



AALBORG UNIVERSITY
DENMARK

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INFORMATION SOCIETY EVOLUTION AND EFFECTS

Keynote Lecture

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Published in:
Proceedings 14th INTERNATIONAL CONFERENCE e-Society 2016

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Brooks, A. L. (2016). INFORMATION SOCIETY EVOLUTION AND EFFECTS: Keynote Lecture. In P. K. Kommers, & P. Isaías (Eds.), *Proceedings 14th INTERNATIONAL CONFERENCE e-Society 2016* (Vol. 14, pp. XV-XV). International Association for Development, IADIS.

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Proceedings of the
14th International Conference

e-Society

9 - 11 April

2016

Vilamoura, Algarve, Portugal

Edited by:
Piet Kommers
Pedro Isaías



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14th INTERNATIONAL CONFERENCE

e-Society 2016

**PROCEEDINGS OF THE
14th INTERNATIONAL CONFERENCE
e-Society 2016**

VILAMOURA, ALGARVE, PORTUGAL

APRIL 9-11, 2016

Organised by



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Edited by Piet Kommers and Pedro Isaías

Associate Editor: Luís Rodrigues

ISBN: 978-989-8533-48-7

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FOREWORD

These proceedings contain the papers and posters of the 14th International Conference on e-Society 2016, which was organised by the International Association for Development of the Information Society, in Vilamoura, Algarve, Portugal, April 9 – 11, 2016.

The e-Society 2016 conference aims to address the main issues of concern within the Information Society. This conference covers both the technical as well as the non-technical aspects of the Information Society. Broad areas of interest are eSociety and Digital Divide, eBusiness / eCommerce, eLearning, New Media and eSociety, Digital Services in eSociety, eGovernment / eGovernance, eHealth, Information Systems, and Information Management. These broad areas are divided into more detailed areas (see below). However innovative contributes that don't fit into these areas have also been considered since they might be of benefit to conference attendees.

Topics related to e-Society are of interest. These include best practice, case studies, strategies and tendencies in the following areas:

- **eSociety and Digital Divide:** Connectivity may imply social coherence and integration. The opposite may result as well, when systematic measures are taken to exclude certain individuals or certain groups. Papers are welcomed on the next keywords: Social Integration, Social Bookmarking, Social Software, E-Democracy
- **eBusiness / eCommerce:** Business Ontologies and Models, Digital Goods and Services, eBusiness Models, eCommerce Application Fields, eCommerce Economics, eCommerce Services, Electronic Service Delivery, eMarketing, Languages for Describing Goods and Services, Online Auctions and Technologies, Virtual Organisations and Teleworking
- **eLearning:** Collaborative Learning, Curriculum Content Design & Development, Delivery Systems and Environments, Educational Systems Design, E-Citizenship and Inclusion, eLearning Organisational Issues, Evaluation and Assessment, Political and Social Aspects, Virtual Learning Environments and Issues, Web-based Learning Communities
- **New Media and eSociety:** Digitization, Heterogeneity and Convergence, Interactivity and Virtuality, Citizenship, Regulation and Heterarchy, Innovation, Identity and the Global Village Syndrome, Internet Cultures and New Interpretations of “Space”, Polity and the Digitally Suppressed
- **Digital Services in eSociety:** Service Broadcasting, Political Reporting, Development of Digital Services, Freedom of Expression, E-Journalism, Open Access
- **eGovernment /eGovernance:** Accessibility, Democracy and the Citizen, Digital Economies, Digital Regions, eAdministration, eGovernment Management, eProcurement, Global Trends, National and International Economies, Social Inclusion
- **eHealth:** Data Security Issues; eHealth Policy and Practice; eHealthcare Strategies and Provision; Legal Issues; Medical Research Ethics; Patient Privacy and Confidentiality

- **Information Systems:** Electronic Data Interchange (EDI), Intelligent Agents, Intelligent Systems, IS Security Issues, Mobile Applications, Multimedia Applications, Payment Systems, Protocols and Standards, Software Requirements and IS Architectures, Storage Issues, Strategies and Tendencies, System Architectures, Telework Technologies, Ubiquitous Computing, Virtual Reality, Wireless Communications.
- **Information Management:** Computer-Mediated Communication, Content Development, Cyber law and Intellectual Property, Data Mining, ePublishing and Digital Libraries, Human Computer Interaction, Information Search and Retrieval, Knowledge Management, Policy Issues, Privacy Issues, Social and Organizational Aspects, Virtual Communities, XML and Other Extensible Languages

The e-Society 2016 had 102 submissions from more than 21 countries. Each submission has been anonymously reviewed by an average of four independent reviewers, to ensure the final high standard of the accepted submissions. Out of the papers submitted, 18 received blind referee ratings that signified acceptability for publication as full papers (acceptance rate of 18%), while some others were published as short papers, reflection papers and posters. The best papers will be selected for publishing as extended versions in the Interactive Technology and Smart Education (ITSE) journal (ISSN: 1741-5659) and also in the IADIS International Journal on WWW/Internet (ISSN: 1645-7641).

In addition to the presentation of full, short, reflection papers and posters, the conference also includes a keynote presentation, a tutorial and two invited speakers. Special thanks go to Dr. Anthony Brooks, Aalborg University, Denmark, for his keynote presentation and Prof. Paul Nieuwenhuysen, Vrije Universiteit Brussel, Belgium, for his tutorial presentation. We would also like to express our gratitude to Prof. Boyan Bontchev, Department of Software Engineering, Sofia University, Bulgaria and Drs. Mark Verhijde, Interim Programmamanager En Adviseur Stedelijke Ontwikkeling, The Netherlands, for being our invited speakers.

As we all know, a conference requires the effort of many individuals. We would like to thank all members of the Program Committee (93 top researchers in their fields) for their hard work in reviewing and selecting the papers that appear in this book. We would also like to thank all the authors who have submitted their papers to this conference.

Last but not least, we hope that everybody has a good time in Vilamoura, and we invite all participants for next year's edition of the International Conference e-Society, in 2017.

Piet Kommers, University of Twente, The Netherlands
Conference Program Chair

Pedro Isaías, Universidade Aberta (Portuguese Open University), Portugal
Conference Chair

Vilamoura, Algarve, Portugal
April 2016

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Yongjian Fu, Cleveland State University, USA

KEYNOTE LECTURE

INFORMATION SOCIETY EVOLUTION AND EFFECTS

**by Dr. Anthony Brooks
Aalborg University, Denmark**

Abstract

The evolution and effects of the information society can be exemplified via many threads, both in hard and soft science, according to ones' discipline and field. In this contribution, the speaker's three decades of applied research acts as a vehicle to demonstrate development and impact via directly and creatively applying technical advances to affect life quality at a societal level. Illustrated is how empirical research successfully reaches beyond the walls of academia to directly affect individuals, groups and communities across abilities and ages. Developments that have led to patented commercial product, national and international projects, and industry start-ups (including impactful third party research investigations) form the basis for discussion. Beyond this, a wider more generic perspective reflects on product adoption that illustrate today's contemporary e-society tendencies where recent influx and uptake of consumer-targeted artificial reality products point to society's desire for alternative sensory experiences. Posited is how aligned with this desire there is a need for new ethical considerations in research as was found in the speaker's research at the end of the 20th century. The keynote will close with video examples that directly address such ethical issues to promote further discussions and analogies.

INVITED TALKS

ADAPTATION IN APPLIED VIDEO GAMES: FROM PLAYER MODELLING TO DYNAMIC GAME ADJUSTMENT AND ENHANCED PLAYABILITY

by Prof. Boyan Bontchev
Department of Software Engineering, Sofia University, Bulgaria

Abstract

Serious video games are widely applied in education, health, safety and training and, thus, help modern e-society in building efficiently knowledge, problem-solving and soft skills, creativity and conceptual thinking. However, though their proven social and cultural impact, applied games require relatively high production costs and offer lower perceived quality compared to the contemporary entertainment games. One promising solution of this problem is creation of adaptive applied video games, which identify implicitly specifics of each individual player (learner) during the game and use them to adjust dynamically some game tasks and features for fitting best that individual. Therefore, adaptive video games need solid modelling of player competences, emotions and styles, in order to achieve better player experiences and, hence, an enhanced overall playability.

The invited talk discusses modern trends and challenges in recent development and application of adaptive video games. It goes through theoretical behavior player models describing dynamic processes of player behavior and emotions during playing the game, and organizational models of player describing properties, attributes and facets of player's competences. There are discussed possible interconnections among them with time and model space constrains useful for affect-based game adaptation. The speech presents briefly the key ideas and results of the European project ADAPTIVES (ADAPTive player-centric serious video gaMES), where measuring player's performance and playing styles is combined with recognition of player's emotional states and applied for adapting dynamically features of game mechanics, dynamics and aesthetics in order to improve player's engagement, immersion, excitement, and challenge.

**THE GOV INDICATOR: LEARNING FROM GOOD PRACTICES
OF THE EU GRUNDTVIG LLP PROJECT
OPENGOVEU 2013-2015**

**by Drs. Mark Verhijde
Interim Programmamanager En Adviseur Stedelijke Ontwikkeling,
The Netherlands**

Abstract

In this article we introduce and apply the GOV typology in order to analyze various e-Government tools, websites and interactive methods of the EU-project “Open Government in Europe”. In many ways these so-called ‘Good Practices’ (GP) are state of the art examples of open data, e-government tools and innovative relationships between governments and active citizens in Europe. Rich though the examples may be, comparing and evaluating them is not easy, while learning from them or using a specific example in one’s own situation is quite difficult. The proposed indicator GOV, while allowing for three distinct GOV strata, hugely improves the options for meaningful comparison between Good Practices and learning from them. Furthermore, with the GOV typology we observe a difference between the patterning of Good Practices, mainly found in GOV 1.0 and GOV 2.0 strata, and the subset of selected ‘Best Practices’, which tend to clustering in the GOV 2.0 and GOV 3.0 strata. Thirdly, due to the GOV indicator we have a better understanding of the workings of the Good Practices, especially the options of interaction between given GOV strata. The Dutch GOV 2.0 case “Research on Civic Initiatives, DIY’s & Liability” illustrates such behavior, resulting in additional GOV examples, with clear indications of push and pull strategies due to attitudes of governments and citizens and thus providing a solid argument for interaction.

(full paper available at page 3)

TUTORIAL

INFORMATION RETRIEVAL FROM THE INTERNET AND WWW, USING SEARCH BY IMAGE: A TUTORIAL

by Prof. Paul Nieuwenhuysen
Vrije Universiteit Brussel, Pleinlaan, Belgium

Abstract

This tutorial workshop is based on a continuing investigation of the power, applicability, usefulness and limitations of search by image through the Internet. In this relatively new method for information retrieval, a query does not consist of text, but of an image file. The search results lead to images on the WWW and also to related texts. Other terms used for this method are:

- Search(ing) by example
- Reverse image search(ing)
- Reverse image lookup = RIL
- Backwards image search(ing)
- Inside search(ing)

- **Some of our findings:**
 1. Several online services are available free of charge to search by image.
 2. Differences among these services are substantial.
 3. The search service offered by Google performs relatively well.
 4. Google can reveal images present on the Internet, which are copies of the query/source image; however, the success is quite variable from case to case.
 5. This recall performance is strongly correlated with the performance of a more classical Google search by text to find copies of the query/source image file on the Internet.
 6. Even images that are modified versions of the query/source image can be revealed by Google; more specifically, such modified versions can differ from the source image in size and in colours; even fragments of the source image that are present on the internet can be revealed.
 7. Our tests have demonstrated that since 2014 search by image can not only find images that are visually similar to the query/source image, but can even retrieve images that are semantically similar/related to the query/source image, even when visual similarity is not obvious. The search results may also include a description of the subject on the image, and this can of course be interesting if the user has not yet much knowledge about the subject, so that using a specific text query becomes possible. Furthermore, other information related to the image and relevant links may also be included in the search results.

8. The performance of search by image to find images that are semantically similar to the query/source image is improving.
- **Various applications can be shown:**
 - Starting from your own image, you may find copies or even modified versions on the WWW.
 - Starting from some interesting image, that you have not created, but that you consider as interesting, and that is perhaps not the original version, you may find other and better versions.
 - Starting from some interesting source image, you may find images with a subject that is related to the subject of that source image.

Keywords

Reverse image search, Google, information discovery, information retrieval, semantic gap

Full Papers

THE GOV INDICATOR: LEARNING FROM GOOD PRACTICES OF THE EU GRUNDTVIG LLP PROJECT OPENGOVEU 2013-2015

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ABSTRACT

In this article we introduce and apply the GOV typology in order to analyze various e-Government tools, websites and interactive methods of the EU-project “Open Government in Europe”. In many ways these so-called ‘Good Practices’ (GP) are state of the art examples of open data, e-government tools and innovative relationships between governments and active citizens in Europe. Rich though the examples may be, comparing and evaluating them is not easy, while learning from them or using a specific example in one’s own situation is quite difficult. The proposed indicator GOV, while allowing for three distinct GOV strata, hugely improves the options for meaningful comparison between Good Practices and learning from them. Furthermore, with the GOV typology we observe a difference between the patterning of Good Practices, mainly found in GOV 1.0 and GOV 2.0 strata, and the subset of selected ‘Best Practices’, which tend to clustering in the GOV 2.0 and GOV 3.0 strata. Thirdly, due to the GOV indicator we have a better understanding of the workings of the Good Practices, especially the options of interaction between given GOV strata. The Dutch GOV 2.0 case “Research on Civic Initiatives, DIY’s & Liability” illustrates such behavior, resulting in additional GOV examples, with clear indications of push and pull strategies due to attitudes of governments and citizens and thus providing a solid argument for interaction.

KEYWORDS

Open Government, Active Citizenship, GOV.

1. INTRODUCTION

The Grundtvig Learning Partnership project “Open Government in Europe” (OPENGOVEU) 2013-2015¹ demonstrates the various ways in which national and local governments establish new and innovative methods and tools on transparency and open data to enforce active citizenship. In OPENGOVEU twelve countries and thirteen project partners from a variety of backgrounds work together.² The project phases include the inventory of Good Practices (GP) from each country and project partner, chosen on characteristics such as Innovative, Realistic Implementation, Impact Assessment, Transferability and Viability, and within three categories: Open Data/Transparency; e-Government Tools; and Citizen

¹ The project website www.opengoveu.eu provides detailed information on the EU Program LLP - Grundtvig Learning Partnership program and the OPENGOVEU goals, processes and partners. It gives a complete overview of all Good Practices on Open Government and Active Citizenship from the national or local level of the thirteen project partners, for comparing and learning. In addition, one may find the overall project results and four additional digital guides (on Open Government, Smart Cities, Active Citizenship and Open Space Technologies) to help European states, cities and citizens to use and learn from.

² The partners of OPENGOVEU 2013-2015 are: EURO-NET (Project Coordinator, IT), Interacting UK Limited (UK), Governorship of Kirsehir (TK), Societatea Nationala de Cruce Rosie din Romania, Filiala Sibiu (RO), University Twente (NL), Euro-Idea Fundacja Spoleczno-Kulturalna (PL), Associazione EURO TWINS (IT), FA - Magdeburg GmbH (DE), Connexion Roumanie (FR), LIPOR Intermunicipal Waste Management of Greater Porto (PT), Intermezzo Ungdomsorganisasjon (NO), Naduvere Village Association (EE), Dimos Paionias Municipality Of Paionia (GR).

Awareness and Engagement.³ In total 62 examples of Good Practices have been submitted by the partners. Furthermore, during the 2014 project meetings of Magdeburg and Paris the partners selected thirteen so-called Best Practices (BP), illustrating aspects of the innovative character of OPENGOVEU methods and tools.⁴

2. PROBLEM SETTING

An initial scan of these 62 Good Practices (thus including the selected BP) shows the enormous diversity of methods and tools within each country and between European countries. It clearly demonstrates the rich and innovative approaches governments have proposed to ensure optimal access to public data or enhance civic initiatives to benefit from e-government tools, thus stimulating active citizenship in countries and municipalities. However, the same diversity makes it nearly impossible to understand and learn from each Good Practice, to compare Good Practices or to apply or implement a specific Good Practice to one's own situation.

Firstly, due to the nature of the EU Grundtvig Learning Partnership project, the partners of OPENGOVEU come from very different backgrounds. The group consists of two municipalities, one village association, one university, two training companies, four welfare organizations, a local Red Cross, and a waste management firm, plus the project manager. Selecting up to five national or local Good Practices allows each partner to present state-of-the-art examples and real issues on Open Government, Smart Cities and Active Citizenship, from the perspective of each partner. As it is meant to be, because it demonstrates the richness of approaches in the context and history of European countries towards such developments.

Secondly, while working at the project each partner has produced a preliminary research about the specifics of its country and local situation. The many discussions between the partners from the 2nd project meeting in Turkey onwards have resulted in an integrated and shared view on Open Government, Smart Cities and Active Citizenship, which in turn has allowed the partners to better motivate their choices of Good Practices (and of the thirteen BP). In other words, the partners have not only selected excellent examples that are important from their own perspectives, the Good Practices themselves cover the broad range of the categories Open Data and Transparency, E-government tools, and Citizen Awareness and Engagement (Participation). Thus, standard benchmarks are not available or unsuited to use.⁵

In order to be able to compare and evaluate the Good Practices in a meaningful way we propose a more structured approach in the remainder of this article. With the use of a single indicator and a number of tags we describe and order the various Good Practices, enabling a more basic analysis, comparison and evaluation of these inspiring OPENGOVEU methods and tools.

Apart from the information provided by each project partner, which include the categories Open Data – Transparency, e-Government Tools and Citizen's Awareness and Engagement,⁶ we have structured the Good Practices using tags and the indicator GOV. Typical tags are: transparency, accountability, e-Government tools, user participation (or public consultation), Governance, co-creation, participatory tools, social innovation, online/offline bridging. While GOV is the most important indicator to structure the various Good Practices, additional insight is gained if we examine the options of movements between the GOV strata. Analyses of several Good Practices appear to support such movements, typically if we look at the notion of changing attitudes of both governments and citizens. Such considerations will be addressed at the end of this article.

³ Characteristics and categories to be used for the determination of the list of Good Practices have been proposed in the project proposal and at the 1st project meeting in 2013 in Italy. See website www.opengoveu.eu for more information.

⁴ A best practice is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark (Wikipedia). Determining BP as a subset of the proposed Good Practices is done at the 3rd project meeting in Germany by voting. No other method or instrument is used to choose the OPENGOVEU BP.

⁵ For instance, the standard benchmarks such as EC eGovernment Benchmark Framework 2012-2015 or Socrata Open Government Data Benchmark are limited to single category examples only.

⁶ See figure 6 below for an overview of the Good Practices with the three categories.

3. INTRODUCING THE GOV INDICATOR

Because the Good Practices are basically specific methods and tools in the relationship between governments and citizens, we propose an additional division that distinguishes three types of relationships. The idea of the proposed GOV indicator is borrowed from a well-known model on institutes, individuals and media landscapes as depicted in the figure below.⁷

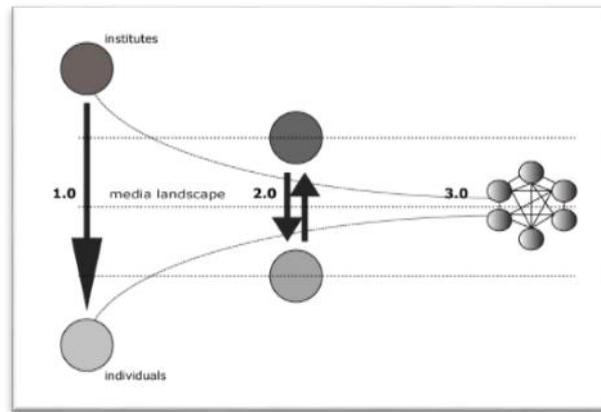


Figure 1. Overview of media landscapes

In figure 1 above three kinds of relationship between institutes and individuals are represented. On the left hand side (1.0) a one-way relationship is given, with aspects of a typical “top down” organization and communication. In the middle a two-way relation between institute and individuals is shown (2.0), representing some form of similar position, interaction or communication. The situation on the right side represents another type of relationship, in which hierarchical or similar positions of institutes and individuals is replaced by a network relationship (3.0). Multiple interactions are depicted as a kind of molecule with atoms. Institutes are seen here as single units, not different in their network position from other (groups of) individuals.

These three types of relationship are used to categorize the Good Practices, based on the argument that the OPENGOVEU methods and tools appear to follow the same distinctions. We have defined the GOV indicator in the following way:

Table 1. Overview of three GOV strata

GOV 1.0	
Description	Top down government instruments, including occasional feedback from citizens and public consultation.
Characteristics	Optimizing organization, efficiency, customer contacts (services), managing on input-output items.
Examples	Good Practices as GOV 1.0 examples typically involve top-down digital tools and methods, websites, portals, benchmarks, sometime as services.
GOV 2.0	
Description	Interactive government policy with more regular and intense top down and bottom up interaction and communication, resulting in co-creation and coproduction often referred to as (more) governance.
Characteristics	New services, new methods, new products, sometimes even new type of organization, managing input-output items.
Examples	Good Practices that show GOV 2.0 aspects may involve digital tools and methods but mostly stimulate citizens to interact and co-work on problems and solutions, or perhaps provide budgets for society to actually realize such co-productions.

⁷ The model that is used here is proposed in Van Os et al. (2013).

GOV 3.0	
Description	Policy making and government positioning in network society, as one stakeholder among many others.
Characteristics	Agenda setting, creating arenas for knowledge exchange, discussion and decision-making, managing some output but mostly outcome items, with specific goals, timeframes.
Examples	Good Practices with GOV 3.0 structure concern civic initiatives, with or without governmental involvement.

