's behaviour in networks, and found that especially two dimensions contribute to a successful collaboration between organisations.

One dimension is how deeply the inter-organisational collaboration is rooted in the organisation; the other is the nature of the involvement. The prerequisite for a successful inter-organisational collaboration seems to rest within the participating organisations, and it seems that the social dimension is of great importance. In many ways this is in line with Wenger's (1998) and Duguid's (2005) understanding, where the ability of enterprises to establish and develop learning, knowledge and innovation is fundamentally ascribed to social partnerships.
 In theory, to focus on the advantages of close and healthy collaboration is important, rather than merely to focus on the advantages of technical, economic and contractual matters and to examine the possibilities of partnership development both between and within the collaborating organisations and enterprises.
However, in practice more concrete knowledge is needed about the development of successful partnerships, especially in relation to Facilities Management (FM), where purchasing of services is often more complicated than purchasing tangible goods. Services are intangible, heterogeneous and

timely expanded making it difficult to assess the precise nature of the service to be delivered (Lehtonen 2006).

Basically, the dilemma is how to gain the advantages of knowledge sharing when cooperating with other enterprises (networks, partnerships etc.) vs. the challenge of keeping control of one's own core assets and future strategy. The starting point can theoretically be seen as a simple transactional cost-related question (Dyer 1997, Williamsson 1986; 1975). We find that it is especially relevant to consider the importance of the collaboration for innovation and the interaction between organisational innovation and learning from a perspective involving trust, interaction and other social elements. Thus, the motivating and ruling mechanisms applied in the partnership have more dimensions than a traditional make-buy-dichotomy can catch. For this reason we apply organisational theory, networking theory and learning theory (see e.g. Bresnen 2006, Dekker 2003, Duguid 2005, Kadefors 2004, Mouritsen, Hansen, & Hansen 2001, Naoum 2003, Weick 2001).

In conclusion, with more outsourcing and outsourcing of integrated services, the present FM development automatically arouses interest in the potential for development in strategic (long-term) collaboration. Such potentials may be new in the FM service sector, but are well known and recognised in other fields.

Strategic alliances

Collaboration between companies to increase competitiveness and control of technological development is common and seen in many production and service industries. So far research may mainly have focused on collaboration between production industries, but the phenomenon is also seen in the service industry, e.g. between airline companies, consulting engineers etc.

It is often seen in the service sector that a motive for partnership is the access to new and bigger markets. Moreover, such partnerships can provide the companies with access to resources that they do not dispose of or control. These resources may be supplementary or complementary or both, and through such an alliance the company may get access to resources that may not be accessible on normal market conditions. In addition to the above mentioned access to bigger markets, a strategic alliance can also open access to e.g. equipment and machinery, customer loyalty, knowledge and experience or technology (Yarbrough and Powers 2006).

A survey of the strengths and weaknesses of different alliance models in different situations shows that the resource type decides the selection of the alliance model when the internal resource basis of a company lacks important elements that must be bought from outside,. In case of physical, tangible resources a takeover (or merger) is preferred. In case of immaterial assets or capabilities, a strategic alliance is preferred (Yarbrough and Powers 2009).

One can thus assume that the need of the enterprise to control supplementary or complementary resources will be seen as strategic alliances in (business) service industries. The higher the degree of intangibility, the lower the need to control the resource at ownership. On the other hand, this indicated that there exist other forms for organisation of the collaboration; not only a formalised strategic (long-term) alliance, but also other types of semi-formal or non-formal collaboration. What makes an empirical, comparative analysis of the strengths and weaknesses of the different alternatives difficult is e.g. that you cannot compare an analysis of a concrete strategic alliance with the alternative - a non-alliance or operating alone (O'Farrell and Wood 1999).

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O'Farrell and Wood (1999), who examined alliances also including clients, point out that at the core of a voluntary, inter-organisational collaboration is compliance between aim, binding involvement, mutual dependency, trust, mutuality, communicative behaviour and conflict resolution, whether this is with a supplier, competitor or client. Methodically it is difficult to quantify the success of strategic alliances, but cooperative behaviour is vital.

For services the importance of trust, knowledge sharing and cooperative behaviour may differ depending on the type of service; routine or more strategic.

The success of alliances (in terms of stronger competiveness) is, of course, also influenced by the nature of the management. Ingirige and Sexton (2006) examined the development of an alliance between a petrol company and a construction company, started in the UK and today operating in twelve countries. The aim of the alliance is to create collaboration for the development of innovative business solutions through target-costing. Ingirige and Sexton (2006) demonstrated a significant difference in the way senior managers and project managers envisage how this alliance can develop the explorative collaboration. The project mangers find that the executive management's goal for the alliance limits their chances of developing and maintaining the explorative collaboration. The executive management's focus on exploitation limits the project managers to such a degree that they are paradoxically prevented from contributing to experience learning after finalisation of the project. The management of the alliance focuses especially on quantifiable and detailed targets and draws attention to short term, immediate financial advantages, and therefore the long term goal to develop innovative solutions fades out (Ingirige and Sexton 2006).

A resource based perspective on long term, voluntary collaboration

In general a business is defined as consisting of the enterprises producing replaceable products or services, e.g. the car industry, standard housing industry, pharmaceutical industry, cleaning services, ICT-service providers etc. From that definition most facility management service enterprises are considered to belong to the business service industry. Facility management service providers supply services to professional clients. Some of these services are characterized by their tangible nature, others are fully intangible and others are combinations. E.g. heated, clean, bright offices with all necessary ICT functions, sterile operation rooms, learning facilitating class rooms in schools and universities, safe airport and well kept cultural heritage. In short, facility management products are services less characterized as physical artifacts than as intangible services, some of which are knowledge intensive, others have a more labour intensive character.