As we propose the GOV indicator as a kind of typology on government – citizen’s relationship, it is important to understand that within each type of GOV, such as GOV 1.0 or 2.0, aspects of both government and citizens are included. That is, GOV is not to be interpreted as an indicator of “Good Policy” of “Good Public Administration”, but also includes the community and the relationship between them.

4. IMPLEMENTING INDICATOR GOV

Good Practices (GP) and the subset Best Practices (BP) labeled with the same value of the GOV indicator (such as GOV 1.0 or GOV 2.0) appear to share certain similarities and therefore can be compared with each other. Such ordering of Good Practices within the framework of the GOV indicator is given below. In addition, we have clustered for each specific GOV indicator examples using the tags. For example, the tags Transparency, Accountability, e-Government Tool and User participation or Public Consultation are applicable on **GOV 1.0** indicator as can be seen below.

Table 2. GOV 1.0 examples

GOV 1.0	Tag Transparency
Open Data DATA.GOV.UK (UK)	open data license, free access/use
The UK GP regulates the specifics, free access and use of open data.	
Other examples are: Both Norwegian GP’s Openness and information integrity, and National Archives and the Noark-5 Standard; Greece GP data.gov.gr; and France GP Etalab data.gouv.fr & Dataconnexions, on health data.	
GOV 1.0	Tag Accountability
Volis (EST)	transparency, policy monitoring.
The Estonian BP allows any citizen to follow online and livestream their politicians’ acts and decisions and react on that information.	
Similar examples on accountability are: UK GP Ward Surgeries, allows citizens to follow their MP’s; Greece BP Cl@rity program, forcing that every government decision is published on the internet; and Italian Perla PA.	
GOV 1.0	Tag user-participation
Partecipa! (IT)	public consultation, e-government
The Italian GP Partecipa! aims to contribute to the national Open Government program, using a particular form of public consultation on various policy items.	
Similar examples on user-participation are: Italian GP’s MiglioraPA (enhance PA) targets customer satisfaction on digital services, and comuni-chiame; Romanian GP OPENBUDGET.RO gives budget information to be manipulated by users; Poland GP’s Fix my street - Naprawmy to, and Public Transportation journey planner - jakdojade.pl, both making public data available with interaction options.	
GOV 1.0	Tag e-Government Tools
Government websites GOV.UK (UK)	centralizing public websites
GOV.UK ensures that any public data and information regarding public administration is traceable and found using a single digital access	
Several GP’s can be categorized on e-Government. Some interesting examples are: Italian GP Compass of Transparency, benchmarking public websites on quality and efficiency, with user participation; Romanian BP E-GUVERNARE.RO; Turkey GP Bimer applications "Alo 150" ensures telephone contact with central PA is possible; France GP Comité Interministériel pour les Archives de France provides digital access to decentralized district archives; and Italian GP Linea Amica (Friendly Line), a nation-wide citizens care system based on multi-channel approach.	

More than 50% of the examples and 4 Best Practices (includes Italian BP Mettiamoci La Faccia) are found in the GOV 1.0 stratum. Several of these refer to Transparency or Accountability, which suggests some form of user participation, monitoring, public consultation or feedback, which are inherent aspects of

GOV 1.0. Better services, more efficiency of public administrations and more value for customers (i.e. companies and citizens) are important characteristics of GOV 1.0 Good Practices. Although the GOV 1.0 examples ultimately promote Citizen's Awareness and Engagement, none of the above appears to result in co-creation, coproduction, or actual cases of active citizenship.

In contrast, Good Practices categorized as **GOV 2.0** clearly aim on co-creation and coproduction, as can be seen below. Again we cluster the various examples on characteristic tags found in GOV 2.0: Accountability, Governance, Co-creation and Participatory Tools. Accountability in GOV 2.0 Good Practices differs from GOV 1.0 examples because it not only monitors but also pro-actively stimulates active citizenship. Governance and Co-creation typically signal the change in relationship between government and society, while the tag Participatory Tools focusses on processes between both actors. Almost 40% of the examples fall within the GOV 2.0 stratum, including 7 Best Practices.

Table 3. GOV 2.0 examples

GOV 2.0	Tag Accountability
City and County Human Rights Committee (TR)	transparency, representative democracy
The Turkey BP Human Rights Committee introduces a new tool to deal with potential inequality within the society.	
Similar examples that involve accountability are: Turkey GP City Council; and UK BP MYSOCIETY.ORG, a set of digital tools on democratic accountability.	
GOV 2.0	Tag Governance
Open Estonian Foundation (OEF)	accountability, social cohesion
Non-profit OEF, founding member of NEON, aims for more governance and social cohesion in Estonia by helping grassroots initiatives and municipalities.	
Other examples are: Estonian GP e-Governance Academy (eGA); UK GP Create the Debate, to actively stimulate political discussions; France BP Commission Nationale de Debat Public (CNDP) and GP Regards Citoyens (Circulating and sharing policy information); Dutch BP Research on Civic Initiatives, DIY's & Liability, which shows how legal issues may or may not block activities of citizens.	
GOV 2.0	Tag Co-creation
Amsterdam Digital map temporary use available wastelands (NL)	tool participatory democracy
The Dutch GP collects and digitally displays information on empty wastelands, thus stimulating active citizenship, startups and entrepreneurship.	
Other GP's on co-creation are: Greece GP's Conference Open access to scientific knowledge (NIRST), aims to open up expert knowledge to citizens, and Study to sustainability of open data infrastructure; Estonian GP Infosystem of Drafts (EIS); and Norwegian BP Company register as data (Bronnoysund Register Centre), on re-using public data.	
GOV 2.0	Tag Participatory Tools
Strategy sustainable development Ighiu, Alba Iulia	public consultation, e-government
In the Romanian GP on sustainable development society and municipalities plan and realize as coproducing partners.	
Many GP's use interactive participatory tools, such as: Portuguese GP's LA21 in the Parish Councils and the Landmark EU-project Public Procurement, and BP Participatory budgeting for children; Poland BP Participatory budgeting pilot project in Krakow, and GP My Country – mojePanstwo; Dutch GP's MyBorne2030 and Winterswijk - Villages without rules (Dorp zonder regels); and Estonian GP Participation Web.	

The **GOV 3.0** Good Practices differ from previous examples. They have in common that citizens themselves use (digital) methods and tools to promote more governance and active citizenship. These GOV 3.0 examples demonstrate how governments may act within a network environment, alongside and interacting with a diversity of private and commercial partners. But they also show a wide variety of civic initiatives, from grassroots activities in public space to crowdfunding platforms, or monitoring regular policy makers and creating new apps. Tags are Social Innovation, Online/Offline Bridging and Accountability. GOV 3.0 contains 10% of all examples and 2 Best Practices.

Table 4. GOV 3.0 examples

GOV 3.0	Tag Social Innovation
Open Public Data Hackathon contest (GR)	re-use public data
The Greece GP shows that events such as Open Public Data Hackathon contest results in new life for public data. Other examples: German BP Open Data Portal Berlin (BODS); Italian BP deRev on discussion, social innovation and crowdfunding; and Portuguese LIPOR GP Horta a Porta - Biological Kitchen Garden of Porto's Region on food and sustainability.	
GOV 3.0	Tag Online/Offline Bridging
Politici Publice - SMART online & offline method (RO)	participatory democracy
Romanian GP Politici Publice is an independent platform, both online and offline, for anyone interested in public administration and policy making.	
GOV 3.0	Tag Accountability
Openpolis (IT)	transparency, e-government
Italian GP Openpolis is an independent organization that allows citizens to have access to public data, acts and motivations of policy makers and members of parliament. Since 2009 it has developed from providing public information to an actually online debate center in Italy, in coproduction with many parties and citizens.	

5. BEST PRACTICES AND GOV

Indicator GOV allows us to differentiate the 62 Good Practices in three types. The 32 GOV 1.0 examples demonstrate a hierarchical relationship between government and citizens, the 24 GOV 2.0 indicates an interacting relationship, with both top down and bottom up processes. Finally, the 6 GOV 3.0 cases display the interacting network relationship between society and government. In summary, the bulk of Good Practices is found in the GOV 1.0 and GOV 2.0 strata.

If we focus on the Best Practices (13 of 62 Good Practices), a different patterning is observed, namely a clustering towards GOV 2.0 and GOV 3.0 in the project partners' selections. We find 6 of 32 Good Practices in GOV 1.0 to be promoted as Best Practices (19% or nearly 1 in 5). Of the 24 Good Practices in GOV 2.0 we find 7 Best Practices (30%) and of the GOV 3.0 Good Practices three of the six examples (50%) is selected as Best Practice. We conclude therefore that the project partners themselves appreciate examples of GOV 2.0 and GOV 3.0 over those of GOV 1.0 for promotion as Best Practices.

6. TAGS AND GOV

The typology resulting from GOV helps to order the Good Practices in a meaningful way. Another level of distinction is added by the use of tags, describing specific aspects of Good Practices. Not surprisingly, tags differ in each GOV stratum, e.g. Transparency is important for GOV 1.0 examples, while Participatory Tools and Co-creation fit GOV 2.0. Unfortunately, precise definitions of several tags are not easy to formulate.

For example, the tag Accountability is suitable for GOV 1.0 to GOV 3.0, but differs in descriptive information. For the Greece Good Practice Cl@rity it means that citizens can rely on the fact that any government decision is valid if published online, while in the Good Practice of the Turkey Human Rights Committee Accountability refers to the possibility for citizens to address the (local) government on equality issues. Italian Openpolis started as independent platform on public data but has evolved into an online arena for public discussion, where policy makers can be held accountable for their actions and decisions. Accountability in the civic initiative Openpolis is forced upon these policy makers.

Thus the proposed tags function as mere descriptions of significant aspects of the GOV typology with respect to Good Practices, allowing some refinement and clustering of the OPENGOVEU methods and tools. In figure 2 below one finds the complete overview of Good Practices, GOV, tags and categories.

Name	Country	Open Data	e-Gov	Active Citiz	Tags	GOV
Compass of Transparency	Italy	x			e-government tool, transparency, user participation	1.0
Openpolis	Italy	x			accountability, transparency, e-government tool, participatory democracy	3.0
comuni-chiame	Italy		x		user participation, e-government, social innovation	2.0
Partecipa!	Italy			x	user participation, public consultation, e-government	1.0
deRev	Italy			x	social innovation, participatory democracy, crowdfunding	3.0
City and county Human Rights Committee	Turkey			x	accountability, transparency, tool representative democracy	2.0
Bimer applications "Alo 150"	Turkey			x	e-government tool	1.0
City Council	Turkey			x	accountability, transparency, tool representative democracy	2.0
Kirsehir Municipality Ak Masa	Turkey			x	e-government tool, transparency, user participation	1.0
e-Government	Turkey		x	x	e-government tool	1.0
Government website(s) - GOV.UK	UK		x		e-government tool, centralizing public websites	1.0
Open Data - DATA.GOV.UK	UK	x			transparency, open data license for free access and use	1.0
Digital tools democratic accountability - MYSOCIETY.ORG	UK	x			accountability, tool participatory democracy	2.0
Create the Debate	UK			x	governance, tool participatory democracy	2.0
Ward Surgeries	UK			x	accountability, transparency, tool participatory democracy	1.0
DATA.GOV.RO	Romania	x			transparency, e-government tool	1.0
E-GUVERNARE.RO	Romania		x		e-government tool, transparency	1.0
OPENBUDGET.RO	Romania			x	user participation, transparency, accountability, e-government tool	1.0
Strategy sustainable development Ighiu, Alba Iulia	Romania			x	participatory tool, public consultation, e-government tool	2.0
Politici Publice - SMART online & offline method	Romania			x	online/offline bridging	3.0
Amsterdam Digital map temporary use available wastelands	NL	x		x	Co-creation, participatory tool	2.0
Winterswijk - Villages without rules (Dorp zonder regels)	NL		x	x	participatory tool	2.0
MyBorne2030	NL			x	participatory tool	2.0
Research on Civic Initiatives, DIY's & Liability	NL	x		x	governance, transparency, participatory democracy	2.0
Research on the use of social media in Twente municipalities	NL		x		e-government tool	1.0
Participatory budgeting pilot project in Krakow	Poland			x	participatory tool	2.0
Fix my street - Naprawmy to	Poland		x		user participation	1.0
My Country - mojePanstwo	Poland	x			participatory tool	2.0
Public Transportation journey planner - jakdojade.pl	Poland	x			user participation	1.0
Information system of broadband infrastructure	Poland	x			e-government tool	1.0
Linea Amica (Friendly Line)	Italy			x	e-government tool	1.0
Mettiamoci La Faccia (Put your face on it)	Italy			x	e-government tool, public consultation	1.0
MiglioraPA (enhance PA)	Italy		x		user participation, transparency, accountability	1.0
IndicePA - Directory of Italian Public Administrations	Italy	x			e-government tool, centralizing PA	1.0
Perla PA	Italy		x		accountability, transparency, e-government tool	1.0
Open Data Portal Berlin (BODS)	DE	x			social innovation, participatory tool	3.0
Etalab (data.gouv.fr & Dataconnexions)	France	x			transparency, accountability, e-government tool	1.0
Commission Nationale de Debat Public (CNDP)	France			x	governance, transparency, public consultation	2.0
Comite Interministriel pour les Archives de France	France		x		e-government tool, transparency	1.0
Dataveys - Haute Autorite de Sante (Scope Sante)	France	x	x		transparency, e-government tool, user participation	1.0
Regards Citoyens (Circulating and sharing policy information)	France			x	governance, transparency, accountability, participatory tool	2.0
LA21 in the Parish Councils	Portugal			x	participatory tool	2.0
Participatory budgeting for children	Portugal			x	participatory tool	2.0
Public Procurement (Landmarkproject EU)	Portugal	x			participatory tool	2.0
LIPOR Sustainability Report 2013	Portugal	x			transparency, participatory democracy	1.0
Horta a Porta - Biological Kitchen Garden of Porto's Region	Portugal			x	social innovation, participatory democracy	3.0
Openness and information integrity	Norway	x			transparency, tool public data	1.0
National Archives and the Noark-5 Standard	Norway	x			transparency, tool public data	1.0
Company register as data (Bronnoysund Register Centre)	Norway	x			co-creation, re-use public data	2.0
Electronic Public Records (OEP)	Norway		x		transparency, tool public data	1.0
Environmental Information Act	Norway			x	transparency, tool public data	1.0
Open Data 8 Principles	Estland	x			transparency, tool public data	1.0
e-Governance Academy (eGA)	Estland		x	x	governance, e-government tool, monitoring	2.0
Open Estonian Foundation (OEF)	Estland			x	governance, transparency, accountability, social cohesion	2.0
Participation Web	Estland			x	participatory tool, public consultation	2.0
Infosystem of Drafts (EIS)	Estland			x	co-creation, digital workspace, public debat	2.0
Volis	Estland			x	accountability, policy monitoring, transparency	1.0
data.gov.gr	Greece	x			transparency	1.0
"Cl@rity program" - every government decision on internet	Greece		x		accountability, transparency, e-government tool	1.0
Open Public Data Hackathon contest	Greece			x	social innovation, re-use public data	3.0
Study to sustainability of open data infrastructure	Greece	x			co-creation, digital infrastructure, guide	2.0
Conference Open access to scientific knowledge (NIRST)	Greece			x	co-creation, transparency	2.0

Figure 2. Overview of 62 Good Practices on Country, Category, Tags and GOV

7. INTERACTION BETWEEN GOV STRATA, PUSH-PULL-STRATEGIES

Apart from the observed GOV patterning of Good Practices we discover that Good Practices may interact between GOV strata. The Dutch BP "Research on Civic initiatives, DIY's & Liability" serves as an illustration.

Originally initiated by the Dutch National Government (Ministry of Interior Affairs – BZK) the research focusses on the question whether or not legal issues like liability hamper or block civic initiatives, grass roots and other bottom up activities in the public domain. Based on more than 60 civic initiatives we found that, in principle, liability does not function as an obstacle for starting or expanding citizens' activities. However, in practice municipalities and citizens have great difficulties in dealing with legal issues such as liability, due to a lack of specific legal knowledge and an unnecessary fear of risks and damage claims. To amend this situation and to provide hands-on knowledge and innovative instruments many recommendations and follow-up actions are given. In other words, based on the research that reveals the current situation on legal issues concerning civic initiatives, many municipalities and other public administrations are working together with groups of active citizens to better facilitate bottom up activities in the Netherlands. As such, this Dutch BP exhibits all GOV 2.0 aspects⁰, with co-creation and co-production, resulting in new products, services and processes.

If we use the GOV typology differently, duplicating role and position of governments and those of citizens, we view that civic initiatives in the Dutch public domain display GOV 3.0 characteristics, while aspects of the legal system and their actors exhibit GOV 1.0. Due to the Dutch BP those two stakeholders join to accomplish new results. For instance, an important recommendation is to make several legal instruments, such as permits and contracts, less complex and more transparent for citizens to understand and use. Municipalities use a “push-strategy” by deregulating various legal instruments and using online tools that simplify contracts (GOV 1.0 actions). On the national level several experiment programs on flexible rules and regulations are introduced to enhance civic activities (GOV 2.0 actions). Citizens in turn use a “pull-strategy”, proposing DIY alternatives to standard contracts and setting up Communities of Practice (CoP's) to exchange and learn of their initiatives, actor municipality and legal issues (GOV 3.0 actions).

In other words, the Dutch GOV 2.0 example generates many spin-offs as methods and tools that we view as either GOV 1.0, GOV 2.0 and/or GOV 3.0, demonstrating that interaction between the three GOV strata is plausible and to be expected. GOV 2.0 is interesting due to its nature of co-creation and coproduction, which leads to push and pull strategies both at the governmental level and in the society. We suspect other Good Practices to confirm this argument of interacting between GOV strata.

8. CONCLUSION

OPENGOVEU Good Practices display a richness and diversity that makes understanding, comparing and learning from them not easy. We propose in this article a typology based on a new GOV indicator which allows for a more structured approach. We demonstrated how the examples may be ordered, illustrate the difference clustering of Good and Best Practices. Finally, the Dutch BP shows the options of interaction between GOV strata, a phenomenon that we also expect to find in other Good Practices. Further research on the Good Practices and their development in time is needed to draw more firm conclusions, however.

ACKNOWLEDGEMENT

We would like to thank all partners of OPENGOVEU for discussing the idea of GOV in 2015.

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HOLISTIC PLAYER MODELING FOR CONTROLLING ADAPTATION IN VIDEO GAMES

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ABSTRACT

Adaptation to player's context is crucial issue in player-centric video games. It is realized at run time according to measurable player behavior and, hence, provides a huge potential for creating an augmented player experience with higher level of fun and satisfaction. Adaptation mechanisms applied to player-centric games have proven success in generating more pleasurable and immersive gameplay for entertainment games and better learning for serious games. The present holistic player-centric model is suited for adaptation control for any type of video game but especially for applied games where gameplay should fit performance, emotional state and style of individual learner. The outlined preliminary results of a case study with such an applied adaptive video game proves that adaptation of game mechanics, dynamics and aesthetics based on player's performance and emotions model provides enhanced learning experiences.

KEYWORDS

Adaptive, player-centric, video game, emotion, affect.

1. INTRODUCTION

Both entertainment and serious video games should employ sophisticated player's model in order to reveal the whole potential of gaming as medium for fun or learning/training, respectively. Games can make use of rule-based or probabilistic models for tracking/measuring player's behavior and, next, to recognize player's emotions and/or the progress of knowledge/skills achieved during playing the game. Thus, the game should be able to present observation of the player's behavior "from a contextually omniscient view" (Magerko, 2008). The recognized player's features are supposed to be used for building a model of individual player based on player's observations and, as well, to update that model. Next, the updated player's model will provide a basis to adapt the game to that individual and even to predict future changes in player behavior. A video game with intelligent adaptation will fit better for any particular player and, thus, adapted game play should bring optimized player experience and much better playability (Sánchez et al, 2009). As well, it will provide higher immersion and intrinsic motivation and, therefore, better learning (Pavlas, 2010).

Early approaches for player modelling for adaptive games (Houlette, 2004) started with defining and updating a set of properties describing the profile of each player such as his/her individual skills, weaknesses, and preferences. The player model is useful used for simple adaptations of some game elements and, as well, for modeling the non-player characters' behavior (Charles et al, 2005). In last years, player modelling appears to be of crucial importance for both serious and entertainment video games. More exciting gameplay is achievable by real-time personalization and adaptation of player-centric video games (Pavlas, 2010) applying appropriate approaches for player modeling. The player models fit generally into two main groups: behavioral and organizational. The models of game player's behavior describe dynamic processes of player behavior and deal mainly with flow, motivation and immersion. Mihaly Csikszentmihalyi (1990) developed the fundamental concept of flow as a process of optimal human experience where "individuals are so involved in an activity that nothing else seems to matter". In the context of digital games, the flow process concerns optimal gaming experience having a balance between the inherent challenge of the game activity and the player's ability required for its execution. Based on the flow theory, Gilleade and Dix (2004) stressed the importance of three issues considering "motivation of the users: why they want to play, their experience and skills: how able are they to play, and detection: how to identify when change is necessary". Transferring

the flow concept to the area of video games, Sweetser and Wyeth (2005) presented a flow model for assessing player enjoyment named GameFlow including eight elements: concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction. The dynamic relation between the effort and the demand level was described as motivational intensity (Fairclough and Gilleade, 2012) going through boredom (low effort because of low demand), engagement (rising effort due to increasing demand), zone (peak of achievable effort at the highest level of demand), and overload – low effort due to excessive demand.