A resource based view of facilities management services would, however, emphasize that the strategy of the service enterprise should rather be based on the resources of the enterprise than on its products (Lorentsen 2004, p. 207-208). The resources of the company define the company, its possibilities and competitiveness (Penrose 1959; Wernerfeldt 1984; Prahalad and Hamel 1990; Wernerfeldt1995;Teece, Pisano and Schuen 1997). Resources posses several applications and can be combined in different ways for different products. It is important to acquire the relevant resources, to appropriate and protect them well and develop them through learning to establish and maintain core competencies. From the same rationale it may also be important to dispose of redundant or obsolete resources (Lorentsen et.al 2004).

In a strategic perspective it may, however, be insufficient only to concentrate the company strategy on getting, establishing and maximizing and protecting resources and core competencies, especially on rapidly changing markets

with fast and unpredictable product divergence and convergence and with intermittent cross-over innovations across conventional boundaries between product and service markets.

Learning and knowledge management are methods to ensure a dynamic dimension in company resources. Learning in relation to management and strategy partly covers sense making in organizations (Weick 1995), partly knowledge creation (Boissot 1998, Nonaka and Takeutchi 1995). Learning is also about striking the right balance between control and creativity, between exploitation and exploration (March 1991) and naturally generally about the balance between the employees' individual learning, group and team learning, and on the other hand about the organizational learning of the company (Foss and Manke 2005; Brown and Duguid 1991, Duguid 2005; Wenger 1999,Tsoukas 1996; Tsoukas 2005).

Long term collaboration with other firms – suppliers as well as clients, horizontally and vertically – point at a company external element that are not fully understood by traditional resource based theory. However, its later development, particularly the notion of dynamic capabilities constributes to a better understanding of the contributions that come from the firm's environment, network and professional clients (users).

The relational element is thus central when examining long term collaboration of a company. Dynamic capabilities that strengthen the ability of the company to orientate and act relationally are specified in the third column in the table below.

Competencies, capabilities and relational abilities

	Individual / group	Organization / company	Cooperation / network
Static	Qualifications Formal education General knowledge	Resources Structured organization, learning-before-doing	Contractual relations, arms length, project partnership, strategic alliances, M&A, closed
Dynamic	competencies relational situation-specific-knowledge	capabilities, development/change , few rules, learning-while-doing (iterative)	Relational capabilities, divergence/konvergence balancing, network innovation, open

Eisenhardt and Martin (2000) show how absence of rules in rapidly changing markets seem to strengthen the competitiveness of companies but, on the other hand, large structures restrain ability to change, learning and product and technology development. Their empirical documentation derives from technology–based industries, and naturally there may be (important) difference in comparison to facility management service production. Moreover, Eisenhardt and Martin point out that mistakes are an important part of the development of dynamic capabilities. Here it is important to understand that small losses contribute more to the useful learning processes than both successes and serious mistakes. Successes make us forget learning enough from our experience. Serious mistakes on the other hand prevent us from learning due to defensive mechanisms (Eisenhardt and Martin 2000:1114).

"External" capabilities and trust

Seen in the light of the discussion about resources and dynamic capabilities one of the advantages of a voluntary long term collaboration between independent firms is that company capabilities become further "dynamised" through a development of the company resources outside its own limits, so to speak. Trust is, however, required to allow for minimizing the transaction costs and instead increase the value of (the service) transaction. Trust is also a prerequisite for the development of a potential for innovation as regards the product as well as the process (Dyer 1997). Inter-firm collaboration may reduce costs of uncertainty through e.g. reduced search and control costs and contribute to higher quality level and fewer errors through better mutual information and interaction. For facility management service companies a favorable, longer lasting collaboration not only offers the possibility of increased business opportunity, but also increased future profit through user based innovation development for the product as well as the process.

Many companies are, however, reluctant to commit themselves in a long term contractual relationship due to changes in demand, too low price competition between suppliers, doubt whether the advantages will actually benefit the company, lack of innovation drive, technological or production lock-in, information retention, knowledge leakage or other types of trust destructive behavior, etc. (Hoecht & Trott 2006). Especially suppliers and providers may be hesitant to enter into long term agreement when facing a period with rising demand, boom and rising prices. And in periods with decreasing demand and prices, clients (customers) may have a similar hesitance. (Gottlieb and Storgaard, 2006).

A voluntary inter-firm collaboration is voluntary in the sense that it is established outside or in addition to a possible contractual agreement regarding specified services. Inter-organizational collaboration naturally also occurs in non-contractual relations. Moreover, collaboration is voluntary in the way that the parties are willing to give away power and limit their range of action. This is done in anticipatation of other advantages. for all parties in terms of a qualitative improved and more efficient common project implementation provided that the collaboration is established in a balanced way,. Whereas traditional contractual regulation may cause an unfortunate polarization , antagonistic lock-in and opportunistic pursuit of own interests, it is characteristic for inter-organizational collaboration that it may potentially create a constructive cooperation environment of mutual trust, higher degree of knowledge sharing, better flexibility and thus also better results and processes.

Experience with operational partnerships and voluntary, strategic collaboration in the built environment

Since the early 1990s there has been more focus on new ways of organizing more long term collaboration between interests in the built environment. Project partnering was established in the building industry leading to long term inter-firm partnerships which is seen as a way to solve the problems of the building industry with excessive conflict and an incoherent value chain. In the UK this was seen in connection with the Construction Excellence Program (Egan 1998, Egan 2002, Construction Excellence 2004, 2005). In Denmark partnering has been in focus in the past five to ten years (Erhvervs- og Byggestyrelsen, 2004), and in the so-called vision project of the building industry in 2006 strategic collaboration was included as a organizational instrument considered to have important advantages for the builders, the building companies and the users (Erhvervs- og Byggestyrelsen, 2006).

In spite of the existence of many long term and strategic collaborations, even in the Building sector, there is not yet an agreed, unique definition of strategic collaboration. Collaboration exists in different forms and with different

characteristics, varying intensity, in different trades and between different partners. Consequently, there are a number of more or less overlapping definitions: Alliances, strategic alliances, partnering, strategic partnerships, extended enterprise etc. (Davis & Spekman 2004).

The building owners' cooperation with suppliers – partnering models and effects

For some companies in the built environment it may have been less common than in many other trades to establish and develop lasting collaboration with other parties both in the supply chain and with clients, at least for public building owners where partnering and partnerships carry an almost iconic status as a universal remedy to overcome often very controversial and problematic relations between companies in the built environment. A new study documents the status of the development of different types of voluntary co-operation relations between enterprises in the built environment in a number of European countries (Rigby, Courtney, Lowe 2009). Five types of professional inter-organizational cooperation are identified between building owners and enterprises in the supplier chain.

– Project-partnering
It is agreed to carry out the project collaboratively in terms of dialogue, trust, openness and a mutual aim. This can be supported by e.g. agreed procedures for conflict solution, cost saving if any and activities to further social interaction og knowledge and information exchange.

– Strategic cooperation
Is typical between buyers and suppliers. Power is handed over, but in this case also for future decisions, as the type of cooperation also includes future service supply, as the buyer commits to use the partnership's other parties for future purchasing of a service or groups of services. Ex ante detailing and specifying may vary, and the organization of the cooperation may be more developed, as in the above cooperation type, or include fewer elements.

– Framework agreements
Is a more formalised way of strategic partnering but is usually limited in time.

– Consortia
Are typically collaborations among supplier companies, vertically or horizontally, to work together to compete to win, and deliver certain (sets of) services. The form of cooperation is flexible and can be applied in a coordinated bid for one job or many. The most extensive kind is the establishment of joint venture in the form of joint venture targeting a particular market.

– Alliances
Are consortia, which also involve the buyer (owner) share. Here the purchaser will share risks with the suppliers in the joint company without security in advance, whether there will be gain or loss. Alliances can be of a more flexible and open type if it is a "virtual" alliance without creating a proper joint owned company, but the cooperation is only based on cooperation between independent (buyer and seller) companies.

In addition to that, there are more loosely connected collaborations in networks of various types.

A strategic cooperation is a relationship between companies that go beyond the actual delivery of a specific service - a spot transaction. The relationship will be repeated, or is long-term and includes, besides the actual service which is the starting point and core of the collaboration, elements such as

shared objectives, delegation of power, more social interaction, knowledge sharing, learning, etc. In this sense, many facilities managements are per definition cases of long-term collaboration- regardless of whether they are contractually regulated or not - because they run for some period of time, maybe a year or more, and consequently there are opportunities for mutual learning, improvement, and innovation. While the conditions for the supply are often contractually regulated, confidence and trust between the parties - or mutual accountability - seem to be the main prerequisite that a long-term cooperation will succeed (Kadefors 2007).

A Finnish paper has examined the tendencies in purchase of FM services and believes that there is a development towards strategic partnerships, although there are still few examples (Lehtonen 2006). In the thesis relationships between suppliers of FM services and customers of FM services are divided into three categories:

The first category is called "arm's length ". These are general purchase of similar services, and a variety of providers are used, often selected on the basis of the lowest price.

The second category is called "operational partnering" where purchases are bundled, so either more locations or more services are gathered. Here is used fewer providers and the selection process includes other criteria than just the price. They work with some common goals, and there are various forms of increased contact between customers and providers.

The third category is called "strategic partnering". Here they work with total solutions for the management and execution, and there are only one or two preferred partners. They work long-time together with common goals and vision for the collaboration. There is close contact between the parties and a lot of information is exchanged, also at a strategic level.

A similar way to categorise the collaboration according to intensity is seen in the "Strategic Partnering Handbook "(Lendrum 2000), which uses a scale from 1 to 10, to classify the cooperation:

1-4 on the scale are selling based conditions, that include belligerent things and sensible trade relations, and even trust and advantages for both parties can be achieved. 5-7 on the scale are provider relationships where at the lowest level a certain customer adaptation from the provider may be seen, and at the highest level there is traded with coherent solutions and is focused on adding value, which can be developed in a certain community. 8-10 on the scale are the real partnership relations, which starts with win-win solutions based on trust and equality between the partners. Next to this are circumstances where paradigms and rules are broken. And it is finished with real communities, where there is cooperation across the entire value chain.

Rigby et al (2009a) also examined the effects of voluntary cooperative arrangements, although they had difficulty in identifying the hard data, for example in relation with observance of time and money budgets, unit costs, or the like. However, they seem to indicate that there are studies of owner satisfaction in connection with projects conducted under collaborative forms of cooperation, where the owners clearly prefer the forms of cooperation and organisation rather than purely traditional contract regulated cooperations. It is also clear that although there may be difficulties in detecting the "hard" data and there are benefits of voluntary working together, there are numerous other areas, which is affected by such collaboration. Improved satisfaction among both employees and customers, better build quality, and a greater investment in employee skills and cooperative abilities are examples

of such indirect benefits, which in the long run can have positive feedback effects on more narrowly defined economic success parameters. Although on a large scale direct savings on building projects cannot be proved, improved compliance with schedules is of high value for construction users and customers.

Knowledge, knowledge sharing, and learning

Knowledge and innovation

In the literature on innovation there have been increased focus on the fact that innovation not only depends on the company's internal affairs, but probably as much on the relationship between them - and on the relations with other institutions that operate in national or regional innovation systems, (NIS and RIS, respectively) (see for instance Lundvall, 1992, Christensen and Lundvall (2007); Braczyk, Cooke and Heidenreich (1998).

In these studies it is emphasised, that much of what makes business innovation is not done through contract work, but so to speak alongside or in parallel with such business activities. Experience, learning and knowledge sharing are important. And this does not only concern the explicit part of knowledge. There are indications that exchanges of tacit knowledge, which just may be difficult to transfer, will be a key competitive tool in the knowledge economy (Lam, 2007, p. 43).