Organizational player models of player describing properties of player's character, their attributes and facets and, as well, interconnections among them with their time and model space constrains. Based on the flow concept, Kiili (2006) designed and evaluated an experiential gaming model developed to bridge the gap between game design and pedagogy. His model differentiates flow antecedents (challenge–skill balance, action–awareness merging, goals of an activity, unambiguous feedback, and sense of control) from both flow experience and flow consequences (increased learning, positive attitude, exploratory behavior, and perceived behavioral control). Based on the achievements of Kiili, Pavlas (2010) proposed a new model of flow and play in game-based learning, with bearing in mind the impact of game features (control, goals, challenge/skill balance, and feedback), player traits (playfulness, self-efficacy, and intrinsic motivation), player states and outcomes (learning, enjoyment, and further intrinsic motivation).

A successful gameplay depends both on cognitive activities related to solving tasks and on player's skills needed for dealing with game interfaces, or artifacts (Kiili, 2006). Game artifacts determine the level of playability, explained by Sánchez et al (2009) within their classification model described playability by a set of seven attributes: satisfaction, learnability, effectiveness, immersion, motivation, emotion, and socialization. Besides playability, game adaptation may be used for increasing player competence in both playing and game-based learning context, though such approaches are not described until present. As argued by Silva and Behar (2015), user competence is a complex issue formed by psycho-cognitive abilities, attitudes and knowledge, which overlap with skills of the player and all together form player's competence.

The holistic player model presented in this paper is valid for both entertainment and applied (serious) video games. It is based on the synergy of three pillars: player performance, player emotional (affective) state and playing style – all used for realization of the game adaptation process resulting in possible adjustments in features of game mechanics, dynamics and audio-visual content. The presented adaptive video game applied for implicit recognition of playing style uses adaptation of difficulty of three types of tasks (shooting flying objects, discovering hidden objects and solving logical puzzles) based on individual player performance and efficiency. At the same time, emotional-based adaptation is used for additional correction of current difficulty of shooting and discovering tasks according to individual emotions (fear, surprise, sadness and disgust) inferred by facial expressions. On other hand, player's happiness level is applied for adaptation of ambient light intensity. The preliminary results of the reported field trial demonstrate emotional game adaptation is highly desirable as an effective tool for achieving better player experiences, flow and motivation, plus higher performance in execution of respective tasks.

2. RELATED WORKS

For reaching maximal efficiency, mechanisms controlling game adaptation must address player context as a whole, including player competences (Silva and Behar, 2015) - skills, abilities, attitudes and knowledge, creativity and motivation. The player context is strongly related to six distinct and interrelated resources defined by the investment theory of creativity (Sternberg, 2012), namely intellectual abilities (synthetic, analytical, and practical abilities or skills), knowledge, styles of thinking (legislative, executive, and judicial), personality, motivation, and external environment. The investment theory of creativity states that the six distinct resources of creativity are interrelated. Their interaction might result in a synergy and confluence leading to an enhanced creativity or, in other cases, might weaken each other. Player's creativity is directly related to performance and effectiveness and, thus, represents a basis for game adaptation, i.e. for tailoring in real time gameplay constraints according to player's performance. According Tremblay et al (2010), player's performance represents player's knowledge and intellectual abilities and could be used for game adaptation/personalization together with the player preferences. Brisson et al (2012) insist on game adaption achieved according to players competency levels, whereupon "users are likely to express a wide range of

cognitive and motor skills affecting both their preferences and performances during game-play". Most approaches modelling performance-based adaptation try to present the knowledge and intellectual abilities by in-game variables. Adaptive games based on such models update steadily the instance of player model for each individual player by monitoring and recording values of these variables in time sequences.

Besides creativity, a player's model has to be aligned with the modern theories of learning. The experiential learning model of Kolb (1984) is organized in two-dimensional space with abscise axis representing the processing continuum and the ordinate axis perception continuum (how he/she thinks or feels about a task). Based on Kolb's cycle of learning, Honey and Mumford (1992) propose a model containing four learning styles: activist (keen on experiments and challenging, practical tasks), reflector (prefers to observe explored subjects and to think about their specifics), theorist (opposite to activist; seeks formalization, concepts and logical theories) and pragmatist (opposite to reflector, tries to apply ideas into practice). The ADOPTA project (Aleksieva-Petrova et al, 2011) proposed a playing style family based on Kolb's cycle and including: logician style (*watch & think*) - gaming and learning activity include spatial awareness and usage of verbal and numeracy skills; dreamer style (*feel & watch*) - embraces problem solving and lateral thinking plus collaborative skills, social interaction and negotiation; competitor style (*feel & do*) - supposes hand-eye coordination, teamwork and ability to think quickly; strategist (*think & do*) - likes planning, decision-making, testing hypotheses, strategic thinking, and management skills. Unlike other families of playing styles (ADAPTIVES, 2015), the ADOPTA styles are directly based on the Kolb learning model and have strong correlation with Honey and Mumford styles, which makes them appropriate for style-based adaptation in educational games.

As far as playing games is a rather emotional than rational process, emotional-based game adaptivity (often called affective gaming) appears to be crucially important for an efficient player-centric game play. Cheap methods applying eye tracking and gestures are used predominantly for explicit, direct and voluntary game control but not for implicit adaptation. In contrary, implicit adaptation mechanisms rely on affective loop with negative or positive feedback (Fairclough, 2009). A negative feedback control keeps player's arousal near the optimal level for offering an improved player's attention and therefore higher performance during the game play. In this way, negative control loops create behavioral stability during gameplay by keeping the player within a safe zone of stable of performance effectiveness. Contrary to the negative feedback, positive physiological feedback control is discrepancy-enlarging and acts as an amplifier of the difference between the measured psychophysiological input and the desired player's standard and leads to performance instability. Within combined scenarios, the affective feedback loop may toggle between positive and negative control dynamics (ibid), where positive feedback used for relatively shorter gameplay aiming at skill acquisition is alternated with longer time intervals of "performance stability and skill consolidation" possible only under negative feedback control.

3. A HOLISTIC PLAYER MODEL FOR GAME ADAPTATION CONTROL

In order to be effective, game adaptation processes has to be based on a dynamic player model being able to embrace the overall behavior of each individual player in its complexity. The player model should be applied for run time tailoring specific game features according to the evolving player character in an appropriate way.

3.1 ADAPTIVES Player Model

Following the principles of the Sternberg's investment theory of creativity, the ADAPTIVES project¹ approaches three chief types of player's features serving as main pillars of our model. These three pillars match the six resources defined by the investment theory of creativity, as follows:

(1) player emotional (affective) state (Ravaja et al, 2005) – matches player personality and therefore flow, immersion and intrinsic motivation, while depending on the player's environment; player emotions appear to be the core pillar of the ADAPTIVES approach as far as playing games is predominantly emotional than rational process;

¹ <http://adaptives.eu/>

(2) player performance and efficiency (Tremblay et al, 2010) – reflect player’s knowledge, skills and intellectual abilities (synthetic, analytical and practical);

(3) playing style (ADAPTIVES, 2015) – depends on player’s personality and styles of thinking (legislative, executive and judicial) and learning.

Player performance, player emotional (affective) state and playing style form the three central pillars (bases) of a holistic player model for achieving an efficient adaptation for enhanced playability. They are closely interconnected each other and should be used as a whole but not in isolation. In fact, all they are used as player’s responses for realization of the game adaptation process resulting in possible adjustments in features of game mechanics, dynamics and aesthetics as represented in fig. 1.a. The adjusted features provide stimuli to further changes in player’s state, which on their turn are expressed as new responses.

Therefore, measuring of any type of player’s characteristics should be done in an implicit way, inconspicuous and invisible for the player. Such an implicit derivation of player model (i.e. assessment of the player) may rely on measuring visible changes in player state and behavior the game adaptation engine will infer about eventual changes in cognitive, affective, and conative player state, as follows:

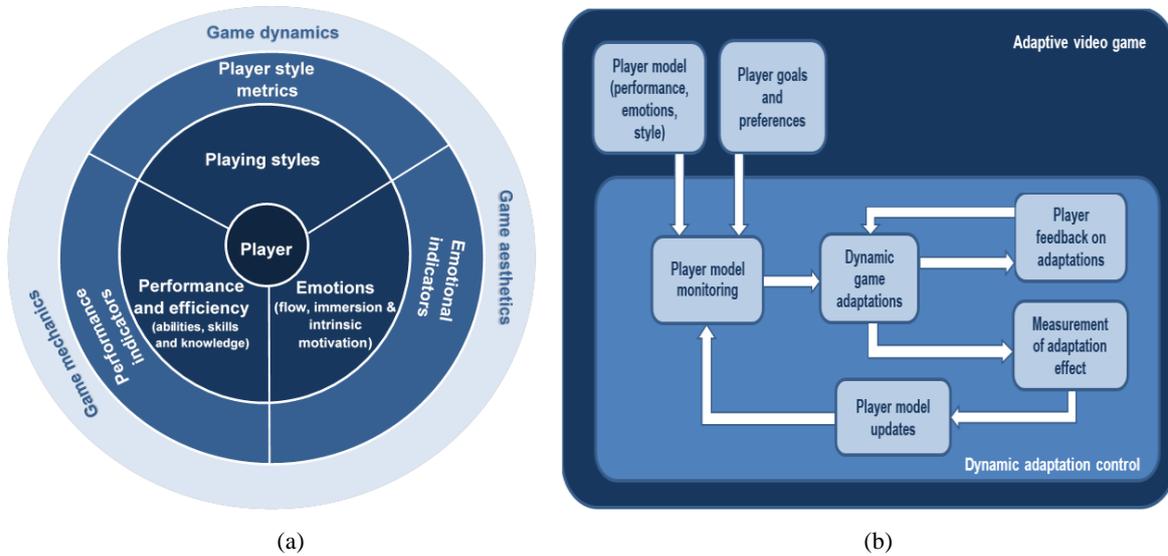


Figure 1. The ADAPTIVES player model (a) and its principal workflow for game adaptation control (b)

(1) Performance indicators will serve for measuring player’s performance and, hence, for estimating player’s abilities, skills and knowledge – the indicator type will vary on the nature of the skill/ability or knowledge considered. For example, motor skills (behavioral and physical skills) can be measured by game metrics like successful hits, number of goals/levels achieved, enemies killed, etc. On the other hand, intellectual skills can be measured by number of problems solved or by time needed for problem resolution. Player’s performance includes total effectiveness and average difficulty of solved tasks, while player’s efficiency is calculated as ratio between attained result and spent effort for achieving that result;

(2) Facial or voice expressions, psychophysiological indicators and/or measures of the central neural system can be used for inferring player’s emotions and, hence, levels of player’s flow, immersion and intrinsic motivation;

(3) For dynamic recognition of playing styles, in particular the ADOPTA styles, the model uses linear regression of specific player metrics obtained by behavioral interactions during the game and depending on specific game context. As a whole, these metrics include: (a) player result (i.e. effectiveness or performance) achieved in accomplishing a task related to specific player style – e.g., number of struck objects might serve as a metric for calculation of shooter style; (b) average player efficiency in accomplishing a task related to specific player style – e.g., ratio between number of struck objects and total number of shots might serve as a metric for calculation of shooter style; (c) attained average difficulty of accomplished task – provided the task difficulty is variable during the game.

Next, identified changes in cognitive, affective, and conative player state are used (all together or separately) for adapting various types of game issues, including the following:

- (1) game mechanics – adjustment of explicit, implicit, or player-driven game tasks and their managed appearance in the game flow (Sweetser and Wyeth, 2005) and non-linear narrative; as far as goals, feedback, rules for obtaining action points, moving within the game, taking greater/lower risk, etc.;
- (2) game dynamics – like adaptation of difficulty according to the player’s anxiety (Rani et al, 2005);
- (3) game audio-visual properties evoking emotional responses (i.e., game aesthetics), like adjustment of ambient light in rooms in a video game (Grigore et al, 2008).

3.2 ADAPTIVES Adaptation Workflow

Player-centric modeling investigates and measures the human behavior and allows researchers and game designers to adapt the game mechanics according important features of the player’s character. The ADAPTIVES principal workflow of game adaptation control generalizes the frame idea of Charles et al (2005) for applying player type and player preferences for monitoring player performance as presented in fig. 1.b. Here, the player type is replaced by an enhanced player’s model including playing style, emotions and performance. Player preferences, together with player goals, are to be used predominantly for static game personalization. In contrast with that, the player model serves for monitoring of overall player’s behavior unlike (Charles et al, 2005) where only player style is monitored, i.e. the model defines exactly what and how to be monitored in terms of space and time. Measurement of the effectiveness of dynamic online adaptation is used for updating the player model and, next, for adapting specific game features according eventual changes in player character. Moreover, individual player feedback is collected and analyzed in real time, instead of traditional methods using self-reports. For example, this could be achieved by means of an adaptation control asset making part of the asset panel of the video game. More precisely, the player communicates his/her appraisal of both direction (negative or positive) and the level (such as low, middle or high) of the present game adaptation, which will allow to the adaptation engine to calibrate the adaptation parameters for this individual player. As well, the adaptation engine may use machine-learning approaches in order to predict the optimal adaptation needed for players with specific instance of the model (i.e. having specific performance, emotional state and playing style).

4. CASE STUDY – THE “RUSH FOR GOLD” ADAPTIVE VIDEO GAME

The main of the designed experiment was to construct a 3D video game using adaptation based on player performance, efficiency and emotional state and, next, to apply it for implicit recognition of ADOPTA playing styles in order to validate them to ones calculated by using self-report. After successful playing style validation (subject of another study), the game is going to be embedded into another educational game, where the implicitly found style will be used for automatic selection of learning content appropriate to that style.

The video game was developed by using Brainstorm e-Studio² and named “Rush for Gold” according its goal: to collect 12 bars of gold (bullions), which are flying, hidden or inside logic puzzles needed to be solved, all located in a 3D Egypt temple (fig. 2) with enhanced audio-visual effects being object of adaptation, as well. The player can use a Strategy Management Table (SMT) representing a table with three rows for planning numbers of bars of the three groups available in the game (shown left in fig. 2). As well, SMT contains data about average effectivity of performance for collecting the gold bars of each group useful for building a strategy for optimal way of play.

Playing styles of Competitor, Dreamer and Logician are calculated using linear regression of achieved total performance, efficiency and task difficulty of shooting flying bullions, discovering hidden bullions and solving puzzles, respectively. Strategist style is determined by using these metrics plus game session time and numbers of strategy plans and SMT views, as well. “Rush for Gold” determines implicitly playing styles using player’s performance, efficiency and emotional state for dynamic adjustment of task difficulties for the shooting, puzzle solving and bullion discovering tasks. Three levels of difficulty are applied for all the three tasks, whereupon the player starts with lowest level and, after solving it, gets a higher level task (no greater than the maximal difficulty) each time when showing efficient equal or greater than 50% (i.e. when using no more than two trials for solving the task), and vice versa. Difficulty of flying gold bars for shooting varies by

² <http://www.brainstorm.es/products/estudio/>

changing their velocity, acceleration and missile defeat range; difficulty of hidden bullions varies by changing their secret location in the temple, and puzzle difficulty is achieved by clustering puzzles into three groups. Beside performance-based adaptation, affective adaptation mechanisms are implemented by emotions inferred by face expression analysis using a Web service accessing Face Analysis Cloud Engine of SightCorp³. Here, individual emotions of fear, surprise, sadness and disgust are applied for additional correction of current difficulty of shooting and discovering tasks by using specific thresholds of their levels, for keeping the player in flow. Generally, when finding relatively high fear, sadness and surprise, task difficulty is decreased, while the opposite occurs in cases of high level of disgust. Solving puzzles is not emotionally adapted, because this would cause dynamic change of puzzle currently shown, while with flying or hidden bars of gold changing task difficulty makes no problems. Player's happiness level is applied for adaptation of ambient light intensity by increasing it at happiness higher than given threshold and vice versa.



Figure 2. A screenshot of “Rush for Gold” 3D video game

The field trial was performed with students and lecturers of the Faculty of Mathematics and Informatics at Sofia University. There were selected 34 volunteers (average aged 27, $SD=10$; 18 men and 16 women), who passed in group explanation and demonstration (20 min.), procedure of informed consent (translated in Bulgarian, 15 min.), individual assisted trial (5 min.) and, finally, unassisted game session to determine their style of play (15-20 min.). Half of the volunteers ($N=17$) played the game with emotional adaptation switched on (forming the experimental group), unlike the others (the control group).

After each session, each player was asked to answer a playing style questionnaire together with five other questions about emotional adaptation. Four of these additional questions used five-level Likert scale (1 - Strongly disagree, 2 - Disagree, 3 - Neither agree nor disagree, 4 - Agree, 5 - Strongly agree) and were as follows: (Q1) I prefer to play the game with adaptation based on the emotions of the player; (Q2) I'm happy with emotional adaptation of the difficulty of shooting in that game; (Q3) I'm happy with the emotion-based adaptation of the difficulty of finding bars of gold; (Q4) I'm happy with the emotion-based adaptation of brightness and contrast. The fifth question (Q5) was about possible recommendations on emotion-based adaptation in video games. For questions Q1-Q5, there were considered only answers of players from the experimental group who have played with emotion-based adaptation switched on. These answers reveal certain preference to play the game with emotion-based adaptation (Q1 *average*=3.9, *sd*=1.1) and positive appreciation of that adaptation of shooting difficulty (Q2 *average*=4.0, *sd*=0.8), discovering difficulty (Q3 *average*=3.8, *sd*=0.7), and brightness and contrast (Q4 *average*=4.1, *sd*=0.7).

Regarding game metrics scores of the experimental and control group, improvements were found in playing time and shooting and game performance. However, Single Factor ANOVA found values of $F(1,32) < F_{crit.}$ and $p > 0.05$ revealing these improvements are not statistically significant. On the other hand, statistically significant correlations between answers to questions Q1-Q4 and some game metrics were found. They are presented in Table 1, where Pearson's r for values of $p > 0.05$ are given in bold together with their p value. Positive statistically significant correlations between preferences to play with emotional adaptation

³ <http://sightcorp.com/>

(Q1) and shooting/discovering efficiency, discovering performance/efficiency and game session time reveal the beneficial impact of emotional adaptation inside the experimental group. In contrary, significant negative correlations can be explained by appreciating emotional adaptation for making the game harder when found higher disgust (decreasing player efficiency and performance) or easier when found higher fear, sadness or surprise (decreasing attained difficulty). Metrics of solving are checked only for correlations with adapted brightness and contrast, as they are not emotionally adapted. As shown in Table 1, adapted brightness and contrast are correlated positively to solving performance and negatively to discovering performance.

Table 1. Correlations between questions answers and game metrics

Correlation	Q1	Q2	Q3	Q4
Shooting performance	-0,05063	-0,04917		-0,10387
p-value				
Shooting efficiency	0,34123	-0,36480		0,15560
p-value	0,02414	0,01695		
Shooting difficulty	-0,10463	-0,16590		-0,09131
p-value				
Discovering performance	0,39304		-0,51222	-0,36528
p-value	0,01075		0,00098	0,01682
Discovering efficiency	0,42803		-0,38033	-0,08400
p-value	0,00578		0,01332	
Discovering difficulty	0,55417		-0,47127	0,01603
p-value	0,00034		0,00245	
Solving performance				0,33674
p-value				0,02575
Solving efficiency				-0,11128
p-value				
Solving difficulty				0,16919
p-value				
Game session time	0,35913	0,37336	-0,09534	-0,05897
p-value	0,01849	0,01482		

5. CONCLUSION

Player-centric adaptive game play possesses essential advantages compared to the non-adaptive gameplay and, as well, to the static game personalization. An appropriately designed and developed game with dynamic adaptation can succeed in matching essential features of the player –cognitive, emotional and conative. These features are to be organized within a detailed and uncontroversial model of player behavior.

The paper presented a holistic player model aimed at player-centric adaptation in video games, especially applied games. It is based on synergy of using player's performance, emotions, and playing styles – all identified in an implicit way at run time and used for adapting game mechanics, dynamics and audio-visual content. Thus, the adaptive feedback loop applies cognitive, emotional and style player's reactions, which correspond to the three divisions in modern psychology: cognitive, affective, and conative.

There were briefly outlined some results obtained from an experiment with a video game applying for implicit calculation of playing style and using adaptation based on performance/efficiency and emotional state of individual player. The results reveal a promising and positive appreciation of emotion-based adaptation and, as well, interesting statistically significant correlations between such adjusting of dynamic difficulty of tasks and player's self-report. More experiments with real time player's feedback on adaptation use, additional self-reporting and qualitative analyses are needed for revealing how such emotion-based adaptations affect game playability and antecedents, experience and consequences of flow (Kiili, 2006).

Finally, generic approaches for automatic classification of player styles and behavior, which are not oriented to a specific family of playing styles nor on a fixed game type, may appear attractive. However, they expediency for game adaptation purposes is questionable because extracted player styles are not interpretable – the automatic classification of player styles and behavior only states that there are found such player styles. On other hand, if researchers know the features of a player style, which is to be found, they will be able to use these features for realizing a player-centric adaptation.

ACKNOWLEDGEMENT

The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's 7th Framework Programme FP7/2007-2013/ under REA grant agreement n° 624184.

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EXPLORING THE EFFECTS OF OPENNESS TO EXPERIENCE AND THEORY OF CONSUMPTION VALUES ON ONLINE LEARNING ADOPTION

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ABSTRACT

Personality traits and perceived product values are increasingly used to explain how people adopt innovative technologies. However, their relationships and effects on online learning adoption are ill-defined. This study investigates one of the common personality trait –openness to experience– and the value dimensions of theory of consumption values –functional (quality and monetary) value, social value, emotional value, epistemic value, and conditional value– to understand students’ intentions to adopt online learning. The study used a structural equation modelling technique (SEM) to analyze the data gathered from university students. The results indicate that students who are highly open to experience pay attention to monetary value and conditional value of online learning. Students, who perceived online learning as a quality method of learning (quality value), an interesting method of learning (emotional value), and an online learning community (social value), will have good intention to adopt online learning. Interestingly, the results contend that the five values of theory of consumption values are interrelated and contributed to online learning adoption differently. This study provides guidance to universities for planning and developing online courses/programs that will be considered valuable by students who are open to new experience leading to the increment in online learning students. The analysis results and implications for theory and practice are discussed. The paper concludes with the study limitations and directions for future studies.