Lundvall distinguishes between four types of knowledge: Know-what, Know-why, Know-how, Know-who (Lundvall, 2004, p. 24). Other types of learning of a similar nature also exist: Learning by doing (Arrow, 1962, A), by using (Rosenberg 1982), by interacting (Lundvall, 1985, in Lundvall, 2004, p. 32). As mentioned there has been increasing focus on the tacit dimension of knowledge sharing and learning in the innovation litteature. Tacit knowledge is primarily carried by the actors - or the stakeholders who are involved in the network which together perform the task. This emphasise a focus on the dimension Know-who. It is among the Know – who´s, acces to the Know – how might be obtained.

There has been discussion about tacitness among economists (Cowan, David & Foray, 2000; Johnson, Lorenz & Lundvall, 2002) because tacitness largely has to do with transferability. The assumption is that the greater the part of tacitness, the harder it is to have a high degree of transferability (Lundvall, 2004 p. 28, in Christensen & Lundvall, 2004).

Some tacit knowledge can be explicated, other some cannot. Especially knowledge, which is attached to know-how is difficult to explicate (Lundvall, 2004, p.28, referring to David Cowan & Foray, 2000).

One can distinguish between two types of Coded Knowledge. At first, the explicit, which may be disclosed in manuals, etc. Next, the implicit coded tacit knowledge, which typically is developed "spontaneously as a mean of communication within or between organisations (Lundwvall, 2004, p. 29, refers to the Arrow, 1974). If these codes could be made explicit, they could be made available to external parties, and mediation of knowledge would become less difficult. Another reason for making implicit explicit codes could be that, in some instances, codification might make it easier to formulate and realize strategies of change". (Lundvall, up cit p. 29).

Knowledge and production

In a classic study Pawitt differentiated the manufacturing sector into four types (Pawitt, 1984): supply dominated (clothes, furniture), scale intensive (cement, food), specialised suppliers (engineering, software, instruments),

and science based products. It was the view that the great potentials for development and growth in an economy, mainly depended on developments in science based industries. In parallel, a linear view also was prevailing, that new scientific findings were the first step in a process of innovation, technological invention was the second stage, and these were then translated into an innovation (process or product), which thus became the third step, which finally brought the scientific findings into the national economy. Since this, this linear view of the relationship between research and innovation has been strongly challenged (Lundvall, 1988, Roth Well, in 1977, von Hippel, 1988; Gibbons et al. 1994; Nowotny; Scottard & Gibbons, 2001).

Often knowledge is expressed as particularly linked to the science based sectors, and often knowledge is understood as only explicit knowledge. Basic research is understood as accurate, reliable and valid knowledge, and preferably expressed in formal forms. But even here it has been shown that tacit knowledge plays a crucial role, and it is often here that the competition parameter is hidden and rooted (Lundvall, up cit p. 29).

Lam analysed the types of knowledge and learning that are central to various types of businesses. She distinguished between two types of knowledge - explicit and tacit - and two levels of reception - individual and collective. In a simple four field model she construct four new types of combination of knowledge and receivers: Embrained knowledge (explicit knowledge of the individual); Encoded knowledge (collective, explicit knowledge), Embodied knowledge (tacit knowledge from individuals), and Embedded knowledge (tacit knowledge from collective) (Lam, 2008, p. 47). She also looked at forms of organisation and she distinguished between standardised - and not standardised work - and on the level: individual or organisational. In the established four cell model, she got four types of organisations - which are closely linked to the four kinds of knowledge types described above.

The four forms of organisation and their relationship to form of knowledge are: Professional Bureaucracy (embrained knowledge), which is standardized work at the individual level. Machine Bureaucracy (encoded knowledge), which is standardised work at corporate level. Operating Adhocracy (embodied knowledge), which is non-standard work on the individual level. And J-form organisation (embedded knowledge), which is non-standardised work at corporate level (Lam, up cit p 48). With a J-form organisation, Lam thinks on knowledge-intensive Japanese companies, which for instance Nonaka and Takeuchi described in their analysis of The Knowledge Creating Company (Nonaka and Takeuchi, 1995), see below. For Lam it is an enterprise which combine bureaucratic stability and efficiency of the flexibility and team dynamics of adhocracy: "*One fundamental characteristic is that it allows an organic, non-hierarchical team structure to operate in parallel with its formal hierarchical managerial structure*" (Lam, up cit. p.49).

Types of knowledge and knowledge transfer
The concept of tacit knowledge was introduced by Polanyi (1966, 2000) and has since played a crucial role in the analysis of innovation and competitiveness. Nonaka and Takeuchi conducted studies in the 1990s, where they assigned Japanese companies´ high competitive level to their ability to expand their learning and knowledge sharing initiatives to include tacit knowledge (Nonaka & Takeuchi, 1995). This was an area on which western companies - and research – had not been focussed. Actually, in the nineties in Denmark, much research explicitly argued that tacit knowledge alone was reserved for crafts and apprenticeship - thus belonging to a former society, and not at all to the emergent knowledge society. At the same time children actually were at work on learning to operate computers without manuals, by hands-on, friends, and a few words - and completely around the formal learning system, which was far behind.

Nonaka and Taleuchi formulated different learning models in which they looked at knowledge sharing and learning sharing between the two main types of knowledge - explicit knowledge and tacit knowledge. In a simple four field model was obtained four spaces for transfer of knowledge - or learning. From Tacit knowledge to Tacit knowledge: Socialisation; from Tacit to Explicit: Explicating; from Explicit to Explicit: Combination; and from Explicit to Tacit knowledge: Internalisation. This model, SECI (socialisation, explicating, combination, internalisation), also says that these types of knowledge exchange takes place in a spiral process, where you each time you run through the four stages will come to new levels.

Knowledge sharing and ICTs

In relation to ICT tools, it is interesting to note that many Process Management systems is largely working alone in the second and third field of the above presented SECI model. In the second field - explicating – in which you by process descriptions have put words on processes in the form of input and output tasks. And in the third field - combination – in which one use the ICT tool to get out SLAs and KPIs in the Internal Control Systems (Alexander, 2008). This research project feeds a hypothesis that these systems and views easily will be developed into administratively hard to run systems based on and promoting top-down control and management, which takes away the focus from the front service staff, who earlier in this research paper has been mentioned as a key resource in FM.