KEYWORDS

Online learning, Openness to experience, Theory of consumption values, Personality, Technology adoption

1. INTRODUCTION

Personality traits and users’ perceptions of technology values presently receive much attention in technology adoption studies. Openness to experience, one of the most studied dimension of personality traits, has been widely investigated by psychologists to understand human mental process and behaviors (e.g., Mehta, 2012; Costa and McCrae, 1992). People who are open to experience are willing to try new and different things associated with people intention to adopt a new technology. However, information systems (IS) researchers rarely investigate this personality trait and have limited understanding of how openness to experience influences people to adopt innovative technologies. In addition, recent IS studies investigating the effect of openness to experience on technology adoption provide incongruent results. Tsao (2013) posited that openness to new experience significantly affected various Internet usages including communication, entertainment, and social relationship excepting information gathering. Tan and Yang (2012) found no significant effect of open personality on the use of various Internet services including email, search engine, online music and movies, social network site, and e-banking. Devaraj et al. (2008) also contended that openness to experience influenced individual use of systems through perceived usefulness and behavioral intention. IS researchers continue investigating how people who are open to experience think about innovative technologies leading to the use of these technologies.

In addition, research in technology adoption has focused on value perceptions to understand users’ adoption of various technologies including Internet services (Tseng and Teng, 2014; Cheng et al., 2009), information systems (Tzeng, 2011), and mobile services (e.g., Wang et al., 2013; Rakhi and Mala, 2014). Theory of consumption values, proposed by Sheth et al., (1991), is one of the most contributed studies of

consumer behavior in a product choice situation due to its multi-dimensional forms of values (Sanchez-Fernandez and Iniesta-Bonillo, 2007). The theory of consumption values (TCV) consists of five attributes; functional, emotional, social, epistemic, and conditional values.

The relationship between open personality and theory of consumption values, however, is ill-defined to explain users' adoption of technologies. Understanding this relationship would fill the gap in technology adoption literature and assist service providers to offer and improve the values of their services for users who are open to new experience. It is therefore worth to understand how openness to experience and the five values of TCV are associated and influence the use of a technology. Online learning a contemporary trend of learning method that uses an innovative technology to provide teaching and learning experiences is used as a domain of this study as it can be used to explain all five values of TCV.

Accordingly, this study aims to investigate the causal relationships between openness to experience and the five attributes of theory of consumption values, and examine their effects on students' intentions to adopt online learning. This study will extend knowledge in technology adoption in relation to the effects of personality trait and value perception of online learning. It will also provide guidance for value creation of a university's online learning system to attract students' intentions to study online courses.

The following sections discuss theoretical background of the study constructs and online learning as a domain of this study. The study's hypotheses and methodology are then presented and followed by a discussion of the findings and the implications for theory and practice. The paper concludes with limitations of the study and the direction of future studies.

2. THEORETICAL BACKGROUND

2.1 Openness to Experience and Technology Adoption

Costa and McCrae (1992) identify openness to experience (OPE) as a tendency to have flexible thought and devise new ideas. People who have a high degree of OPE have curiosity to seek out new experiences and learn value change. OPE as one dimension of big five personality traits (Costa and McCrae, 1992) has been used to understand human thought and predict various aspects of human behaviors. For instance, OPE was proved to have significant correlation with creativity, absorption and general knowledge (Phares and Chaplin, 1997; Chamorro-Premuzic et al., 2006). A high level of OPE affects various personality disorders including odd and fragmented thinking, excessive self-valuation, and sensitivity to external hostility (Piedmont et al., 2009). Other studies have applied OPE to predict human behaviors in relation to work success (Mehta, 2012) and learning styles (Komarraju, 2011).

Table 1. Effects of openness to experience on technology adoption

Investigated technology (Dependent variable)	Relationships with openness to experience	Result	Sources
Social networking site use and instant messaging use	Direct effect	Significant effect	Correa et. al., 2013
Internet use for entertainment, communication, and social relationship	Direct effect	Significant effect	Tsao, 2013
Internet use for information gathering	Direct effect	Insignificant effect	Tsao, 2013
Internet use for basic services, entertainment, social networking, transaction, and finance	Direct effect	Insignificant effect	Tan and Yang, 2012
Online purchase intention	Indirect effect through utilitarian motivation, hedonic motivation and search intention.	Significant effect	Tsao and Chang, 2010
Information system use	Indirect effect through perceived usefulness and intention to use	Significant effect	Devaraj et al., 2008

However, previous studies on the impact of OPE on technology adoption are limited and the results are incongruent. Tsao (2013) found that the impacts of OPE on Internet usage categories are varied. OPE had significant and direct effects on the use of Internet for communication (e.g., video conference and Internet call), entertainment (e.g., online movie, music and video), and social relationship (e.g., online games and chat rooms); but insignificant effect on Internet usage for information gathering (e.g., portal browsing and information searching). Tan and Yang (2012) examined the direct impact of OPE on the use of various Internet services including basic services (e.g., email and search engine), entertainment services (e.g., online music and movies), social networking (e.g., blog and social network site), transaction services (e.g., buy from and sell in websites), and financial services (e.g., e-banking and e-tax reporting). They found no significant effect of OPE on the use of all Internet services. Correa et al., (2013) posited that openness to experience had significant and direct effect on the use of social networking and instant messaging. Furthermore, researchers had examined the impact of OPE on technology adoption through different mediators. For instance, Devaraj et al. (2008) found the significant impact of openness to experience on a system use through perceived usefulness and behavioral intention. In the study of Tsao and Chang (2010), OPE was proved to have an indirect effect on online purchase intention through utilitarian motivation, hedonic motivation and search intention. Table 1 summarizes recent studies of the impact of openness to experience on technology adoption.

2.2 Theory of Consumption Values

For many years, researchers have applied theory of consumption values (TCV) to explain the consumer choice—to buy or not to buy or to choose one brand over another (e.g., Pihlstrom and Brush, 2008; Tzeng, 2011; Wang, et al., 2013). The theory was designed specifically for practitioners to understand specific factors that drive consumer decisions so they can develop actionable strategies efficiently. The applications of TCV have been vastly demonstrated in marketing literature; however, it is limited appearing within information systems literature. TCV was initiated under three fundamental propositions: a consumer choice is a function of multiple consumption values, the values give different contributions in any given choice circumstances, and the values are independent (Sheth et al., 1991). Sheth et al. (1991) proposed the five attributes of TCV involving functional value, emotional value, social value, epistemic value, and conditional value that contribute to consumer choice behavior.

Functional value is relevant to the ability of a product to perform functional, utilitarian, or physical purposes through its composite attributes such as durability and price (Sheth et al., 1991; Tzeng, 2011). Consumer's buying decision is associated with product attributes and how well the product fulfills the consumers' utilitarian needs. Quality/performance and price/value for money are major factors that contribute to the perception of functional value of a product and should be measured separately (Sweeney and Soutar, 2001). In this study, functional value are depicted by these two dimensions, quality value and monetary value. Emotional value refers to a product's ability to arouse individual emotion (Sheth et al., 1991). A product can potentially evoke users' feelings towards the use of a product. Emotional value reflects enjoyment, playfulness, and pleasure of using products and has been attested to promote the use of information technology (Tseng, 2011). Social value refers to the product utility associated with one or more specific social groups to obtain social status of individuals among others (Sheth et al., 1991). People may buy products as they want to be accepted by others (Sweeney and Soutar, 2001). Social value often influences consumer choices of highly visible products such as clothing, cars, and jewelry. Epistemic value pertains to a product ability to arouse curiosity, provide novelty and/or satisfy a desire for knowledge (Sheth et al., 1991). It could refer to novelty value derived from learning new ways of doing things. For instance, in the context of online learning, it entails curiosity for new knowledge gained through testing a new online service (Pihlstrom and Brush, 2008). Conditional value refers to a product's ability to perform in a particular circumstance or set of circumstances (Sheth et al., 1991). People perceive a product's conditional value only within a specific context. For instance, a winter coat has significant value during a winter snowstorm.

Most of value-based studies excluded the epistemic and conditional value dimensions of TCV from their investigations (e.g., Deng et al., 2010; Sweeney and Soutar, 2001). Epistemic value, however, is important to understand the individual's use of a new technology while conditional value is a context specific which is an important value of online services where users can access the services in specific and different situations (Pihlstrom and Brush, 2008; Tzeng, 2011; Wang, et al., 2013). This study uses all five factors of TCV to explain the effects of their relationships and openness to experience on technology adoption. The consumption values perceived by individuals can occur at various stages of the adoption process (Sweeney and Soutar, 2001).

2.3 Online Learning in Education

Many universities progressively offer online learning for online programs and/or online courses (a part of the online program). The term of online learning, however, is not clearly defined and closely related to the interpretations of e-learning and distance learning (Moore et al., 2011). Online learning can be broadly described as an approach to access learning experience using some technologies such as Internet, Intranet and web-based tools (Carliner, 2004; Cheng, 2012). It can be used as a supplementary learning method for supporting traditional classroom teaching or as a stand-alone learning method for facilitating independent learning (e.g., distance education) (Ho et al., 2010). Various learning systems can be used to accomplish online learning such as a learning management system (LMS), a course management system (CMS), and a learning content management system (LCMS). Presently, a new online course development called MOOC (massive open online course) has been largely adopted by many elite universities including Yale, MIT, UCLA, Carnegie Mellon, and Stanford University. Universities use MOOC to handle large participants who openly access via the website and offer online courses for credit, non-credit, certificate or online degree. In this study, online learning pertains to the online courses offering via the web-based applications and can be accessed with mobile devices. Online learning is used as a domain of this study as it can be used to explain all five attributes of TCV.

3. HYPOTHESES

People with a high degree of openness to experience more actively look for various viewpoints and opportunities to learn a new way of doing things in the same way that online learning allows students to study in different situations associated with conditional value perception. To seek out opportunities to learn from new things, open people will consider functional value of such things they want to learn (Tsao and Chang, 2010). These people will look at the functional value in terms of price (i.e., monetary value) and quality value. Consumers usually seek a high quality and low price product. Accordingly, the study proposes that openness to experience positively associates with conditional value and quality value, and negatively associates with price or monetary value.

H1_{a-b}: Openness to experience positively relates to (a) conditional value and (b) quality value.

H1_c: Openness to experience negatively relates to monetary value.

Conditional value has been investigated and confirmed its effects on functional value, emotional value, and social value of mobile services (Gummerus and Pihlstrom, 2011; Pihlstrom and Brush, 2008). Wang et al., (2013) examined the use of mobile applications and affirmed the positive effect of conditional value on the other four values of TCV. As online learning is an application of mobile services, this study proposes that conditional value will have positive effects on quality value, epistemic value, and emotional value of online learning. However, the study argues that the capability of online learning in studying anywhere at convenient time will isolate students from social (classroom) interaction and hence lessen social value of online learning.

H2_{a-c}: Conditional value positively affects (a) quality value, (b) epistemic value, and (c) emotional value.

H2_d: Conditional value negatively affects social value.

Epistemic value is occurred when a product satisfies individual desire for new knowledge and experience (Sheth et al., 1991). Online learning, an innovative IT artifact, can stimulate students' curiosity to experience the novelty of this technology. Previous studies have confirmed the effects of epistemic value on other consumption values—functional (utilitarian/quality) value, emotional value, and social value (Pihlstrom and Brush, 2008; Gummerus and Pihlstrom, 2011). Accordingly, it is expected that epistemic value will have positive effects on quality value, emotional and social values of online learning.

H3_{a-c}: Epistemic value positively affects (a) quality value, (b) emotional value, and (c) social value.

Monetary aspect is a major consideration for consumers to make buying decision. Price of a product stimulates consumer emotion toward the product. Most buyers are happy and tend to buy a product that is inexpensive compare with the alternatives or a product that are on sales. Monetary value, therefore, has a direct effect on individual emotion (e.g., like or dislike) toward a product or service.

H4: Monetary value positively affects emotional value.

Online learning system commonly provides collaboration, interactivity and information sharing services to fulfil students' requirement for their learning indicating the quality of online learning. Previous studies has

confirm the relationship between quality and price of a service. A service with high quality commonly comes with its price. In addition, students intend to study online courses when they perceive the quality of online courses. In other words, quality of online learning positively influence students' intentions to adopt online learning.

H5_{a-b}: Quality value positively affects (a) monetary value and (b) intention to adopt online learning.

Emotional value was proved to have an important effect on the usage intention of mobile services in many studies (e.g. Kim et al., 2007; Mallat et al., 2009; Turel et al., 2010). Consumers who have a good impression of the shopping website had a positive attitude and intention to shop from the website (Babin and Attaway, 2000). Similarly, students who find the online learning is emotionally carried out such as enjoyment, interesting, and playfulness tend to accept online learning.

H6: Emotional value positively affects intention to adopt online learning.

Individuals perceived social value of products when they can express self-image socially to others by using the products. Online learning is considered to represent a contemporary trend of education and is receiving much attention from universities and students. Students studying online courses therefore can promote their self-images among others studying online courses. Previous studies provided evidence to support the positive effects of social value on individual intention to use various technologies (e.g. Li, 2011; Cheng et al., 2009).

H7: Social value positively affects intention to adopt online learning.

4. METHODOLOGY

The study uses a survey as a method of data collection. Students at a university offering online learning programs were used as subjects of analysis as they are familiar with the nature of online learning. A questionnaire used as the survey instrument was preliminary tested with some students to ensure the clarity of questions before proceeding to the main study. Students were asked to express their agreements with the statements aimed at addressing the study constructs using the five-point scales (1=strongly disagree, 5=strongly agree). They were also asked to provide their demographic profile in the last part of a questionnaire. 335 questionnaires were distributed to students in several classrooms in cooperation with the class lecturers. After dropping out incomplete questionnaires, 272 usable questionnaires accounted for 81% were proceeded to further analysis. These data were greater than a critical sample size of 200 providing sufficient power for the structural equation modelling (SEM) analysis technique (Garver and Mentzer, 1999). The respondents' demographics indicated that 57.4 percent of respondents were male and 76 percent aged between 20 and 25 years old. More than 92 percent of respondents were undergraduate students and 57.7 percent had never studied online courses.

A confirmatory factor analysis using the Analysis of Moment Structure (AMOS) software was employed to assess the fit indices of the measurement model, construct reliability, convergent validity, and discriminant validity. The fit indices were measured by the ratio of chi-square to degree-of-freedom (χ^2/df), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), incremental fit index (IFI), comparative fit index (CFI) and root mean square error of approximation (RMSEA). Compared to the recommended fit indices (Hair et al., 1998), the results in Table 2 indicate a reasonably good fit of the measurement model ($\chi^2/df=1.551$, GFI=.913, AGFI=.879, NFI=.911, IFI=.967, CFI=.966, RMSEA=.045).

Table 2. Fit indices of the measurement model and structural model

Fit indices	χ^2/df	GFI	AGFI	NFI	IFI	CFI	RMSEA
Recommended level	≤ 3.00	≥ 0.90	≥ 0.80	≥ 0.90	≥ 0.90	≥ 0.90	≤ 0.08
Results (measurement model)	1.551	0.913	0.879	.911	0.967	0.966	0.045
Results (structural model)	1.642	0.900	0.870	.900	0.958	.958	0.049

Reliability was confirmed by composite reliability. The acceptable composite reliability should have a value greater than 0.6 (Kline, 2000). As shown in Table 3, all composite reliabilities of each construct were greater than or equal to 0.7 affirming the construct reliability. Convergent validity was determined by the average variance extracted (AVE) (Fornell and Larcker, 1981). It was suggested that the AVE of each construct should be greater than 0.5 for an acceptable level of convergent validity (Hair et al., 1998). As

shown in Table 3, all AVEs were greater than or equal to 0.5 affirming the convergent validity of all latent constructs. Discriminant validity was confirmed when the square root of AVE is greater than the correlation between any two constructs (Fornell and Larcker, 1981). Table 3 indicates that the square root of AVEs for each construct (Diagonal elements) were greater than the correlation among any of two constructs (Off-diagonal elements) satisfying the criteria of discriminant validity. In sum, the measurement model evidenced adequate reliability, convergent validity and discriminant validity.

Table 3. Measurement properties of reliability, convergent validity, and discriminant validity

Construct	β	ρ_c	AVE	OPE	QV	MV	EV	EPV	CV	SV	INT
OPE	.78, .69, .63	0.75	0.50	0.70							
QV	.73, .74	0.70	0.54	0.16	0.74						
MV	.71, .94	0.81	0.69	-0.06	0.67	0.83					
EV	.85, .89, .79	0.88	0.71	0.08	0.73	0.54	0.84				
EPV	.76, .76, .66	0.77	0.53	0.03	0.52	0.37	0.66	0.73			
CV	.70, .87, .75	0.82	0.60	0.16	0.48	0.26	0.55	0.50	0.78		
SV	.83, .90, .77	0.87	0.70	0.06	0.49	0.34	0.46	0.52	0.17	0.83	
INT	.83, .79, .84	0.86	0.67	0.14	0.68	0.44	0.78	0.65	0.49	0.64	0.82

Notes: β =factor loading; ρ_c =composite reliability; AVE= average variance extracted; OPE=openness to experience; QV=quality value; MV=monetary value; EV=emotional value; EPV=epistemic value; CV=conditional value; SV=social value; INT=intention to adopt online learning. Diagonal elements are the square root of AVE. Off-diagonal elements are the correlation between any two constructs.

The fit indices and causal path analysis of the structural model were examined by AMOS software. The fit-model indices accompanying the recommended levels are shown in Table 2. The results met the requirement of the recommended level confirming a good fit of the structural model ($\chi^2/df=1.642$, GFI =.900, AGFI=.870, NFI=.900, IFI=.958, CFI=.958, RMSEA=.049). Figure 1 shows the results from the structural modeling analysis and the path effects among respective factors. It provides the standardized regression weights, significant levels, and squared multiple correlations (SMC) of endogenous variables.

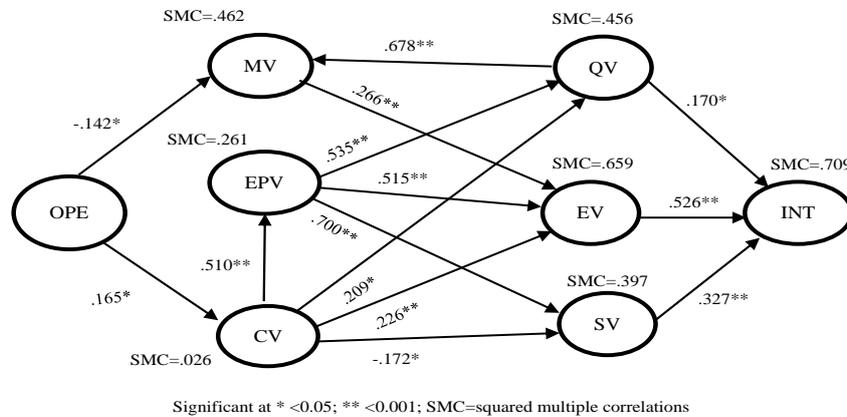


Figure 1. Result model

5. RESULTS AND IMPLICATIONS

The study framework explains the variance of intention to adopt online learning at 70.9 % and most hypothesized relationships between the two constructs are significant (see Figure 1). Openness to experience positively affects conditional value and negatively affects monetary value and (H1a, H1c: support), but insignificantly affects quality value (H1b: not support). Conditional value positively affects quality value, emotional value, and epistemic value (H2a-c: support). It also has a negative effect on social value (H2e: support). Epistemic value positively affects quality value, emotional value, and social value (H3a-c: support).

Monetary value positively affects emotional value (H4: support) and quality value positively affects monetary value (H5a: support). Finally, quality value, emotional value and social value have positive effects on intention to adopt online learning (H5b, H6, H7: support).

Students who are open to experience actively look for new things which often devise novel ideas and creativity. They tend to seek opportunities to diverge their thinking from learning new ways of doing things. The results indicate that students who are highly open to experience pay attention to conditional value and monetary value of online learning. In an online learning environment, students don't have to study in classrooms as usual. They can study in different situations at any locations and any time (a manifestation of conditional value). The study also points out that students who are open to experience will consider functional value of online learning in terms of value for money (monetary value). Open students want to gain new experience which has a low cost to them. Cost of online learning, usually cheaper than classroom learning, is attractive to students who are highly open to try new experience. The results, however, show that students who open to new experience insignificantly concern the quality of online learning. This can be explained that students do not believe online learning can provide a good quality of learning when compared to classroom learning. In addition, the result shows that openness to experience has an indirect effect on intention to study online courses through the perceived values of online learning (Figure 1). Students who are highly open to experience, therefore, will not adopt online learning without perceived values of online learning.

The results indicate that students' perceptions of quality value, emotional value, and social value directly affect their intentions to adopt online learning (see Figure 1). Students intend to study online courses when they perceive that online learning provides quality of learning, satisfies their needs (emotional value), and enables students to express and share their ideas among others in an online learning community (social value). According to the effects of conditional value, an online learning's capability to be studied in different locations allows students to learn anywhere when needed which improves the quality of learning. Online learning provides a new way of learning experience and calls forth students' interests in studying online courses. However, studying online courses at convenient time encourages self-learning and prevent students from social interaction. For the effects of epistemic value, students who want to try a new method of learning (study online courses) will concern about online learning quality. Students have positive emotion toward online learning and want to be part of online learning community. In case of the social value's effects, students who perceive that online learning can help them to express and exchange their ideas among others studying online courses will intend to study online courses. Finally, quality and emotional values significantly affect intention to adopt online learning. Students who believe online learning satisfy their needs of study are more likely to adopt online learning. Those who also believe online learning provide quality of course content and support tend to study online courses in the near future.