But ICT tool may also be developed to strengthen quite other elements of the SECI model. This is the conclusion by Storgaard (Storgaard, 2005). Here there is particular focus on opportunities to develop visualisation based on nD-modelling.

The statement "images express more than a thousand words", as expressed in good Danish "bon mot", exactly suggests this potential to express tacit knowledge into explicit knowledge (explication). Much art takes place precisely in this field, be it music, literature, painting, theatre or movies. In what kind of explicit communication this ends up, is another question. There are other forms of explicit recovery than words, text and numbers. But a part of this communication is in the field tacit to tacit (socialisation). You learn - experience - and you are getting richer in knowledge and experience - without the possibility of explicate in details, what you have learned.

Even in the field combination - explicit to explicit - visualisation is an invaluable tool. Visualisation and simple animation through 3D modelling makes even complex microbiological processes (e.g. DNA molecule structures) comprehensible to the layperson. Even in the field from explicit to tacit - internalisation - visualisation and ICT plays a huge role. The media, especially the television becomes the tool where the world is consumed and internalised. Precisely this issue was the main theme in a larger Danish multidisciplinary research project funded by the Research Council at the beginning of the century (Modinet, 2002, Hoff & Storgaard, 2005).

Creation of knowledge and visualisation

from/to	tacit	explicit
tacit	socialisation *imagination/visualisation*	externalisation *illustration*
eksplicit	internalisation *medialisation*	combination *factual propagation*

Source: Nonaka & Takeutchi 1995 and Storgaard 2005

It is the conclusion by Storgaard (Storgaard 2005) that: "In this light it is not so surprising that virtual 3D and other ICT carried visualisation might have a potential to transfer knowledge, whether explicit or tacit. And it is not surprising that especially the 3D modelling might be developed to be a strong tool in collaborative planning. One may add: And in other collaborative processes as well, not in the least in the building sector. Research and development especially for the building sector is carried out at the SBi by the modelling work of Nils Lykke Sørensen" (Sørensen, 2003, 2004). 3D models are not only to be seen as an extra dimension added to a CAD drawing. It is quite a new tool - for collaboration, as stated in this article, or a tool for rough reckoning and calculation of prices, energy, materials, etc. as well as a tool (or user interface) for gathering information of drawings, construction details , information about materials, etc. In this light 3D modelling as an exact copy of a building, which is the overwhelming viewpoint in today's building industry, is only one way to use 3D. A 3D "look-a-like" could successfully function as an effective tool - for collaboration, for calculation and as a frame upon which more specific information could be drawn. To this purpose, the 3D machines in the game industry are of great interest. What is needed for those purposes is not high exactitude but fixed mobile transfer. (Storgaard, 2005)

Similarly, Senaratne and Sexton focus on the knowledge that is developed within groups and teams on the building site - when (unexpected) changes in building projects take place. In their view many teams are, to a large degree, able to match such urgent needs for improvisation, based on knowledge and previous experience. Visualisation plays potentially an important role in this (Senaratne & Sexton, 2009, p. 197).

Technology

In relation to FM technology has a special role in several ways. Mechanical technology is developed that results in working tools which refine the performance of services such as lawn mowing, digging and cleaning. In some fields there are tendencies towards an increasing automation - such as lawn mowing, vacuum cleaning and washing devices.

In other areas processing aids are developed using chemistry and biotechnology, which streamlines and improves the cleaning service. Through the development of nanotechnology are produced materials and coatings, which also promotes cleaning and maintenance of buildings (Munch Andersen, Molin, 2007).

ICT also plays an increasing role in FM, as it is the case in many other industries, partly as a planning and collaboration tool, partly as embedded technology.

Finally it is worth noting that ICT tasks are often well suited to be outsourced and bought as a self-service.

Below we take a closer look at ICT and FM.

Planning and collaborative tools

In the European cooperation on FM, which takes place in EuroFM network, it is an important task to promote "the advancement of knowledge of Facilities Management" ... and "An understanding of the processes behind the activities of FM is crucial to develop the profession"(Alexander, 2008). In this FM report are brought 9 articles that all give their opinions on how to decipher FM tasks - both in terms of planning and in execution, and thus for one thing make the field more professional - and we may say - more mature as an area of business where the services are traded between providers and customers.

The background of process descriptions of the monograph can be found in the work with flow and process descriptions, which were developed in system theory and in programming (for instance IDEF0 - integration definition language 0 for the functional model, developed from "information technology system engineering (Hamid, Baldry and Alexandra, 2009, p. 109). Hence there is a clear interaction between states, inputs and processes and new modes (Hamid, Baldry and Alexandra, 2009, pp 107).

Also in first article of the report a part of departure is taken from an IDEF0 model (Atkin and Björk, 2009, pp 14). In the article the model are developed in 6 levels, or stages, starting with a simple process description, proceeding with a process description of the analysis of requirements for FM services, description of models – in-house and outsourcing, implementation of solutions (including procurement), execution of benefits, and finally a description of the process for monitoring and management of the entire task. The top-down approach is emphasised.

Other articles more look upon the description of the individual performing tasks and provides recommendations on how the requirements and benefits can be controlled by ICS - Internal Control Systems, and through increased

use of IT, (see e.g. Redlein and Giller, 2009, pp 67). Through such process descriptions it is hoped that it will add to the process of making the benefits and processes more lucid - or transparent.

The models only come into their own when you can use them to improve processes and services – i.e. they must also serve as a monitoring tool. Hence, the ground is prepared for measuring requirements (SLAs) and benefits (KPIs). Potentially the models may easily go hand in hand with additional administration and control. It is worth noticing that, particularly in the outsourcing of public FM activities, demand for control and management goes hand in hand with the desire for competition postponement (see fx. Redlein and Giller, 2009).

But that it does not need to develop like this, is also suggested in the above publication. Based on the work with SPICE (Standardised Process Improvement for Construction Enterprises) at Salford University it is emphasized, that process models should be able to support learning at all levels of an organisation. It is also shown how these models easily are used as an operational tool to control and for statements (Amaratunga, Haigh, Baldry, Sarshar, 2008, pp 104-105). It also appears that you can use process mapping as a method for visualisation and indication of the contents of each job step (Hamid, Baldry, Alexander, 2008, p. 108). It should be mentioned that just at Salford they have worked with nD modelling (Lee, Marshall-Ponting, Aouad, Cooper, Tah, Abott, & Barret, 2005). A model and theoretical work, which largely open up for the use and transfer of non-explicit knowledge and practice. Relations, which have been further developed by the SBI (Lykke Sørensen, 2003, 2004; Storgaard, 2005).

Embedded Technology

With the development of micro-sensors - often at the nano level - and with the development of RFID, the possibilities of incorporating technology into the materials and plants that can be used to both report on conditions, need of action and inform of instructions and operating modes, are present. Potentially, this may have a significant influence on many FM tasks. FM tasks are performed when materials or facilities tell for themselves, when there is a need for action, what must be done - and how to do it (Storgaard, Forman and Rasmussen, 2006).

In a large Danish development project, in cooperation with the Building Materials Industry, the IT industry and the users, there will during 2009 and 2010 be developed specific proposals for applications, among these application related to FM (Grunnet, Storgaard, 2008).

Hence, the opportunities to provide services as needed - just in time - and not in accordance with approved time sheets, will be much larger, and there is a potential for an increased automation of the process of registration and data making up data for control and administration. Thus it is possible to avoid the control and administrative routines, which can easily be implicit in the application of Process Management tools, actually result in cost increases. And there is the opportunity to develop the FM tasks in a way that the executives maintain the central position in the task solution, which was the crucial element of the previous quotation by Jan Carlson about the service employee as a service company's main resource.

ICT as an independent FM focus area

First, ICT represents an important field that can be perceived as part of the FM area. Next, technology may have a potential to change the service, as in the case of Xerox, who went from being a hardware supplier of printers, to perceive themselves as a company that sold services - communications.

When one mentions Xerox, most people are thinking of the copiers, but there are many other Xerox products in the market. Xerox is constantly at the forefront of technology, and Xerox´s major, early inventions, such as. facsimile, the intelligent writing wheel, the laser printer, the icon and mouse illustrates this.

"Today it is not a special event that Xerox marketing new technological breakthrough. It is part of everyday life, both in the development of machinery, new thinking in relation to applications and workflows, and new definitions of document appearance and use. Xerox has the broadest product range in the industry in document development and production, with digital technology for both production and office environments, as well as complex solutions for both color and black and white.

Additionally Xerox Global Services (XGS) offers the expertise which has been built up in the organisation in a number of areas, such as Facility Management, which offers total print solutions to customers, incl. recruitment of Xerox employees in the customer's business. "(wev article in which Xerox inform about new career opportunities, http://www.xerox.com/jobs/dadk.html)

Thus technology can be an independent factor - and the superintendent – the FM facilitator – may be a significant facilitator for change. This illustrate that the future change in an industry area may be highly dependent on a stakeholder, who is not on the runway when the development starts, but put into play as the area – the technology - materialise.

Conclusion

Innovation and long-term collaboration in the form of informal, voluntary collaboration or more formalised partnerships between companies, which respectively sell and buy facilities management services, may be motivated by various factors. Horizontal cooperation between providers of facilities management services can be either cartels, aimed at streamlining the monopolisation of markets, or they can be strategic collaboration among competitors where the aim is to achieve development and technological potential, which would otherwise have been outside the individual enterprise resource opportunities. Vertical cooperation can be either cooperative alliances, where efficiency is aimed at, through economies of scope of vertical integration and reduction of transaction costs. Or they can be collaborative alliances with strategic focus, which seeks to develop new services or access to new markets. While horizontal cooperation naturally does not involve customers, it may well be the case of vertical cooperation.

The above literature review indicates that difficulties may arise for innovation and development, and thus for the businesses strategy of the participating firms, the more you focus on management information and management, on performance target control, etc. The development potential of long-term collaboration is hindered - or completely fades away - if there is a too strong focus on "exploitation". "Exploration" implies that smaller errors are allowed, and that cooperation is characterised by trust, reciprocity, obligation and communicative behaviour.

Knowledge sharing seems to be core to the success of collaborative endeavours when it comes to innovation and competitiveness. The literature review suggests that there are significant differences in the learning and knowledge sharing that takes place in collaboration, based on standardised production in traditional bureaucratic organised companies or institutions - and the knowledge sharing that takes place in collaboration on non-standardised tasks. The same dichotomy was found as regards technology. There have been many efforts to find ways to display – or elucidate – facility management processes and the different steps and work tasks that are involved. Whereas such models may be well-suited for clarification and particularly enumeration of tasks and services and control of performance they also have an in-built tendency to increase administrative costs both directly and indirectly. Today there is nevertheless also access to new ICT-based tools and methods that both contribute to strengthening the sharing of explicit knowledge and the sharing of tacit knowledge. An essential element of these methods is visualisation. Moreover, the evolution of embedded technology, which is still in its infancy, may represent pathways to new strategic options as regards knowledge sharing and the conversion of tacit into explicit knowledge. Summing up, the above relationships can be illustrated as follows:

Performance	Standardised production	Non-standardised production
Form of cooperation	Contractually regulated	Relational capabilities
Knowledge sharing	Formal education Explicit knowledge	Competences Tacit knowledge
Technology	SLA, KPI, Administration and control	nD and visualisation, Embedded technology

Next, an empirical study is carried out in which we intend to analyse the interaction between partners in voluntary, non-contractual collaborative arrangements within facilities management. Particularly, we focus at how the organisation of inter-firm collaboration is affected by the produced services, the applied technology and knowledge that is retrieved, processed and exchanged within and between the collaborating organisations. Likewise we examine the effects of different organisational arrangements for the development of new services – innovation – technology and knowledge management.