5.1 Implications for Theory and Practice

The implications for theory are threefold. Firstly, this study fills the gap in technology adoption literature as previous studies had not applied the openness to experience and theory of consumption values (TCV) to understand online learning adoption (see Table 1). It successfully tests and confirms the significant effects of openness to experience on online learning adoption through the five attributes of TCV. Secondly, this study contends that the values of TCV are interrelated as opposed to the fundamentals of TCV. Individual perception of technology values are prioritized leading to a causal effect among consumption values. For instance, students perceive conditional value and monetary value leading to the perceptions of other online learning values (see Figure1). In complement to previous studies, the results imply that value perceptions vary in relation to individual personalities and subjects of study. Thirdly, the study further investigates cause-effect relationships between the dimensions of functional value and other values of TCV. This study further investigates and confirms relationships between the two attributes of functional value, namely monetary value and quality value, and other values of TCV (i.e., conditional, emotional, epistemic and social values).

This study also provides important implications for practice. It provides guidance to universities for creating values of their online learning systems and attracting students' intentions to study online courses. In particular, university policy-makers and online learning developers can use the study results for planning and developing online courses/programs that have high values for students who are open to new experience. Firstly, students with a high degree of openness to experience pay much attention to conditional value and

monetary value of online learning. In case of the conditional value concern, students should be able to study online courses in different conditions without (or minimum) time and location constraints. Universities should therefore make online learning available for students to study not only through their personal computers but also through their mobile devices (e.g., mobile phones, notebooks and tablets) and the online learning system should support various mobile operating systems (e.g., androids, IOS, and window mobile). For the concern of monetary value, universities should offer the reasonable and competitive cost of online study (e.g., tuition and miscellaneous fees). Secondly, the study indicates that quality value, emotional value, and social values significantly influence students' intentions to adopt online learning. Universities should enhance these values perceived by their students. For instance, instructors should update online course materials and respond to students' comment regularly. They should be trained to develop online course content and use learning management system efficiently, and the online learning system should have a competent performance (quality value enhancement). Online learning system developers should focus on user-friendly interface to enhance students' pleasure and enjoyment to study online courses (emotional value enhancement). In addition, they should create online communities such as forum and social media where students can express their self-image and ideas socially among others (social value enhancement).

6. CONCLUSION AND LIMITATIONS

This study proposes a new framework to explore the effects of openness to experience and value dimensions of theory of consumption values on intention to adopt online learning. The results indicate that openness to experience has an indirect effect on intention to adopt online learning through the perceived values of online learning. The value dimensions of theory of consumption values –functional value (i.e., monetary value and quality value), emotional value, social value, epistemic value, and conditional value– are associated and influence students' intentions to adopt online learning differently. The study suggests that students who are highly open to experience pay much attention to monetary value and conditional value of online learning. Students, who believe that online learning provides a quality of learning (quality value) is an interesting method of learning (emotional value) or enables them to express ideas among their friends in an online learning community (social value), will have strong intention to adopt online learning. This study extends knowledge in information technology adoption and provides some important implications for theory. It also provides an opportunity for universities to explore and understand how students who are open to new experience perceive the values of online learning and develop their online learning systems to suit the students' needs resulting in the possibility to increase their online learning students.

This study has some important limitations. Firstly, the study describes the attributes of openness to experience in relation to active imagination and invention. Previous studies, however, advised additional attributes of openness to experience including intellectual curiosity and aesthetic sensitivity (Costa and McCrae, 1992). Future study might strengthen the construct validity by incorporating different attributes of openness to experience. Secondly, the study proposes a new framework to explain online learning adoption through the effect of one importance of personality traits–openness to experience. It is worth to broaden the scope of this study to examine or include other personality traits (e.g., agreeableness and extraversion). Finally, the study is carried out at one time point and the perception of technology values can be changed over time. A series of observations of students' perception of the online learning values is recommended to validate the study framework.

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CREATING INCLUSIVE USER INTERFACES: TOWARD A COMPREHENSIVE INCLUSIVITY EVALUATION

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ABSTRACT

This research proposes a new inclusivity measurement called the ‘Inclusivity Metric’, to measure whether the website or online service suitable for use by older users, users with disabilities, as well as able-bodied users and computer literates. The Inclusivity Metric will use a set of constructs and will calculate the Inclusivity Score for the online service, providing a number value for the design team to rate and evaluate their design. This metric can aid designers to adjust their designs to be mindful of the users who fit in the categories mentioned above instead of just following a generic design guidelines, thus bridging the digital divide by allowing a wide range of users to engage with the business or government conveniently on the internet rather than in person or on the phone, which will in turn reduce costs and work load from workers. This metric can also be used as tool for usability testing to insure that the design is easy to use for as many users as possible without compromising on the functionality of the online service.

KEYWORDS

Interface Design, Inclusive Design, E-government, Interface Evaluation, Human-Computer Interaction, Digital Divide.

1. INTRODUCTION

In recent years there has been a shift of focus by user interface designers when designing for marginalized groups, moving from designing exclusively for older and disabled people toward an Inclusive Design approach, where designers try to accommodate the needs of these groups in their original designs, thus targeting as many users as possible (Christopher Sze Chong Lim 2010). This is triggered by governments pushing legislations that promote inclusive design practices for their services as well as the growing change of demographics around the world and especially industrial societies as the 60+ age group is continuously increasing. These potential users’ needs are not being well catered for with current design of e-services, by solely focusing on able-bodied users will hinder the governments and businesses prospects reaching out to as many customers as possible (Chu et al. 2012).

This is important to governments and businesses alike, for instance with businesses they might lose potential customers to competitors if their e-services’ design is difficult for older or disabled users. While with governments they are mandated by legislations to provide accessible services to all their constituencies. Many laws have been put in place to insure that websites allow people with different capabilities to use without the need from others. Acts like the USA’s Telecommunications Act of 1996 that requires designs to be accessible and usable for people with disabilities, similar laws have been put in place in many countries around the world to promote the same notion (Abascal & Nicolle 2005; Story et al. 1998). Being able to serve a wide range of customers online without having to call customer service for assistance is key to reduce operation costs and free staff to handle more complex tasks. This Action Research was conducted in a County Council in the United Kingdom and aims to propose an Inclusivity Metric that assigns a numeric value called Inclusivity Score to indicate how inclusive the interface of the e-services to older users, users with disabilities, and able-bodied users. The purpose of this research is to see how the Metric was able to measure the inclusivity level of the user interface, and how designers and project team can utilize this tool to improve their designs and bridge the digital divide.

2. INCLUSIVE DESIGN

While there are procedural and philosophical differences between Inclusive Design (also referred to as Universal Design) and User-centered Design methodologies, they both focus on improving design usability by focusing on users' needs, however they differ on how they tackle it (Astbrink & Beekhuyzen 2003). Figure 1 classifies user groups in terms of their abilities; in the bottom which represents the largest percentage of users are the able-bodied people. This users group does not require special attention during user interface design. However, as we go up the pyramid the users' needs and the design requirements change. At the top of the pyramid is a niche user group with specialized user interface requirements that often relay on the use of assistive technologies. While User-centered Design tries to address the needs and provide user interface for services that especially cater for users in each level of the pyramid. Inclusive Design tries to address only the bottom two levels in a unified way assuming that if the needs of the middle level are satisfied the needs of the bottom level will be satisfied automatically. Moreover, Inclusive Design does not try to include the needs severely disabled users as they are more likely to drastically change the user interface and these needs are satisfied by the use of assistive technologies.

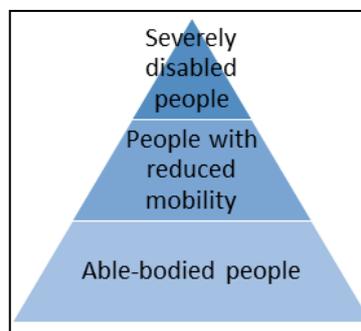


Figure 1. User types based on abilities

Inclusive Design promotes maximizing the number of potential users, by reducing the emphasis on aesthetics and more on accessibility (Keates et al. 2000). Newell and Gregor (2002) argue that the idea of designing something for everyone to use can be discouraging to designers as it limits their freedom and caps the user interface's capacities in terms of interaction and appearance. The idea of designing a user interface that can be used by users with different capabilities –physical or mental- is a very hard task, if not impossible. Especially since designing a user interface for disabled or older users would make the usage more difficult for users without disabilities (Newell and Gregor, 2002). The issue with designers is that they often design for able-bodied users and neglect the needs of users with different capabilities due to their unawareness to these users' needs and how to accommodate them (Keates et al., 2000).

Inclusive Design has always been embraced in the architecture field (Astbrink and Beekhuyzen, 2003). While it is grounded in the field of architecture and environment design its principals still apply to the field of HCI. Story et al. (1998) outlines the seven principals of Inclusive Design as follows:

- Equitable use: The design is useful to users with different abilities
- Flexibility in use: The design accommodates different users' preferences
- Simple and intuitive Use: The use of the design is easy to understand regardless of users' experience.
- Perceptible information: The design communicates necessary information effectively.
- Tolerance for error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Low physical effort: The design can be used efficiently and comfortably and with a minimum of fatigue
- Size and space for approach and use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Inclusive Design is seen as the catalyst for promoting inclusivity of user interface's design. While this approach places more emphasis on user involvement in the design process, by investigating the needs of the users and build a user interface that satisfies these needs. However, the user interface designed might not be useful to a big variety of users (Newell and Gregor, 2002). By this active involvement of users designers can gain clear understanding of how and why the users will use the user interface, and thus prioritize the things that have more significance to facilitate a smooth interaction with the UI (Astbrink and Beekhuizen, 2003).

3. INCLUSIVE DESIGN EVALUATION TOOLS

There are multiple tools used by user interface designers use to evaluate their design. While they are all beneficial for designers, they differ in the way and the stage at which they are used. All these evaluation tools help designers to be more aware of the requirements of a broader user group and be able to fulfil these requirements.

3.1 Guidelines

One of the great benefits of design guidelines is that it can be used at various stages of the design process. At the early stages it can help with defining the requirements of the new interface, it can also be used as an evaluation tool to check whether specific requirements have been met in the design (Zitkus et al. 2013). While there are many accessibility guidelines available for designers, it is evident that designers still struggle with providing an inclusive and accessible user interface due to lack of knowledge or sometimes interest (Abascal et al. 2004). Finding appropriate design guidelines is a hard task not to mention trying to interpret these guidelines into actual designs (Sutcliffe et al. 2006; Zitkus et al. 2013). Designers need to be aware that the use of these guidelines need to properly evaluated and treated as suggestions to good practices, not as treated as recipe book (Carroll 2000).

3.2 User Evaluation and Involvement

User involvement in design practices have always been encouraged and recommended to insure that the design meets the users' requirements. This democratization exercise enables users to evaluate the new design and insure that their concerns or recommendations has been voiced properly, and that the design team recognize them in their new designs (Ogonowski et al. 2013). This user participation exercise need carefully consider the needs and characteristics of the potential users, thus understanding why they use the system and how users interact with it, as the nature of the user participation will be different depending on the users. For instance users who suffer from dementia require establishment of long-term relationship between designers and users (Lindsay et al. 2012). User evaluation of interfaces is time and resource consuming endeavor, designers need to make the most out of it while balancing the users' needs and system's/organization's needs (Scariot et al. 2012). Vines et al. (2013) argue that opening up the user participation to social media and online communities can help in diversifying the experience and benefit from a wider prospective rather than a narrow user sample.

3.3 Simulation Tools

Simulation tools can be either physical or digital tools used to reduce the evaluators' physical abilities to mimic some of the disabilities experienced by users, thus empathizing and acknowledging the needs of users other than themselves (Cardoso & Clarkson 2012). These simulation tools are used as way to overcome the high time and cost consumption of evaluation with real users. While they do reduce testers' motor and sight capabilities, they still enable to replicate cognitive abilities of some cases (Hitchcock & Taylor 2003). While there is a wide range of simulation tools available designers need to insure that these tools are effective in demonstrating users' characteristics so they do not assume that they understood users' experience while in fact they did not, leading to improper design decisions (Cardoso and Clarkson, 2012).

4. INCLUSIVITY METRIC

The Inclusive Design principles of Architecture can be applied in the field of Human-Computer Interaction (HCI). While in the Architecture field Inclusive Design translates into incorporating ramps alongside of stairs and wide doors. Inclusive Design applies to HCI in terms of insuring that the interaction with the interface provides the same level of information –and enjoyment- to users with different skill sets (Story et al. 1998). To further tailor the Inclusive Design principals to HCI, and bridging it with Nielsen (1994) Usability Heuristics. The constructs that constitute the Inclusivity Metric proposed in this research are as follows:

1. **Readability:** The terms used in the interface are easy to understand and does not require field knowledge.
2. **Affordance:** The interface provides visual and audio clues that inform the users how to interact with the objects.
3. **Error Tolerance:** The interface prevents users from making errors and if so the errors are clearly worded.
4. **Organisation and Colour Coordination:** The interface has enough colour contrast and the information is clearly organised in small chunks.
5. **Natural flow of information:** The interface mimics normal conversation.
6. **Vigilance to users' abilities:** The interface has all the assessable features that enable any person with disability to use it without asking for help.

The Metric can be tailored to the needs of the system to be developed to properly address inclusivity requirements. The design team or the interface evaluators can assign scores based on the criteria that they can assign for each constructs. After rating each element of the construct on 5-level scale, the result is then averaged to produce the Inclusivity Score that determines how inclusive the interface is (See Table 1). This can help designers as well as other project's stakeholders to visually assess how inclusive the interface is and insure the maximum usability of the system.

Table 1. Inclusivity score's breakdown

Inclusivity Score	Inclusivity Level	Comments
4 to 5	Very High	Satisfies the requirements of most user groups
3 to 3.99	High	Satisfies the requirements of most user groups, with opportunities to improve
2 to 2.99	Medium	Satisfies the requirements of some user groups
1 to 1.99	Low	Requires work to insure the fulfilment of the requirements of most user groups
0 to 0.99	Very low	Requires a lot of work to insure the fulfilment of the requirements of most user groups

4.1 Readability

One of the issues that come with ageing the decline of vision, thus having the appropriate font size for text used in the user interface is very important to insure that it can be read and understood by users. Moreover, refraining from using complicated terminologies can also improve readability of the user interface. One of the important benefits of online services is that users have the freedom and flexibility to use the service without the need to rely on customer support or others to understand the terms used. Nielsen (1994) said that "The system should speak the users' language", this means that the terms used in the interface matches the terms that the users use in their everyday life. In order to insure this match of understanding Flesch-Kincaid Reading Ease test can be used to evaluate the readability of the text (Friedman & Hoffman-Goetz 2006). Flesch-Kincaid Reading Ease test gives a score of 100, where 100 is the highest readability score and 0 is the lowest, the score can later be changed to a 5 scale to insure constancy of the Inclusivity Score. The evaluation of the Inclusivity Metric include:

- The interface uses simple language with no jargon.
- The fonts used are clear.
- The interfaces does not include acronyms.
- Flesch-Kincaid Reading Ease.

4.2 Affordance

Norman (2005) talks about the notion of affordance in design for the everyday items people use. This notion also applies to HCI, in which visual clues should be given to the users to inform them about the required steps to accomplish a given task without having to read the instructions. Clues like the trash bin metaphor used in operating systems to inform users they can use it if they want to delete an item. These metaphors and clues should be used with great amount of consideration as they have to be culturally familiar, an example of that is the use of floppy disk icon to save items, floppy disks have been obsolete for more than a decade however they are still used for the same purpose in current user interfaces. For younger users it does not relate to any experiences they previously had with saving files in a floppy disk. The evaluation of the Inclusivity Metric includes:

- The interface provides visual clues for navigation.
- The interface provides audio clues.
- The interface avoids drop down lists.
- The interface provides logical means to know how to use the elements in it (i.e. using illustrative icons).

4.3 Error Tolerance

Making errors and mistakes is inevitable, so the role of the user interface is to first minimise the opportunities for errors, then guide users to the right course of action if an error is committed. User interfaces should provide the appropriate validation control mechanisms to spot errors as they happen to avoid feeding the system with erroneous data and reduce the time required by users to interact with the user interface. Clear labelling of what needs to be inserted in the text box showing that the users need to input numerical or alphabetical data. Furthermore, guidance should be given to users if they need to know what should be used as an input for the user interface. The evaluation of the Inclusivity Metric includes:

- The interface does not allow entering invalid data.
- The interface tells you the correct format for each field before entering.
- The interface validates the data as soon as it is entered.
- The interface avoids text fields unless necessary.

4.4 Organization and Color Coordination

Organisation of the elements in the user interface is a very important feature to insure the success of any user interface. Organisations and clear bordering can help users to understand what needs to be inserted in a given field and insures that the information is logically organised to insure full understanding of the content. On the other hand, colour coordination is a two edged sword. While colour can enhance logical organisation of user interfaces and overall appearance, they can defeat the purpose if they are used extensively. Careful consideration must be taken to insure that people who suffer from colour blindness can use the user interface comfortably. So clues other than colour should be used to convey certain information. Nielsen (1994) encourages the use of minimal design by which designers reduce the use of graphics in their designs while maintaining an appealing look of the interface. The evaluation of the Inclusivity Metric includes:

- The data are clearly divided.
- The data are logically divided.
- The interface uses a good contrast between text and background.
- The interface does not only rely on colors.

4.5 Natural Flow of Information

The interaction with the user interface should provide seamless and logical flow of information and steps to accomplish a certain task. Clearly showing the required steps to fulfil the users' needs and mimicking the way the users are interacting with a service in person or over any medium of communication. This insures

that users understand what is needed from them and what they expect to receive at the end of the interaction. The notion of metaphor also applies broadly here, in which the entire interaction with the user interface resembles the interaction that the users would expect if they done the task in real life. Clearly showing where the user is, how many steps needed, and what the steps in the task are very important step to enhance logical flow of the interaction. Nielsen (1994) discussed it in his usability heuristics by encouraging designers to reduce the cognitive load from users by recognition rather than recalling. The evaluation of the Inclusivity Metric include:

- The interface provides a logical information flow.
- The interface informs the user of what is needed to finish a transaction.
- The interface provides navigation steps to show the position in the process.

4.6 Vigilance to Users' Abilities

This is done by insuring that the user interface can be used by people with disabilities, the user interface should conform to the accessibility regulations issued by governments or public guidelines such as W3C accessibility guidelines. User interface compatibility with screen readers is vital to allow users with sight disabilities to use the interface easily. Moreover, options to eliminate colour from the user interface is also useful to for users with colour blindness. The evaluation of the Inclusivity Metric include:

- The interface is compatible with screen readers.
- The interface provides large selection options (i.e. radio buttons, check boxes, buttons).
- The interface provides a black and white option.
- The interface provides options for bigger or smaller text.

5. RESEARCH METHODS

The research was carried out in a County Council in the UK, amid a change in the way that County/City Councils offer social care services to its constituencies, following the introduction on the Care Act 2014 around the UK, which encourages County/City Councils to engage with their customers electronically to request or update their social care needs. As for Action Research, the researcher did not just observe the interaction in the e-service's design sessions, but was actively engaging with the research participants amid the design sessions asking questions and proposing solutions as the design team progressed in the creation of the service. During these weekly design sessions 10 interviews were conducted with participants of the design sessions who range from ICT professionals, marketing personnel, social workers, and customer service representatives. Along with observing these design sessions the Inclusivity Metric was used to evaluate the inclusivity of the designs. The interviews helped to define the project context and to further understand the participants' backgrounds and their involvement in the project. At the end of the design session the Inclusivity Metric was used to evaluate the website design and then further discussions were facilitated by the researcher with the research participants to provide feedback on the design and on the Metric itself. Below is a list of research participants interviewed for the purpose of the study. Table 2 shows the participants and their respective specialty along with code to insure the anonymity of the participants.

Table 2. Participants' specialties and interview length

Number of participants	Participants' Field	Length of the interview
2	Web Developer	WD1: 45 minutes WD2: 30 minutes
1	Project Manager	PM: 60 minutes
3	Social Worker	SW1, SW2, SW3 Group Interview: 60 minutes
2	Customer Service Representative	CSR1: 30 minutes CSR2: 40 minutes
2	User Interface Designer	UID1: 30 minutes UID2: 60 minutes

The interviews covered a range of questions that shed the light on how they County Council was able to embed inclusive design practices in their projects, how the project team manages the challenges that stem from inclusive designs efforts, and whether these challenges can be overcome and design issues be highlighted with the Inclusivity Metric. The full-day design sessions was carried out on a weekly. During the early ones the researcher sat through the sessions to understand the design strategy followed in the County Council, which helped to establish deeper understanding of the underlying processes that needs to be in check during the design and help found trust between the participants and the researcher. These observations shed the light on important issues to be addressed during the design on inclusive websites, like the discussion around the use of certain terms to convey information and the procedure flow for users and Social Workers. At the end of the design sessions the Inclusivity Metric was used and the results were discussed among the design team, to demonstrate where they needed to improve and also feedback on the Inclusivity Metric itself.

6. FINDINGS

The Inclusivity Metric was used to evaluate and rate the design prototype after the design sessions for an online service for requesting social care in the county. The Metric was used by Project Manager and the researcher to pinpoint the issues with the design. The Inclusivity Metric has been proven useful in several ways. Firstly, it helped to facilitate and organise discussion about the issues important to the user interface. Especially since IT professionals tend to use IT jargon and field related terms that are not well understood across the project team evidenced by the customer service representative who struggled to understand the jargon used by some of the IT professionals. The Inclusivity Metric helped to guide these conversations showing designers and other stakeholders the areas where they need to place more emphasis on to make it easier for users regardless of their abilities to interact with the interface.