Literature

Alexander, K. (ed.) (2008). Facilities Management Processes, EuroFM, AC Naarden, the Netherlands.

Arya B. & Lin Z. (2007). Understanding collaboration outcomes from an extended resource.based view perspective: The roles of organizational characteristics, partner attributes, and network structures, Journal of Management Vol 33, No 5, October 2007

Amaratunga D., Haigh R., Baldry D., Sarshar M. (2008). Process improvement in Facilities Management. The SPICE approach. in Alexander K. (2008) Facilities Management Processes. EuroFM, Research Monograf.

Andersen M. Buch, Molin M. (eds) (2007). NanoByg. A survey of nanoinnovation in Danish Construction. Risø.

Atkin, B. and Björk, B.C. (2008) Business process modelling for FM. In Alexander, K. (ed.), 2008. Facilities Management Processes, EuroFM, AC Naarden, the Netherlands.

Bechtel C. and Jayaram J. (1997). Supply Chain Management: A Strategic Perspective, International Journal of Logistics Management, Vol. 8 No. 1.

Braczyk H, Cooke P and Heidenreich R. (eds) (1998). Regional Innovation Systems. UCL Press, London.

Bresnen, M. (2006). Conflicting and conflated discourse? Project management, organisational change and learning, in Hodgson D and Cicmil S (eds) (2006). Making projects critical. Palgrave Macmillan, Basingstoke.

By- og Boligministeriet, (2000). Nye samarbejdsformer. Arbejdspapirer om udformning af samarbejdsaftaler ved partnering. København.

Chesbrough, Vanhaverbeke & West (eds) (2006). Open innovation. researching a new paradigm. Oxford University Press.

Constructing Excellence (2004). Demonstrating Excellence - An Evolution of the Programme of Demonstrations. Constructing Excellence

Constructing Excellence (2005). Key findings from Constructing Excellence's 2005 Key Performance Indicators, 08 Jun 2005, (lokaliseret 20060211 på http://www.constructingexcellence.org.uk/news/newsarticle.jsp?id=2089&track=2089).

Cooke, P. and K. Morgan (1998). The Associational Economy: Firms, Regions and Innovation. Oxford University Press.

Davis E..W. & Spekman R.E (2004).The extended enterprise. Gaining competitive advantage through collaborative supply chains. Prentice Hall, Upper Saddle River NJ.

Dekker, C.H. (2003). Value chain analysis in interfirm relationships, Management Accounting Research Vol. 14 pp. 1-23.

Duguid P (2005). The art of knowing; Social and tacit dimensions of knowledge and the limits of the community of practice. The Information Society Vol. 21 pp.109-118. 2005.

Dyer J. H. (1997). Effective interfirm collaboration: How firms minimize transaction costs and maximize transaction value. Strategic Management Journal, Vol. 18, No. 7:535-556.

Egan, J. (1998). Rethinking Construction. Construction Task Force. Department of the Environment, Transport and the Regions (DETR). London.

Egan, J. 2002 Accelerating Change, London 2002

Egebjerg, C. og Storgaard, K. (2006). Strategiske partnerskaber i byggeriet. Modul 2. Case eksempler. BYG rapport, BYG-DTU

Erhvervs- og Byggestyrelsen (2004). Vejledning i partnering, Erhvervs- og Byggestyrelsen (EBST), København.

Erhvervs- og Byggestyrelsen (2006). Vision 2020. Byggeri med mening

Erhvervs- og Byggestyrelsen (2007). Fem modeller for offentlig-privat samspil. Udbudsportalen.dk.

Europæiske Fællesskaber: Udbudsdirektivet bek. nr. 937 af 16.09.2004

Gadde L.E., Huemer L, Hakansson H. (2003). Strategizing in industrial networks Industrial Marketing Management, Vol. 32   No. 5:357-364.

Gibbons M., Limogenes C., Nowotny H., Schwartzman S., Scott P., Trow M. (1994). The new production of knowledge. Sage Publications.

Gottlieb, S. og Storgaard, K. (2006). Besparelsespotentialer for det offentlige ved længerevarende samarbejder i byggeriet. Erhvervs- og Byggestyrelsen, København.

Grabher, G. (2004). Learning in projects, remembering in networks? European Urban and regional Studies, Vol. 11, No. 2: 102-123.

Grunnet, K.E., Storgaard, K. (2008). Brugerdreven innovation, indlejret teknologi og byggeri. Dansk Industri, København.

Hakansson H, Ford D. (2002). How should companies interact in business networks? Journal of Business Research, Vol. 55, No. 2:133-139.

Hamid, Y., Baldry D., Alexander, K. (2008). Facilities Management Process in Higher Educational Institutions. In Alexander K. (2008) Facilities Management Processes. EuroFM. Research Monograph.

Hardy C., Phillips N. and Lawrence T.B. (2003). Resources, knowledge and influence: The organizational effects of interorganizational collaboration. Journal of Management Studies, Vol. 40, No. 2, March 2003.

Hoecht, A, P. Trott (2006) Innovation risks of strategic outsourcing, Technovation, Volume 26, Issues 5-6, May-June 2006, Pages 672-681.

Ingirige, B. and Sexton, M. (2006). Alliances in construction. Investigating initiatives and barriers for long-term collaboration. Engineering, Construction and Architectural management. Vol. 13, No. 5, pp. 521-535.

Jensen, P.A. (2006)e.a. Facilities Management. Eksempler på god praksis fra de nordiske lande. BYG rapport, BYG-DTU.

Jensen, P.A., Nieslen, K. og Balslev Nielsen, S. (2008). Facilities Management Best Practice i Norden. 36 cases. Byg DTU.

Kadefors A. (2007). Trust and Contract in Facilities Management. Chalmers University of Technology, Göteborg.