“To be perfectly honest, I didn’t know what the IT folks were saying about user journey and navigation. I’m keen in understanding what the issues in the online forms are, because I’ll get a lot of phone calls from customers who don’t know what they need to do next! So being able to pinpoint issues in the forms now and know what they are called is handy... I can just point at it in the survey and tell the folks here what needs to be done” (CSR2).

This is important to help reduce the tensions between project members as communication between members is significant for project success. It also helps to build ownership of the project among the team especially during structuring the logic of the interface and the wording for text in the interface. Collaboration and discussion among project members is helps to channel each member’s expertise on some issues like the terms used in the interface rather than leaving the task to a single team member and then having to redo the interface if things are not satisfactory. While these discussions can be time consuming but reaching consensus while designing is easier than finding errors at later stages. These concerns were also voiced by another customer service representative, as she used the word ‘we’ to describe the predicament of having online forms that are difficult to use.

“We need to get it right, because having half-baked online forms will just result in us having to do the application for our customers. This is really counter intuitive! I’ve seen this in previous projects where we were told that going online would be good for us and our customers, but obviously we got as many calls –or sometimes more- to help customers finish the application and we end up doing it for them! Well this project is no different as we expect the beneficiaries to primarily older folks and people with disabilities so we have to be mindful in our online application” (CSR1).

Mistakes done during the design will only complicate the issues to other stakeholders. Thus proper evaluation of the design will help to find these potential bottlenecks and actively eliminate or reduce their effect. Moreover, the Inclusive Metric helped the designer in this project to be more empathic to users with reduced abilities, as the designer was fixated on aesthetics features of the interface and the Inclusivity Metric helped the designer to strip down some of the aesthetic features that might make it difficult for an older adult or person with disability to navigate and use the interface easily. While aesthetics are important for user

interface design they need to be used with extra care so the user interface does not get overwhelmed with graphics and animation, moderation is key to insure that the user interface is visually appealing and considerate of users' abilities. The project manager expressed his frustration with current designers' mind set when it comes to designing interfaces.

"The problem nowadays is that the designers are so obsessed with creating a cool looking website, that they might forget that they are doing it for other than themselves. So I think this survey is useful to let them step back a little and look at the big picture to really understand what the users especially those who are older or have some kind of disability. It's not just about providing a screen reader on the website. It's more about being aware of users' needs to provide something that they can really use" (PM).

While it is believed that incorporating user testing in the project development lifecycle would provide a great deal of insight on how users will use the website. It is difficult for some projects to incorporate them due to financial and time constraints. So the Metric can be thought of as a cost effective measure to investigate whether the website is friendly to older adults and users with disabilities. The project manager attests to the difficulty of including user testing phase for some projects due to constraints.

"Surely bringing actual users and involve them in user testing is great to build something around the user... But we either have shortage in time or money to do a full blown user testing... specifically with this project we're limited with time as the legislation comes to law in few months and we have to have something that satisfies the criteria that the new law requires" (PM).

Moreover, choosing the right words and format is very difficult when designing a complex online service that often rely on the users' field knowledge and expertise. However, that might turn off users from using the online service and send them to the customer service desk which defeats the purpose of having the online service to begin with. The addition on a readability test on the Metric was praised by one of the user interface designers in the project.

"I think the inclusion of a readability test in the metric is handy, as we had long discussions about the wording of each question in the form, because we didn't want to use words that are too 'social care-y' that the average user might not understand. It's been tough trying to figure out which words convey the meaning that we wanted without being too technical and distance our customers who might not get them" (UID2).

The readability test in here was used to demonstrate the grade level required to understand certain terms. It was not surprising the online forms scored poorly Flesch–Kincaid readability tests as the terms used were complex and context dependant. Thus the interface could use some dilution in terms of the choice of words, as the users might not be too familiar with social care related terms. Meanwhile, careful thought and consideration need to be put in place to insure that online forms are logically and cognitively sound. As a great deal of automation projects consider the needs of the system first and then the needs of its perspective users. The online service should be thought of as another mean to interact with and serve the organisation customers, not just interface to the systems that the employees use. The online service should enable users to understand what is required of them and what do they need to do in order to achieve the task at hands. This was mirrored in the social worker's remarks on the difficulty of automating the complex processes related to social care.

"It's very complicated to automate the stuff that we do during the assessment. There are a lot of steps that we do in order to assess a condition and assign it to the right team. So we need to be extra careful not to misrepresent any information that we will put on the online form and try our best to mimic the stuff that we do regularly" (SW1).

The project manager also shared the same notion about the difficulty to mimic the logic of social workers as they have the experience and knowledge to know what to do in each case, thus it was really vital to understand the process properly so the interface becomes easier to use and understand.

“For this project in particular we spent a lot of time trying to untangle a very complex procedure that the social workers and the customer service representatives tackle on a daily basis. The forms should act in the same fashion that our people would work. So the form should have some sort of built in logic which take some time to understand but once understood can be easily automated” (PM).

However, one of the web designers pointed out that even though they tried to develop logical online forms, they still had to struggle with the systems that they use in social care in the county. Indicating that a lot of designers and web developers feel like they are between a rock and a hard place trying to balance the requirements on the users as well as the requirements of the systems the online forms have to interface with.

“We are obligated by law, to provide online service to anyone regardless of their condition. I mean there’s a lot of stuff that we do in order to do that. But sometimes we need to adhere to system requirements in terms of the data types and other required information. In this case in particular we are using the online forms to interface with our social care system, and sometimes we’re limited of what we can achieve with it” (WD2).

It is very important to be mindful of the designers’ feeling while evaluating the website as it could be thought of as criticism of their work, especially if it is done by an ‘outsider’ like the case of this research. The main user interface designer felt like he was being cornered and he felt that he had to defend his work from the results of the Metric. Even though he was told repeatedly that this is an investigation of the benefit of using a Metric to insure that online services were as inclusive as possible.

“I usually go with what makes sense to me and my colleagues, because there’s ton of guidelines out there we try our best to keep up with them but you’re only human! There only so much that we can do especially with time pressure with all the projects that we handle. I see the benefit really... But I’m not sure that we can do all the trouble of doing the Inclusivity survey... I have a lot of experience designing websites and online forms, I think that would be helpful for a new designers who might be more eager to design fancy stuff rather than taking the users’ needs into consideration” (UID1).

While the other user interface designer did not share the same resistance to the idea, he was aware that there is potential for improving the online forms, embracing the idea to put these designs that he felt so protective of under evaluation to see whether they tick the boxes in terms of inclusivity.

“I was surprised to see our online form averaging a 2.2 in the Metric... But then again we have to take a step back and see this rating as an opportunity for feedback and improvement... I tend to treat the projects I work in as my babies but I know that we can definitely improve” (UID2).

Nonetheless, a social worker pointed out that the Inclusivity Metric can be used as marketing tool to demonstrate how inclusive the website is, by using the score achieved to show the organisation’s commitment to show that they have taken serious steps to insure that services provided can be used by a wide range of users irrespective of their abilities and computer knowledge. The organisation can use this advertising opportunity to convey itself as an organisation that cares about who uses their online service and it is pledged to make the interaction with its services as convenient as possible to its customers.

“I can see how we can use the results of the Inclusivity Metric to our advantage if we made put the rating in our website to show how committed we are in insuring that we care about our customers... If this thing gets a public attention and other websites follow through, I can see great potential in incorporating this inclusivity rating in our County Council website” (SW3).

As echoed by the web developer in the team, the Inclusivity Metric needs true commitment from the project team as the evaluation process takes a significant amount of time. As the evaluator needs to first interpret the criteria allocated for each construct, and then navigate through the interface thoroughly to assign the appropriate score for each criterion. Of course not all the constructs can be automated; there are constructs like the logical flow of the interface that can be measured by the evaluator’s expertise.

Nonetheless, automating some constructs in the Inclusivity Metric can be deemed useful to reduce evaluation time and effort.

“While I definitely see the advantage of it, I think it will be better if it was automated so we don’t have change the readability test to 5-scale. It would be a turn off for designers if they have to do it on a paper and then compile the results” (WD1).

Also the Inclusivity Metric can be used by actual users as part of the user testing phase of any project. Unfortunately this research did not introduce the Inclusivity Metric to users with different capabilities, due to time constraints in the County Council and the need for the form to go live as quickly as possible. The Inclusivity Metric can be used during user testing to allow users to evaluate the interface. It is important to note that some constructs need to be slightly changed so users can easily understand what and how they need to evaluate the interface.

“If we can dilute the survey a little bit we can actually use it for user testing, it will be brilliant to see how designers rate their design and how they users actually rate them” (PM).

As mentioned above by the project manager, the Inclusivity Metric can be beneficial during user testing that creates an opportunity for designers to see how different their views of their design to the views of the real users. Opening up the users’ perspective to the interactivity and ease of use of the design.

7. CONCLUSION AND FUTURE WORK

The Inclusive Metric demonstrated great potential to evaluate the online service that will be offered by the County Council. The Metric was able to pinpoint the weaknesses of the current design, and enable discussion among the project team to be able to overcome these issues. The project team expressed their endorsement of the Metric for future projects that they will carry. The Inclusivity Metric was deemed useful by project members in terms of looking at the broader issues that comes with user interface design and inclusivity, especially when it comes to the choice of wording and the use interface elements like drop menus and icons and helps to direct designers’ emphasis on inclusivity rather than aesthetics. Moreover the Metric can be used to as marketing tool to demonstrate how committed the organisation to insuring that their online services are accessible to the widest range of users. However, there were some limitations that can be looked into in future research. The first limitation was the Metric was only used by the project team and not actual users; it will be beneficial to see how the Metric can be used by users during user testing. Unfortunately, user testing was not carried out due to project time restrictions. Also, the Inclusivity Metric can be extended to evaluate interfaces on platforms other than desktop computer. Investigating the results of the Metric on applications’ interfaces on mobile platforms like smartphones and tablets would be greatly valuable as a lot of organisations and government agencies are designing mobile-friendly interfaces due to the great interest of users to use smartphones.

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SECURE AND TRUSTWORTHY REMOTE JAVASCRIPT EXECUTION

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ABSTRACT

Javascript is used more and more as a programming language to develop web applications in order to increase the user experience and application interactivity. Although Javascript is a powerful technology that offers these characteristics, it is also a potential web application attack vector that can be exploited to impact the end-user, since it can be maliciously intercepted and modified. Today, web browsers act as worldwide open windows, executing, on a given user machine (computer, smartphone, tablet or any other), remote code. Therefore, it is important to ensure the trust on the execution of this remote code. This trust should be ensured at the JavaScript remote code producer, during transport and also locally before being executed on the end-user web-browser. In this paper, the authors propose and present a mechanism that allows the secure production and verification of web-applications JavaScript code. The paper also presents a set of tools that were developed to offer JavaScript code protection and ensure its trust at the production stage, but also a proxy-based mechanism that ensures end-users the un-modified nature and source validation of the remote JavaScript code prior to its execution by the end-user browser.

KEYWORDS

Web applications, JavaScript, security, trust, proxy

1. INTRODUCTION

For some time now there is a software production paradigm shift, where previously desktop-centric software is migrated to a more distributed and ubiquitous web and mobile-based software (Grove, 2009). Software is currently distributed over the Internet (mostly through the WWW) and accessed and executed on a Web browser. This model consists in fetching code from a remote service (or multiple remote services) and execute that code locally on the end-user web browser – the web application is a client-server software application in which the client-part of the application runs on the web-browser (Segaran, 2007). These web applications, in particular on what concerns the client-side, are mostly based on three different technologies: HTML, CSS and JavaScript. In particular, JavaScript is one of the most important components of a web application, allowing programmers to develop client-side complex logic and interactivity, improving the end-user experience (Flanagan, 2006). Speed on client-side JavaScript execution is one of the most important characteristics of modern web browsers. However, JavaScript is also used as a way for an attacker to compromise a web application. Since JavaScript code is obtained from one or more remote sources and is afterwards executed locally on the end-user browser, it is also possible for an attacker, or even a malicious programmer, to produce or modify the Javascript code prior to its execution, putting in risk the web application itself and consequently the end-user and its own data (Cova, Kruegel, & Vigna, 2010). A major JavaScript attack vector is the non-authorized modification of the code – these modifications can occur at the distributor (server-side), during transport (man-in-the-middle) or even at the destination (man-in-the-browser). Therefore, it is important to ensure JavaScript code trust in all moments, in particular its integrity and origin. JavaScript code can be intercepted, change by an attacker and later executed on the user web browser for malicious purposes, without any warning (Nikiforakis et al., 2012). Moreover, JavaScript code being executed by the browser might not be trustworthy. These attacks authors compromise popular web sites and redirect users to their own malicious versions (phishing) deceiving users, forcing them to give away private information such as bank account numbers, credit card numbers, personal access codes and much more. Therefore it is important to ensure the security and integrity of the remotely obtained

JavaScript code in all phases of its existence and execution (since its creation) to enable the appropriate trust mechanisms, protecting the final user (Patil, Dong, Li, Liang, & Jiang, 2011).

The major contribution of this paper is the identification of some of the security challenges associated with the remote Javascript execution and to present a proposal, based on public-key cryptography to create the appropriate mechanisms for protecting web application JavaScript code and also build the necessary trust, integrity and confidentiality mechanisms to ensure the security of the remote JavaScript code before its execution by the browser web. This paper starts by introducing the context of web application and describe their major problems in terms of security. On the following section the major attack vectors to the JavaScript lifecycle are presented and described. The description of the methods that are going to be used to provide the necessary confidentiality and trust characteristics to the JavaScript source-code will be detailed in the next section. After this, the authors present the tools developed to implement the previously mentioned mechanisms and describe its operation. Finally, some conclusions of this work are presented and some future worked directions are pointed out.

2. JAVASCRIPT ATTACK VECTORS

A central component of a web application is JavaScript. JavaScript allows the development of complex logic and advanced interaction mechanisms at the web application client-side. However, this architecture is prone to error and vulnerabilities that can be explored by malicious attackers. Cross-Site Scripting (XSS) attacks and its variants Stored XSS Attacks, Reflected XSS Attacks and DOM Based XSS Attacks consists on the injection of JavaScript code in order to manipulate the logic of the web application, subverting it and allowing an attacker to obtain possible advantages over the web application and the user that is using it (Stuttard & Pinto, 2011). Cross-site Request Forgery (CSRF) is another class of attacks that affect web applications and JavaScript, affecting the end-user forcing him to conduct non-intended operations on the applications it trusts (Barth, Jackson, & Mitchell, 2008). There are multiple threats that affect web applications with particular impact on JavaScript. Having into consideration the web applications and JavaScript lifecycle (Figure 1) it is possible to consider a significative number of attack vectors.

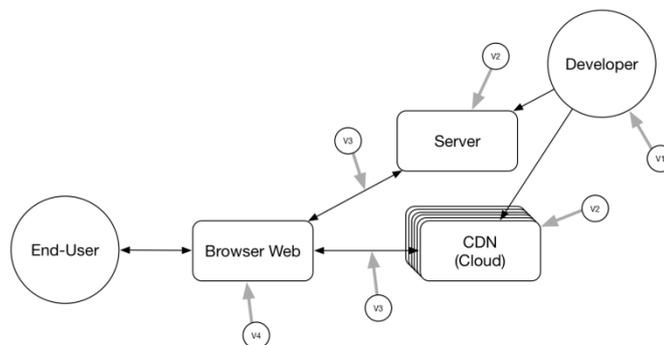


Figure 1. The different attack vectors on the JavaScript lifecycle

This lifecycle covers the development of the web application (and also JavaScript), its storage and distribution, and finally its execution on the client-side web browser. In this lifecycle it is possible to identify a set of attack vectors (V1, V2, V3, and V4) that can be seen as opportunities for attackers to try to exploit the web application and target end-users.

The programmer as an attacker (V1)

In this scenario, the web application developer can be seen as an attacker that produces malicious JavaScript code. This malicious code can be embedded on the web application and executed on the end-user web browser without its own knowledge. This malicious code can be used to obtain details from the end-user environment, mislead the end-user to conduct different non-normal operations, or give more information than it is supposed to. There is also a small variation from this threat that refers to the fact that the developer might be tricked by a third attacking party to inject malicious JavaScript into legit code. This is, for instance, the case where a developer wants to include some external library into its own code and, accidentally, includes malicious third party code on its own source-code that, ultimately, will be executed at the end-user browser.

Application distributors modify the application (V2)

After being developed, the web application is deployed on a server or Content Distribution Network (CDN) where it can be accessed by multiple users across the World, through a web browser over the Internet. This specific attack vector considers the case where this distributor is also an attacker. The distributor, acting as a malicious attacker (or any third party that was able to subvert the distribution infrastructure) can access the web application source-code (including JavaScript sources) and modify it through the injection of rogue JavaScript. Although improbable, this is also a scenario that needs also to be taken into consideration in order to offer an affective protection of the web application source code throughout all the lifecycle stages.

Attacking the communication channel (V3)

Whenever the client requests the web application, the source-code is downloaded from a server before it is executed. While all this source-code is traveling from the server to the client there is the opportunity for an attacker to listen to the communication channel, intercept the code, modify and redirect it to the end-user browser, as if it was the original unmodified code (man-in-the-middle attacks) (Callegati, Cerroni, & Ramilli, 2009). There are a large number of tools that can be used to sniff HTTP intercepting the traffic and retrieving communication data. Even an HTTPS ciphered connection can be targeted by these man-in-the-middle attacks – an attacker can setup a rogue proxy that can intercept HTTPS ciphered traffic, decipher it, modify and send it back to the client. The client receives the modified source-code and executes it locally.

Client-side attacks (V4)

Finally, it is also possible to consider an attack vector related with the local execution of JavaScript code, in which malicious software (planted on the web browser or any other compliant user device by an attacker) can act over the legit JavaScript code and inject malicious instructions on it – also known as man-in-the-browser (MITB) attacks (Dougan & Curran, 2012). These attacks use a similar approach to MITM attacks but the user requests interception and modification is conducted by malware that runs between the browser and its security mechanisms, tricking the end-user to believe that everything is absolutely normal.

3. BUILDING TRUST IN JAVASCRIPT

Although JavaScript security mechanisms are already in place, either built-in on the web browser or offered by external plugins or extensions, none of such mechanisms offer end-to-end trust at the JavaScript source-code level. These systems are limited to the defense of the JavaScript code through mechanisms like obfuscation, vulnerabilities identification (JavaScript analyzers) or by blocking the access to non-desirable domains (NoScript browser extension, for instance). However, there are no browser internal or external mechanisms that limit the code execution according to different pre-established conditions nor mechanisms that warrant the origin and integrity of the code since its creation until its execution on the web browser.

End-to-end trust as it is presented in this work refers to the possibility of strongly assuring that the JavaScript being executed by the web browser was originally created by a given authenticated developer and that the code has not been tampered by any external entities. In order to attain these objectives, the authors devised a set of mechanisms implemented through two different tools: “ScriptProtector” and “ScriptProxy”. “ScriptProtector” is the tool used by the developer to create the protection mechanisms that are used to protect and create trust on the produced JavaScript source-code. “ScriptProxy” is the tool used by the end-user that verifies the authenticated code and the code present in the page and validates the browser trust on it.

3.1 Creating and Obtaining Developer Credentials

In order for these two tools to work a set of cryptographic mechanisms need to be setup. The process is based in public-key cryptography and therefore certification authorities (CA) will be used to issue credentials to software development companies and individual programmers. Depending on the trust level, these CA can be public or privately explored by software development companies (SDCA). These CA must have a key-pair $(K_{CA}^{pub}, K_{CA}^{priv})$ and a self-signed certificate $(Cert_{CA}^{CA})$.

3.1.1 Credentials for Individual Developers

In this case the developer will get the credentials from a CA in order to be able to produce the code and digitally signed it:

- A developer (SD_1) has a key pair: $K_{SD}^{pub}, K_{SD}^{priv}$
- The developer submits its public key together with other CA requested information: K_{SD}^{pub} ;
- The CA verifies the information sent by the developer and using its own private key (K_{CA}^{priv}) to issue a digital certificate for the developer ($Cert_{SD_1}^{CA}$).

3.1.2 Creating Company Credentials

In this second situation is the development company that will be certified and afterwards can issue their own credentials to their own developers. As an alternative all the developers on the company will use the same digital certificate.

- In the first scenario we have a CA that issues a digital certificate for a specific company certification authority (SDCA). After submitting its public key (K_{SDCA}^{pub}) the CA issues a certificate for SDCA ($Cert_{SDCA}^{CA}$).
- In the second scenario there is only a single certificate that the software development company (SDC) can use globally ($Cert_{SDC}^{CA}$).

3.2 Javascript Code Protection

The developer will need to protect and ensure trust on the produced JavaScript source code. In order to ensure this, the developer will use cryptographic mechanisms that will implement these two requirements. A web application is composed by several components, mostly HTML pages and Javascript scripts that may be included inside or outside an HTML page (Figure 2). The protection mechanism will consider both inline scripts and scripts which are referenced by the HTML page on the web application.

3.2.1 Integrity Protecting and Trust Assurance

In this case, the Javascript scripts will be properly identified the inline scripts ($Script_1, Script_2, \dots, Script_n$) and also the remote scripts ($RScript_1, RScript_2, \dots, RScript_n$) that will be protected, through digital signature, either by the individual developers (1) or directly by the software development companies (2).

$$(1) DSig_{Script_m}^{SD_n} \rightarrow K_{SD_n}^{priv}(Hash_{SHA1}(Script_m)), \{n, m \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$$

$$(2) DSig_{Script_m}^C \rightarrow K_C^{priv}(Hash_{SHA1}(Script_m)), \{m \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$$

Besides that, after all the scripts are properly signed, the full HTML document is also signed in its full extension (1) (2).

$$(1) DSig_{HTML}^{SD_n} \rightarrow K_{SD_n}^{priv}(Hash_{SHA1}(HTML)), \{n \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$$

$$(2) DSig_{HTML}^C \rightarrow K_C^{priv}(Hash_{SHA1}(HTML)), \{m \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$$

Together with the web page properly protected in terms of integrity and trust the CA (or SDCA) certificate is sent together with the web page to the client. This will allow the client to validate the digital signatures and therefore the integrity and trust on the different scripts.

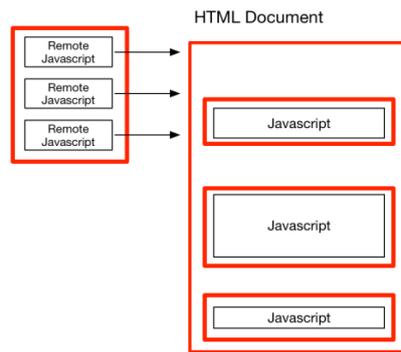


Figure 2. Structure of the HTML document with the elements to protect

3.2.2 Scripts Confidentiality Protection

In the specific case of the confidentiality protection, it is required to avoid the access of an attacker to the Javascript source-code. Depending on the security policy it is possible to consider the following scenarios:

1. A single key is used to protect all the different scripts on the HTML web page, and it does not change according to the end-user requesting it: $\bigcup_{i=1}^n S_k(\text{Script}_n)$.
2. Using multiple protection keys, each of the keys is used to protect a single script and do not change according to the end-user requesting it: $\bigcup_{i,n=1}^j S_{k_i}(\text{Script}_n)$.
3. A variant from the previous two presented scenarios is the one in which the keys are changed according to the end-user. Therefore different S_k are selected and applied for the script protection whenever the HTML page is requested by the end-user.

As a result, from this process, the Javascript source-code will be ciphered with a key that would need to be sent to the end-user – the proxy that will be responsible for the scripts validation prior to its execution by the Web browser.

3.3 Javascript Protection Execution Proxy

In the Javascript execution protection process, there is a proxy that runs on the client-side that receives the content and immediately before passing it to the browser performs a set of validations to verify the remote Javascript trust, integrity and authentication. In order for this proxy to work in a security perspective, the following requirements are necessary:

1. When the proxy is executed for the first time, the proxy (P) creates a key-pair (K_P^{pub}, K_P^{priv}) ;
2. The proxy contains on an internal database a list of trustworthy certification authorities (and root certificates) properly setup: $(Cert_{CA_1}^{CA_1} \dots Cert_{CA_n}^{CA_n})$. These certificates are necessary to ensure trust every time signed Javascript is sent to the user Web browser.

3.3.1 Javascript Integrity Protection and Trust Verification

This will be the most common usage that will be used for developers that will allow the Javascript integrity and trust. In this situation, both local $(DSig_{Script_m}^{SD_n})$ and remote $(DSig_{RScript_m}^{SD_n})$ scripts are digitally signed and would need to be validated by the proxy before being executed by the web browser or discarded. The verification process is the following:

1. Extraction of the integrated digital certificate that is present on the web page HTML file: $Cert_{SD_n}^{CA}$.
2. Validate the digital certificate comparing it with the existing proxy trustworthy certification authorities database –additional validations may also be used, such as OCSP (Myers, Ankney, Malpani, Galperin, & Adams, 1999).

3. Finally after the trust is established on the certificate emitting entity is also possible to trust the certificate public-key: K_{SD}^{pub} .
4. This public-key can be used to validate the HTML file digital signature: $VDSig_{HTML}^{SD_n} \rightarrow K_{SD_n}^{pub} (DSig_{HTML}^{SD_n}), \{n \in \mathbb{Z}: 1 \leq n \leq \infty\}$.
5. After validating the HTML digital signature its necessary to validate all the other scripts digital signatures:
 - a. $VDSig_{Script_m}^{SD_n} \rightarrow K_{SD_n}^{pub} (DSig_{Script_m}^{SD_n}), \{n, m \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$
 - b. $VDSig_{RScript_m}^{SD_n} \rightarrow K_{SD_n}^{pub} (DSig_{RScript_m}^{SD_n}), \{n, m \in \mathbb{Z}: 1 \leq n, m \leq \infty\}$
6. The deciphered scripts, provided by the digital signatures (local and remote) are validated with the respective scripts presents in the page, to ensure that what was signed is the same of what is present in the page.
7. If all the validations were successfully accomplished, the page can be delivered to the web browser for rendering.

3.3.2 Javascript Confidentiality Protection

This is the additional process that ensures the confidentiality and intellectual property protection of the Javascript source-code. After being assured the integrity and trust on the code on the previous step, the proxy already has the digital certificate of the script producer ($Cert_{SD_n}^{CA}$) that contains the public-key of the producer ($K_{SD_n}^{pub}$). With this public-key the proxy will send a new request to the server to get the appropriate key(s) to access the Javascript source-code. The client after validating the answer from the client will select the appropriate secret-key (S_k) and sends this key to the server ciphered ($K_{SD_n}^{pub}(S_k)$). The software development company deciphers the key ($K_{SD_n}^{priv} (K_{SD_n}^{pub}(S_k)) \rightarrow S_k$). This key is used to protect the different scripts sent from the server to the end-user ($\bigcup_{i=1}^n S_k(Script_1)$). The protected scripts are sent to the proxy that uses the appropriate secret-key to decipher them before passing them to the web browser ($\bigcup_{i=1}^n S_k(Script_1)$).

4. “SCRYPTPROTECTOR” AND “SCRYPTPROXY”

In order to implement and test the mechanisms proposed and described before two different tools were implemented – “ScriptProtector” and “ScriptProxy”. While the “ScriptProtector” was the tool used by the developers to create the trust, integrity and confidentiality required by the Javascript files in the web application, the “ScriptProxy” is the tool used by the different end-users to verify the trust, integrity and protection of those scripts.

4.1 ScriptProtector

The “ScriptProtector” was developed as a command line tool that developers could use to protect and build trust on the local and remote JavaScript source-code required by the web application. This tool starts by parsing the web application files looking for different local JavaScript source-code but also for the different remote JavaScript included by this web application resource (Figure 3). After all the different scripts are identified by the tool it is necessary to apply the necessary trust and integrity protection measures and optionally, if the developer requires so, apply also the confidentiality protection. After all these processes are completed, the final version of the protected web application resource file is outputted to the filesystem. This process is repeated for all the web application resources that need to be protected.

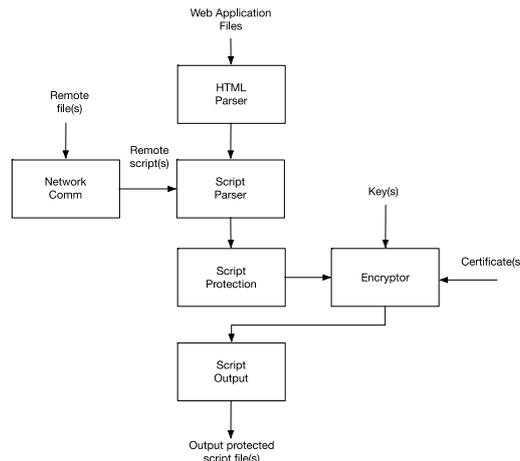


Figure 3. "ScriptProtector" tool architecture

An example of a simple resource to protect (on the left) and the protected version (on the right):

```

<html>
<head>
<title>Page Sample for RSA verify in JavaScript</title>
<script language="JavaScript" type="text/javascript">
alert("Javascript Signed");
</script>
</head>
<body>
<h1>Page Sample for RSA verify in JavaScript</h1>
</body>
</html>
    
```

```

<html>
<head>
<title>Page Sample for RSA verify in JavaScript</title>
<form name="formSig0" id="formSig0">
<input type="hidden" name="cert0" id="cert0" value="-----BEGIN CERTIFICATE-----MIIB/TCCASICQD55FNzcuWF7
<input type="hidden" name="siggenerated0" id="siggenerated0" value="ad0d424851db62afcc19b80f326169c22383
<script language="JavaScript" type="text/javascript" class="js">
alert("Javascript Signed");
</script>
</form>
</head>
<body>
<h1>Page Sample for RSA verify in JavaScript</h1>
</body>
</html>
    
```

The protected web application resource protected by “ScriptProtector” adds extra information (developer certificate with his public key and the digital signature of each script) on the resource that will enable the establishment of trust and integrity – in this case, confidentiality was not a requirement.

4.2 ScriptProxy

On the end-user side, it was developed a tool that is responsible for assuring the integrity, trust and confidentiality on the JavaScript resources before passing them to the web browser. There were two different choices for the development of such tool – the first would be to develop a specific web-browser extension (or plugin) that would work inside the browser web, while the second would be an independent web-proxy software to which the browser was connected to intercept the web browser requests and server responses. Due to the more platform independent characteristics of the web-proxy, this was the choice selected.

The web-proxy after intercepting the request from the web-browser, requests the appropriate web application requests from the web-server. After receiving the data, parses it and identifies the protected scripts on the received web-pages resources, and processes them, according to the mechanisms defined previously to ensure the trust, integrity and confidentiality of the Javascript present on the web application resources received. After all the validations are performed and the scripts are unprotected, the original version of the web application is passed to the web-browser where it can be rendered accordingly (Figure 4).

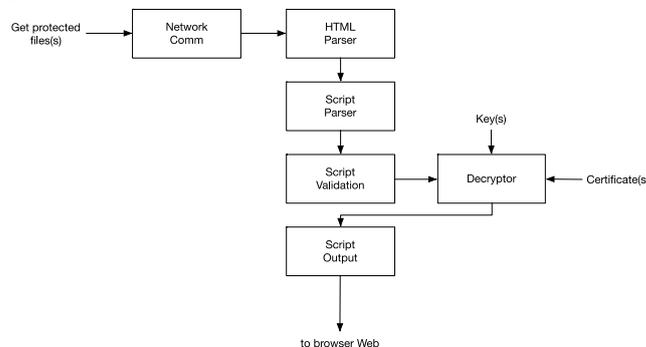


Figure 4. The "ScriptProxy" architecture overview

5. CONCLUSIONS

Web applications are becoming trend applications in our days. The distributed and open nature of the Internet and, in particular, the World Wide Web has made possible the usage of such applications for personal or corporate usage. Critical web applications (such as banking, health and others), that handle personal sensitive data are also becoming more and more frequent and are targeted by attackers that aim specifically at the end-users of such applications.

Exploiting the mechanics of the web application, messing up with their logic, to perform non-authorized actions against their end-users is one of the preferred attack vectors. Most of the times, this is accomplished by tampering the Javascript source-code of the web-application, that is executed locally on the victim's web-browser without any notice.

The system proposed and described in this article presents a set of mechanisms, implemented in two different tools, that allow developers to address the establishment of trust, integrity, confidentiality and intellectual property protection of their own source-code. With it, its possible to create an independent trust bound between the web application producer and the end-user web-browser, to ensure that the source-code executed by the web browser is not tampered with.

Although this is an important step towards making the web applications safer, it is still reduced due to the limitations imposed by the current web-browsers. The level of integration and pre-processing of web content is still limited in most modern web-browsers, thus forcing our tools implementation to be external to the browser itself, having an impact on the end-user experience. In the future it would be desirable to implement the same trust mechanisms either inside the web-browser itself or as a web-browser extension.

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BIG DATA PRIVACY CONCERNS IN THE LIGHT OF SURVEY RESULTS

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ABSTRACT

Big Data may be understood as data sets whose sizes exceed the capacity of conventional database tools. The Big Data resources may include business transactions, e-mail messages, photos, surveillance videos and activity logs. Big data can be analyzed with the aim to draw informative results that lead to better decisions and strategic business moves. Although Big data could benefit many areas of social life and business, it also raises privacy concerns.

The paper discusses the issue of privacy and threats related to using big data technologies, especially personal data processing, video surveillance and monitoring the internet users' behavior during different activities. The aim of the paper is identification of subjective perception of privacy violation related to mass personal data processing. For this purpose the authors present the questionnaire survey results that was conducted recently among the students of Warsaw School of Economics.

KEYWORDS

Big data, data analysis, invasion of privacy, privacy concerns, surveillance, personal data

1. INTRODUCTION

The development of information technologies on one hand gives increased opportunities in business and the lives of individuals, but on the other hand it brings various threats. Both threats and opportunities are caused by new effective methods of mass data processing. Emerging capabilities for solving huge complex analytical tasks are known as Big Data phenomenon. The term itself has not been clearly defined yet but its analysis shows its multifaceted nature. The reviews of definitions of Big Data can be found in literature (Boyd and Crawford 2012), (Tabakow, Korczak and Franczyk 2014).

Big Data may be understood as data sets whose sizes exceed the capacity of conventional database tools for gathering, storing, managing and analyzing data (McKinsey Global Institute 2011), or Big data is data that exceeds the processing capacity of conventional database systems, when the data is too big, moves too fast, or does not fit the strictures of database architectures (Dumbil 2012).

Some definitions underline the unstructured character of data, i.e. according to Rouse (2011) big data is a general term used to describe the voluminous amount of unstructured and semi-structured data a company creates - data that would take too much time and cost too much money to load into a relational database for analysis. Other definitions refers to the type of processed data. According to PcMag encyclopedia (2016) Big Data refers to the massive amounts of data that collect over time that are difficult to analyze and handle using common database management tools. Big Data includes business transactions, e-mail messages, photos, surveillance videos and activity logs (machine-generated data). Scientific data from sensors can reach mammoth proportions over time, and Big Data also includes unstructured text posted on the Web, such as blogs and social media.

The term Big Data is - driven to a large degree by the IT companies offering various types of solutions. However the problem is to define the term in a way that the definition would be timeless and set aside from the current state of technology. For example on blogs related to Microsoft (2013), an attempt to describe Big Data can be found as a term increasingly used to describe the process of applying serious computing power to seriously massive and often highly complex sets of information. According to SAS (2016) Institute big data is a term that describes the large volume of data – both structured and unstructured – that inundates a

business on a day-to-day basis. But it's not the amount of data that's important. It is what organizations do with the data that matters. Big data can be analyzed for insights that lead to better decisions and strategic business moves. In turn, Oracle (2013) in its report states the concept of big data refers to the number of basic groups of data, such as typical enterprise data (coming, for example, from ERP and CRM systems), data collected automatically (e.g. sensor data), data from the internet and social media.

In practice the 3V model of META Group (Laney 2001) is still considered as a basis of big data notion and its further development. In an original model coming from the report of META Group on the influence of electronic commerce, globalization and other trends on IT development, the three features were indicated which constituted the basis for the concept of big data that has been crystalized later, i.e.: volume, which means large amounts of data processed, velocity – which means variability of data, and variety – understood as heterogeneity of data. Recently many authors have attempted to indicate other characteristic features of big data, which could extend the “V” model, particularly: value – which means monetary worth of the processed data, veracity - credibility of the data, visualization – ability to visualize data.

The authors of hereby paper advocate the new possibilities of real-time (or near real-time) processing and processing ill-structured data are particularly important. The growth of the processed data is an evolutionary trend –technology development increases the number of data sets available. In contrast to the typical OLAP (On-Line Analytical Processing), in which the well-structured and aggregated data is used, the big data enables real-time analyses with detailed and often unstructured data sources. However, it is worth to notice that the data processing in data warehouses using ETL processes is often treated as big data (in such a case the Velocity feature is not present). Also the compound analytical processing of well-structured data is sometimes called big data processing (however the Variety feature is not present). These examples highlight the difficulties in distinguishing the big data phenomenon.

The phenomenon described above is associated with a threat of using new technology to the individuals' privacy violation. Threat to privacy is increasingly often perceived by IT users and other persons whose data is processed in information systems (Kamakshi 2014). The research efforts can be found in literature concerning privacy issues related to big data methods (Victor, Lopez, Abawajy 2016). The privacy in social networks and usage of privacy settings has been discussed by Surma (2013), the author indicates that active Facebook users who understand the issue, also willingly use available privacy settings. The question arises what is the relationship of the users' knowledge of contemporary mass data processing technologies and feeling threat to one's privacy resulting from using these technologies.

In this paper the problem is presented in the light of technology and business of big data. The aim of the paper is identification of subjective perception of privacy violation related to mass personal data processing. With this purpose in mind the survey was conducted which encompassed several questions potentially concerning privacy violation. Next the assessment of understanding the phenomenon and methods of big data was conducted. The paper also presents the literature analysis of the term big data and its three basic aspect: technological, business and social, with particular emphasis placed on the last one – related with privacy violation. The consecutive sections describe the research methodology and its results. Several statistical methods were used to describe and compare the survey results. The last section concludes the paper and presents most important findings, the propositions of further research efforts in this area were also indicated.

2. SOCIAL ASPECT IN THE 3-ASPECTS APPROACH TO BIG DATA

The authors of hereby paper identify three basic aspects of big data considerations (Wieczorkowski and Polak 2014):

- technological,
- business,
- social.

Distinguishing these three aspect has been the outcome of recent research conducted by the authors. The identification of the mentioned aspects was obtained through the research on a common understanding of big data term. The research encompassed, i.e. the analysis of the content of press articles on big data. The articles were sourced from non-scientific press and from various press releases.

The **technological aspect** is divided into two sub-aspects:

- information technology,
- analytical methods.

It represents a focus on the methods of big data analysis and information technology used. The big data concept is based on statistical methods, artificial intelligence, machine learning and data mining. This approach gives a possibility to analyze unstructured data such as texts from internet pages.

Big data requires specific solutions of very high computing performance and distributed processing. Acceleration of computing is associated with increasing computing performance (for example HPC - High-Performance Computing), extended memory use (in-memory), processing by database engine (in-database). The parallelization and distribution of computing is achieved by grid computing, cloud computing, applying MapReduce paradigm, in particular Apache Hadoop. The ineffective, old methods of data storage such as relational databases are replaced by new approaches. One of such solutions are column based NoSQL database management systems which are more convenient for storing weakly-structured data. Rapid growth of technological capabilities has become a starting point for development of big data in contemporary meaning.

The **business aspect** focuses on applications of big data. Shrinking cost of data gathering and processing makes it worth to process the data which were previously not possible or economically not feasible. The big data concept assumes almost costless data gathering and processing. Formerly, for instance, while designing analytical structures for data warehouses it was necessary to choose the most important business data in advance, and if there was too much data selected the cost and time of processing increased. The big data concept can be considered the next stage in evolution of business intelligence and predictive analysis.

Former applications of business intelligence were mainly associated with commercial sector. Undeniably big data for this sector creates wide range of opportunities, particularly according to Davenport and Dyché (2013) in: cost reduction, reducing the cycle time of analytical calculations, developing new product and service offerings based on data, supporting internal business decisions.

Applications of big data also seem to very promising in widely understood public administration and government. However until now the methods of processing large data volumes such as public statistics or public registers (population, ground, vehicles, companies etc.) have not been the typical big data in contemporary sense. The source of knowledge about public registers and other statistical data sources in Poland is the register of information systems for public administration (GUS 2013) which encompasses over 600 items. The trend can be observed for more real-time data while minimizing delays in processing, typical for public statistics. Most likely using such data sources will be increasingly close to big data not only regarding the data volume. Governments have increasing access to different data apart from typical public registers. Often it is weakly structured sensor data, such as city monitoring, more or less official internet traffic monitoring (Szymielewicz and Szumańska 2013). Moreover according to the reports of Tech America Foundation (2012) and McKinsey Global Institute (2011), and the Author's own observation it can be expected that big data analysis will proliferate to the areas such as: various frauds detection (in particular financial, economic, fiscal, or prohibited actions on securities market), public security (i.e. internet monitoring, wider use of monitoring systems), management of public services (in particular healthcare, transport, education and social care services), also in providing different information for supporting country government.

The **social aspect** concerns social repercussions of application of big data methods. Contrary to the aforementioned technological and business aspects, the social one goes beyond typical definitions of big data. The press research in popular journals indicate that the aspect of big data is very important in common public opinion. The subject has been touched often in popular press. The aspect of big data was raised most frequently in popular press. The social aspects of primary concern were the consequences of processing and using personal data, problems of infringements to privacy and threats of surveillance.

Currently the internet is an important source of personal data, where the social services are primary concern. The users' data may have significant value as they are potential customers for many companies. The possibilities of internet data analysis appeared long ago before big data was introduced, the benefits of internet data exploration were emphasized with the use of data warehouses (Pawelozek-Korek 2008). Currently the basic business model of social services assumes making the social platform available to the community in exchange for access to the personalized information streams co-created and shared by the community (Polańska and Wassilew 2015). Advertisements, watched by the internet users can be based on the data profiled in the real-time. Banks and insurance companies may analyze community portals with the

aim to profile the customers and to gain better assessment of their individual risk and creditworthiness. The mass personal data also come from mobile telephony services such as roaming, location data, logging to base station transceivers and Wi-Fi networks. Data on private financial transactions can be valuable, such as credit and debit cards payments, transactions from bank accounts, and data gathered by loyalty programs related to shopping.

Processing of very large data volumes and application of methods typical to big data can be also very useful for government, in particular for ensuring public security. Especially the role of police and emergency services can be important. Currently tracking internet requests is particularly important for prevention activities. For example an analysis of data coming from tax administration, customs shall and public registers, supported with internet tracking are applied for the detection of frauds. In case of prevention of serious threats the big value can be obtained from the resources of restricted access such as private messages and content of various files accessible in the cloud. Currently data of telecommunication operators is being extensively used to detect crimes. Other important sources of public security data are city monitoring, traffic monitoring, satellite and aerial photos. Monitoring provides sensor unstructured data that can be used with big data analysis methods. Apart from direct observation of people, particularly in places and -events particularly vulnerable to threats, the identification of vehicles is significant on the basis of their identification numbers.