Kadefors A. (2004). Trust in project relationships – inside the black box, International Journal of Project Management, Vol 22 pp. 175–82.

Lam, A. (2005). Organizational Innovation, in Fagerberg, J, Mowery, D.C. and Nelson, R.R. (eds.) (2005) The Oxford Handbook of Innovation. Oxford University Press.

Lam, A. (2007). Societal Institutions, Learning Organizations and Innovation in the Knowledge Economy, in Christensen, J & Lundvall B-Aa (eds) (2007) Product innovation, Interactive Learning and Economic Performance, Emerald, p 43 – 67.

Larsen, J.N., Gottlieb, S. og Haugbølle, K. (2008). Partnerskaber i Nordisk Byggeri. Nordisk Innovationscenter.

Lee, Marshall-Ponting, Aouad, Cooper, Tah, Abott, & Barret (2005). nD modelling Rodmap. A vision for nD- Enabled Construction.Salford

Lehtonen, Tero (2006). Partnering Relations – Justification and Success Factors from Facilities Management Services Perspective, http://lib.tkk.fi/Diss/2006/isbn951228376X/

Lendrum, T. (2000). The Strategic Partnering Handbook, McCraw-Hill, Sydney.

Lundvall, B.-Å., (ed.) (1992). National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning, London: Pinter Publishers.

Lundvall, B-Aa (2007). The Economics of Knowledge and Learning, in Christensen, J & Lundvall B-Aa (eds)(2007) Product innovation, Interactive Learning and Economic Performance, Emerald, p. 21 – 42.

Moss, Qi Zhou (2007). FM Market Intelligence in Europe, Salford.

Mouritsen, J., Hansen, A and Hansen, C.Ø. (2001). Inter-organisational management control in Management Accounting Research vol. 12 pp. 221-244.

Naoum, S. (2003). An overview into the concept of partnering", International Journal of Project Management, Vol. 21, 71-76.

Nowotny, H., Scott P., Gibbons, M. (2001). Re-Thinking Science. Polity Press, Cambridge.

O'Farrell, P. and Wood, P.A. (1999). Formation of Strategic Alliances in Business Services: Towards a New Client-Oriented Conceptual Framework. The Service Industries Journal, Vol. 19, No. 1, pp. 133-151.

Redlein , A., Giller, B. (2009). Reference Processes and Internal Control Systems within Facility Management. In Alexander, K. (ed.), (2008), Facilities Management Processes, EuroFM, AC Naarden, the Netherlands.

Rigby J., Courtney, R. and Lowe, D. (2009a). Study on voluntary arrangements for collaborative working in the field of construction services, Part 1. Manchester Business School, University of Manchester.

Rigby J., Courtney, R. and Lowe, D. (2009b). Study on voluntary arrangements for collaborative working in the field of construction services, Part 2. Best Practice Guide and Case Studies Manchester Business School, University of Manchester.

Rothwell, R. (1977). The characteristics of successful innovators and technically progressive firms. R&D Mannagement, 3(7), 191- 206.

Senaratne S. and Sexton, M.,G, (2009). Role of knowledge in managing construction project change, ECAM 16,2, Emerald, 2009, pp. 186-200

Storgaard, K. (2005). 3D - a tool for instant participation and collaborative urban design. In *S*. Emmitt, & M. Prins (Eds.), Proceedings of CIB W096 Architectural Management: 'Special meeting' on Designing value: New directions in architectural management, Technical University of Denmark, Lyngby, Denmark, 2,3 & 4 November 2005 (pp. 285-294).

Storgaard, K. og Egebjerg, C. (2006a). Strategiske partnerskaber i byggeriet. Modul 3. Case Eksempler - Strategiske partnerskaber i danske byggevirksomheder. BYG DTU R 142 2006. DTU.

Storgaard, K. (2006b). Strategiske partnerskaber i byggeriet. Fleksible strategiske samarbejder i byggeriet. Interview med nøglepersoner. Virksomhedsundersøgelse. Delrapport 2. (SBI 2006:16). Hørsholm: Statens Byggeforskningsinstitut.

Storgaard K., Forman M., Rasmussen, T. (2006). Indlejret teknologi i Byggeriet. Potentialer og besparelsesmuligheder for offentlige bygherrer. Erhvervs- og Byggestyrelsen, København.

Storgaard, K. og Larsen J.N. (2008). Forskningsområde 7. Driftpartnerskaber og strategiske samarbejder inden for Facilities Management. SBi, AAU.

Storper, M. (1995). The Resurgence of Regional Economies, Ten Years Later: The Region as a Nexus of Untraded Interdependencies. European Urban and Regional Studies, 1995 Vol. 2. Vejdirektoratet, 2002: Funktionsudbud. København.

Wagner S.M. and Bukó C. (2005). En empirical investigation of knowledge-sharing in networks. The Journal of Supply Chain Management Fall 2005.

Weick, Karl E. (2001). Making sense of the organization, Blackwell, London.

Wenger, E. (1998) Communities of Practice. Learning, meaning, and identity. Cambridge University Press, New York.

Williamson, Oliver E. (1975). Markets and hierarchies: analysis and antitrust implications, The Free Press, New York.

Williamson, Oliver E. (1986). Economic organization: firms, markets and policy control", NewYork University Press, New York.

Yarbrough, A.K. and Powers, T.L. (2006). A Ressource-Based View of Partnership Strategies in Health Care Organizations. Journal of Hospital MArketing and Public Relations, Vol. 17, No. 1, pp. 45-65.

Facilities Management (FM) is an increasingly significant
growth sector. Collaboration between customers and FM
suppliers is greatly important for the effectiveness and
quality of the delivered facility services. Moreover, col-
laboration seems to be a significant factor for innovation
in the sector. The study reviews literature and previous
analyses of collaboration and innovation in FM.

The project is conducted in cooperation with Centre for
Facilities Management-Realdania Research, DTU Ma-
nagement Engineering.