The social aspect encompasses a **legal subspect** regarding legal consent for using personal data, particularly with big data methods. The legal system is to ensure the minimal degree of protection of the right of privacy of the individual. Sensitive data concerning health, racial or ethnic origin, political opinions, religious or philosophical beliefs and sexual life are of great importance. The legal regulations of personal data processing address mainly businesses and administration (in particular state protection, public security and public finance management). In the scope of personal data processing for business purposes, legislation should ensure on one hand privacy protection, and on the other it should not hinder the usage of IT and economic development. In the area of state protection, the level of surveillance of individuals is an issue.

The subject of privacy is often raised in the context of comparison and a wordplay of two terms: Big Data and Big Brother. The latter refers to well-known novel by Orwell (Craig and Ludloff 2011), (Simon 2013). According to Craig and Ludloff (2011) privacy can be categorized into three basic types: physical (freedom of intrusion into one's physical person, possessions or space), informational (one's expectation of privacy when personal information is collected, stored, and shared in digital or some other format) and organizational (government agencies, organizations, and businesses expect to be able to keep activities or secrets from being revealed to others). From the point of view of this paper the second meaning is important. The significance of information privacy grows along with the advancements of IT, but it is not only related to big data phenomenon. Nevertheless the development of big data applications significantly influenced the perception of information privacy. Haire and Mayer-Schönberger (2014) note that currently core strategies to insure privacy (such as: individual notice and consent, opting out, anonymization) have lost much of their effectiveness in the light of the possibilities brought by big data. For instance contemporary computing power to a high degree facilitates the process of anonymization. Therefore it can be assumed that significant change in the approach to privacy is taking place. The question remains, how far the change in technology influences changes in the awareness of the problem.

3. RESEARCH DESIGN AND METHODOLOGY

Widespread interest in social aspect of big data induced the authors to undertake a survey concerning threat perception arising out of the violation of privacy. Since the year 2014 the authors conduct a periodical survey on understanding the term of big data and perception of threat coming from using big data methods. The study group consisted of the students from Warsaw School of Economics, which is the university of economic and business profile.

Certainly, this is not a representative sample for the society as a whole. However this choice of respondents allows for posing detailed questions, thanks to their sufficient understanding of the problem. The students, as young people, are usually open for using new technologies as an obvious part of their lives. The respondents, being the students of university of economics and business should sufficiently well understand

the possibilities of new technology applications and at the same time treat them as typical individual or business users.

The survey was conducted during the classes not related to big data, and the questionnaires are in traditional paper form, so the nearly 100% of the issued questionnaires were filled in. The survey is anonymous, but the direct contact with the interviewer improved data reliability. One part of the questionnaire is related to knowledge and understanding of big data term, the second one – perception of threat to privacy. In this paper the authors focus on the second part, referring only to the main conclusions of the first part. The 256 students underwent the survey in consecutive three semesters.

The first part of the survey contained 20 closed questions on the acquaintance with the term big data and pointing its features and related items listed. Because the term is emerging and has multifaceted nature, the authors advocate that it is not possible to unambiguously evaluate the level of knowledge of the definitions of big data. Part of the questions is related first of all to the students' opinions and cannot be used to evaluate their knowledge. The other part refers to the commonly accepted issues and descriptions of big data. The latter questions let the authors conclude on the overall level of knowledge of the big data term among students and a knowledge indicator was created. These issues were comprehensively discussed by the Authors in the context of IT education within a separate article (Pawełoszek and Wieczorkowski 2015).

The 12 next questions were formulated, referring to the phenomena of mass personal data processing, to which the respondents were asked to assign their subjective perception of threat to their privacy using the scale 1..5. The level 1 meant lack of perception of threat to privacy, the level 5 – feeling of serious threat to their privacy. While choosing questions, the Authors had in mind various threats resulting from mass data processing, in particular related to recent advances in information technologies. The table 1 presents questions from this part along with the arithmetic mean of answers.

Table 1. Questions on perceiving the threat of privacy violence with arithmetic mean of the answers

No.	Question	Arithmetic mean	Standard deviations
1	Using cloud file storage services	2,7	1,09
2	Possibility of access by unauthorized persons/robots to private e-mails	3,6	1,16
3	Gathering information about users' behavior on the internet (i.e. visiting web pages)	3,7	0,98
4	Automatic surveillance of information about activities in social media portals	3,8	1,05
5	Gathering data on payments with credit cards	3,7	1,15
6	Gathering data on behavior of consumers in loyalty programs	2,7	1,08
7	Gathering data on using healthcare services in IT systems	2,7	1,19
8	Gathering geolocation data and billings by telecom operators	3,6	1,15
9	Gathering data on network usage of devices (i.e. Wi-Fi logs)	2,9	1,12
10	Closed-circuit television (CCTV) - video surveillance	2,6	1,26
11	Mass photo-taking: aerial, satellite and "street view"	2,3	1,21
12	Vehicle identification system i.e. with the aim of charging for the use of roads, detecting traffic offences	2,7	1,24

4. INTERPRETATION OF THE SURVEY RESULTS

The average results of answers to the specific questions ranged from 2,3 to 3,8 (with the possible values from 1 to 5). The standard deviations for particular questions ranged from 0,98 (question 3) to 1,26 (question 10). In the light of the above, it is apparent that the respondents answered to the questions in a quite balanced manner, avoiding extreme answers. Generally the feeling of privacy violation was evident because the average evaluation is 3,1.

The strongest perception of threat is represented in case of:

- automatic tracking of activities in social media portals (3.8),
- gathering information on users' behavior on the internet (3.7),

- gathering information on electronic payments i.e. with credit cards (3.7),
- the possibility of access to private e-mails by unauthorized people/robots (3.6),
- gathering geolocation data and billings by telecom operators (3.6).

These are the threats associated with day-to-day activities, which are inevitable in the modern world.

The slightest perception of threat is related to:

- photo-taking: aerial and satellite imagery, “street view” photos (2.3),
- closed-circuit television (CCTV) - video surveillance (2.6).

These are the activities that the respondents do not have under control.

The quite low perception of threat is related to:

- using file storage services in the cloud (2.7)
- gathering data about consumers’ behavior for the purposes of loyalty programs (2.7).

It can be interpreted as the threats, which could be easily avoided. For example the people taking part in loyalty programs do not treat them as privacy violation, the other people avoid such programs.

One of the questions regarded the sensitive data (health). Interestingly the feeling of threat resulting from gathering data on healthcare is not evaluated highly (2.7). This can be related to legislation, which significantly influences the possibility of processing sensitive data. Moreover the respondents were young people, who usually do not have severe health problems.

The differentiation of the answers is not high for particular questions, but the highest standard deviation can be observed with regard to the situations which are evaluated as the slightest privacy violation: closed-circuit television (1.26), vehicle identification systems (1.24), aerial, satellite and “street view” photo-taking (1.21). The evaluation of such activities is rather ambiguous. On the other hand the lowest differentiation of answers is in the case of one of the activities which causes the largest privacy violation – gathering information on the users’ behavior on the internet, with standard deviation 0.98.

It is worth to notice that the differentiation of evaluations can be seen also over time. Notwithstanding the fact that the period of survey is not long, because it encompasses three consecutive semesters, there was the steady growth of knowledge about big data. Simultaneously there is almost no difference in evaluation of the level of privacy violation. Average evaluations in subsequent semesters are: 3.08, 3.09, 3.09. In case of particular questions any clear trends of change of evaluations cannot be seen.

It seems reasonable to differentiate the answers according to gender, some situations of threat can be perceived differently. There were 144 women and 112 men among the respondents. No significant differentiation can be observed of average total value of feeling threat to privacy according to gender (women 3.09, men 3.07). Interesting differences are in the answers to particular questions. Men clearly feel more significant privacy violation referred to vehicle identification systems (men 2.95, women 2.54) as well as closed-circuit television (men 2.86, women 2.43). These are the same questions for which the bigger standard deviation of answers were observed. The explanation can probably be the fact that men are more often caught by the mass surveillance systems in the act of aggressive behavior and road traffic offences. Women perceive higher privacy violation related to data gathering about consumers’ behavior in loyalty programs (women 2.81, men 2.55). It could be result of the fact that women probably pay more attention to loyalty programs, at the same time considering their threats. Women also feel higher privacy violence related to the possibility of accessing private e-mails by unauthorized persons/robots (women 2.75, men 2.36). However it is hard to explain this regularity.

The correlation testing between the indicator of knowledge about big data (obtained from the first part of the questionnaire) and the sense of privacy threat in particular areas may lead to potentially ambiguous results. On one hand the deeper knowledge of big data means greater awareness of potential threats, on the other hand better understanding may raise less concern. The results of correlation tests are ambiguous indeed. Total correlation is not large (for average of all the questions 0.09), for particular questions most often it takes value near to 0 (from -0.03 to +0.09). In case of two questions it exceeds the aforementioned range. These are the questions about possibility of unauthorized e-mail access by persons/ robots (correlation with knowledge is 0.15, one-tailed P value: 0.008) and about automatic tracking the users’ activities in social media portals (correlation 0.14, one-tailed P value: 0.012). It can be assumed and confirmed that knowledge about big data methods has very little influence on increasing concerns over unauthorized e-mail access and tracking the internet users’ behavior. The justification for this may be the fact that big data methods are based on complex algorithms that are hard to understand for non-IT specialists so many respondents do not have neither the experience nor the ability to assess the risk and threats in this field.

5. CONCLUSION

The notion of privacy evolves along with the information technology development, particularly with the concept and practices known as big data. The issues of information privacy are classified into the social aspect of big data (among other aspects: technological and business). It may be assumed that technological developments and business possibilities of big data applications will entail changes in awareness related to privacy of mass processing of personal data as well for commercial purposes (such as personalization of advertisements) as for public management (preventing of frauds and abuses).

The survey conducted by the authors was to identify the level of perception of privacy violation related to different activities associated with big data. The results do not show clear correlation of threats to privacy with the overall level of knowledge on big data phenomenon. The respondents indicated the activities being to a high degree related with privacy concerns, these were: activities on the internet (i.e. automatic surveillance and gathering data about visited web pages, behavior in social media portals and unauthorized access to private e-mail correspondence), gathering data of cellular telephony (geolocation data and billings) and performing electronic payments (i.e. gathering data about payments with credit cards).

Therefore it is particularly interesting that some of the mentioned activities are totally legal (such as surveillance of the internet users with the aim to personalize advertisement displayed), as well as those which are illegal or officially permitted only in specific cases (for example the activities of authorized forces with the aim to prevent security threats, which encompass the control of private e-mail messages, billings and electronic payments). In turn the lowest perception of privacy violation is connected with activities such as mass photo-taking such as: city surveillance, vehicle identification. Also, interestingly, the low perception of privacy violations is related to processing typical sensitive data – such as using healthcare services. The difference between men and women in total perception of threat related to personal data processing could not be stated although there are clear differences in answers for particular questions. It can be assumed that trust to the legal system and respect for the law influence a person's feelings concerning privacy violation or the lack of it. Therefore the authors advocate that it is very important that the legal acts on the protection of personal data would keep up with the pace of technological development. The law should be on one hand sufficiently detailed, but on the other hand so general and timeless that the technology development would not cause permanent legal gaps. Simultaneously it is very important the law would be actually respected and the society should not be surprised at the news about completely illegal actions of, for example, special forces.

The described research should be continued with the purpose to monitor changes in subjective evaluation of threats to privacy being related to technology advances. The authors are planning to conduct more detailed research considering the aims for which the respondents are able to agree to share their personal data. The question still stays open and the further research can be conducted regarding the differences between regions, culture and legal system of the country influencing the perception of threats to privacy.

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CONCEPT REPRESENTATION ANALYSIS IN THE CONTEXT OF HUMAN-MACHINE INTERACTIONS

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ABSTRACT

This article attempts to make a conceptual and epistemological junction between human learning and machine learning. I will be concerned with specifying and analysing the structure of concepts in the common ground between a concept-based human learning theory and a concept-based machine learning paradigm. I will focus on (i) humans' conceptual representations in the framework of *constructivism* (as an educational theory of learning and a proper model of knowing) and *constructionism* (as a theory for conceptualising learning) and (ii) concept representations in the framework of *inductive concept learning* (as an inductive machine learning paradigm). The results will support figuring out the most significant key points for constructing a conceptual linkage between a human learning theory and a machine learning paradigm. Accordingly, I will construct a conceptual ground for expressing and analysing concepts in the common ground of human and informatics sciences and in the context of human-machine interplays.

KEYWORDS

Concept, Human Learning, Machine Learning, Constructivism, Constructionism, Inductive Concept Learning.

1. MOTIVATION

Regarding a very general definition, the act [and the role] of learning can be identified as related to acquiring new or modifying existing knowledge. Often, the ability to acquire knowledge is seen as a sign of, or even a prerequisite for, intelligent behaviour. I shall stress the fact that *knowledge* is a very complicated and sensitive term that must be used with caution. Considering the structures of human and information sciences and their interrelationships, I need to focus on specifying knowledge and on analysing the phenomena that we can use under the label of 'knowledge'. It seems quite important to investigate what the term 'knowledge' stands for (and can stand for) to be assumed and to be comprehensible in various frameworks of learning within different systems. This article attempts to construct a conceptual and epistemological linkage between human learning and machine learning and to analyse the structure and description of concepts in the common ground between a theory (and a philosophy) in the framework of human learning and a paradigm in the framework of machine learning. Before getting into the details, I contemplate the term 'Machine Learning'. Later on, I focus on knowledge to provide a proper background for my desired contributions.

Machine Learning has been recognised as a subfield of Artificial Intelligence and Computer Science. According to [Mitchell (1997)], "A machine learning approach attempts to develop strong algorithms that allow machines to improve [the productivity of] their performances on a given goal [and on an objective function]". In machine learning, the word 'learning' has been utilised as a binary predicate for machine. Learning as a binary predicate describes a role that is being performed by a machine. It is important to focus on the term 'learning' within the context of the analysis of knowledge. My main goal is figuring out the most significant key points for building a conceptual link between humans and machines.

In order to analyse knowledge I take Bloom's taxonomy¹ into consideration. This taxonomy is a framework for classifying pedagogical objectives, which could be interpreted as the statements of what teachers [, tutors and mentors] expect their learners to have learned, see [Furst (1956), Krathwohl (2002)]. Consequently, knowledge has a strong relationship with recognition of materials, ideas, methods, processes, structures and settings. Bloom's taxonomy divides a body of knowledge into multiple classes like, e.g., knowledge of terminologies, knowledge of ways and means, knowledge of trends and sequences, knowledge of classifications and categorisations, knowledge of methodologies, knowledge of universals and abstractions, knowledge of principles and generalisations, knowledge of theories and structures. Later on, [Krathwohl (2002)] has proposed a knowledge dimension in the revised version of Bloom's taxonomy. The revised taxonomy consists of four categories: (1) Factual Knowledge (e.g., terminological knowledge), (2) Procedural Knowledge (e.g., knowledge of methods and algorithms), (3) Conceptual Knowledge (e.g., knowledge of theories, models and structures) and (4) Metacognitive Knowledge (e.g., contextual knowledge, conditional knowledge). According to this categorisation I can say that "knowledge acquisition consists of a sort of transformation of functions from reality into the sets and categories of facts, procedures, concepts and contexts". The human being has this ability to deal with multiple classes of facts, procedures, concepts and contexts and can transform them into her/his mind. Transformations can be interpreted as the outcomes of self-involvement in increasing knowledge about a subject matter. In human systems a learner is someone who intentionally attempts to know more about something in order to construct her/his knowledge about that thing. Any human has a background knowledge and tackles to carry on constructing knowledge over her/his existing knowledge. This consideration conduces me to observe and to interpret human knowledge acquisition (and human learning) as the *activity of construction*. Any person tackles to develop her/his constructed knowledge constructions and to gain an opportunity to attain deeper comprehensions, realisations and understandings. Also, human's deeper understandings support her/his greater motivations. Here I feel the need to concentrate on *conceptualisations* in order to provide a supportive analysis of realisation and understanding. In my opinion, "a conceptualisation is an uniform specification of separated understandings. A conceptualisation provides a global manifestation of local understandings in the context of a human's thoughts". Additionally, a human's grasp of concepts provides a proper foundation for generating her/his own conceptualisations. Also, the personal conceptualisation could be identified as the action or the process of forming a concept with regard to the basis that has been provided by the individual realisation.

In this research I will mainly focus on concepts, conceptions and concept representations. I have believed that the main focus of process of knowledge acquisition (and learning) is on concepts and concept representations in the ground of conceptualisations. Knowledge acquisition based on concepts can be based on the following definition. This definition draws out the key elements, which have individual and social implications for intelligent learners, see [Watkins (2002)]. Knowledge acquisition is the reflective activity which enables the learner to draw upon her/his previous experiences (and her/his background knowledge) to conceptualise (and, respectively, understand) and evaluate the present, so as to build up and shape future actions and to construct (and develop) new knowledge.

Let me go back to machines and machine learning. A machine program is said to learn from an experience if (i) there is a set of tasks for machine and (ii) there is a machine's performance measure, and also if (iii) the machine's performance at those tasks, as measured, improves with its experiences. Here I present a problem in human learning to make a comparison between human learning and machine learning. This example can clarify what the afore-mentioned concepts in a machine learning problem are. Suppose we think of the problem that focuses on students' mathematical problem solving. Considering this problem, the most significant task of a student is to find proper solutions for mathematical problems. Then the set of tasks must consist of the student's tasks and obligations for solving mathematical problems. Also, the performance measure could be known as the percentage of correctly solved problems. Additionally, the experience could consist of the existing transformations and alterations between observed problems and solved problems. Hence, a student can improve her/his ability in performing proper solutions for different mathematical problems after further experiments (experiencing more transformations). Subsequently, this student will have a better capability and more qualified competences in solving mathematical problems when more transformations (experiences) are provided for her/him. Providing more transformations for a student could

¹ www.icels-educators-for-learning.ca

be achievable by showing and providing her/him with more positive (sample) and negative (non sample) examples of the solved mathematical problems.

Here I shall claim that the word ‘learning’ in ‘machine learning’ is a *metaphorical image* and is a reflection of human knowledge acquisition and learning in machines and artificial agents. Let me express that machine learning is a metaphor that describes what ingredients and concepts are concerned with effective knowledge acquisition and learning within reality. Through my lenses, the most important concepts in a machine learning problem (e.g., problem, experience, task, performance, ability, learning) are *conceptual reflections*. They are some mappings from reality into usable and applicable labels.

In the following sections I will focus on (i) humans’ conceptual representations in the framework of constructivism (as an educational theory of learning and a proper model of knowing) and constructionism (as a theory for conceptualising learning that could be identified as a complement for constructivism) and on (ii) hypothesis generation and concept representation in the framework of inductive concept learning (as a supervised machine learning paradigm). Accordingly, the main contribution of this research is figuring out the most significant key points for constructing a conceptual and epistemological linkage between a [concept-based] human learning theory and a [concept-based] machine learning paradigm. I will analyse the structural and logical specifications of concepts and conceptual representations and will analyse a common ground for expressing and analysing concepts in the context of human-machine interplays. I will also relate my specifications with Kantian account of schemata (and schemata-based concepts). Consequently, I will provide a list of the most significant transformations (from human into machine) and reflections (of human in machine) that make conjunctions between human learning and machine learning.

2. CONCEPTUAL REPRESENTATION

In this section I focus on (i) human conceptual representation in the framework of constructivism and constructionism and on (ii) hypothesis generation in the framework of inductive concept learning.

2.1 Constructivism and Constructionism

Constructivism is a philosophy that appears in a variety of guises, some of them pedagogical, some epistemological and some in complex combinations, see [Phillips (1995)]. In this research I see constructivism as a model of knowing with roots in philosophy, psychology and cybernetics that could support constructivist learning. In my opinion, the successful theories of learning are always getting supported by strong models of knowing, and thus, constructivism as a learning philosophy and as a theory of learning is highly dependent on constructivism as a model of knowing. According to these characteristics, it's possible to say that a successful theory of knowledge and an effective learning science may be constructed and developed based on the proper foundation that is provided by constructivism. Jean Piaget, the originator of constructivism, argued that all learning was mediated by the construction of mental objects that he called *schemata*. Schemata gradually develop into more conceptual mental entities, see [Bartlett (1932), Parker (2008)]. Let me explain the schemata in more detail. In constructivist learning the human’s mental structures manifest themselves in the form of schemata. The schemata demonstrate the human’s realisation of the world. They conceptually represent the constituents of human’s thoughts for knowledge acquisition with regard to her/his realisation of the world. Anyhow, in the framework of constructivism, a human being with respect to her/his pre-structured knowledge and her/his preconceptions attempts to develop the construction of knowledge. The most significant objective of constructivism is producing one’s own understanding of the world, see [Husen (1989), Keith Sawyer (2014), McGawand (2007)] for more detailed information.

Constructionism is a framework central to the learning sciences, and it posits that learners create their own knowledge by the construction of conceptual representations. Constructionism focuses on conceptualising learning and on learning how a human can learn. Papert’s constructionism focuses more on the art of learning and on the significance of making and producing things in learning. Papert is interested in how learners engage in a relationship with [their own or other’s] knowledge construction(s) and in how these relations ultimately facilitate the construction of new knowledge. Constructionism is a constructivist learning theory. It shares constructivism’s view of learning as ‘building knowledge structures’ through progressive internalisation of action, see [Spiro (1991), Ackermann (2002), Papert (1980)]. I may conclude that the main

idea of constructionism is that human beings learn effectively through creating, constructing and developing things. Additionally, by adding experiences to the constructivism approach, constructionism attempts to conceptualise learning and to specify and analyse ‘learning to learn’.

The most significant mutual objective of constructivism and constructionism is creating one’s own knowledge by constructing conceptual representations. According to [Hampton (2003)], conceptual representations are arguably the most important cognitive functions in humans. They stand at the centre of the information processing flow, with input from perceptual modules of differing kinds. Also, the most important building block of constructivism and constructionism is schemata, see [Bartlett (1932)]. Schemata provide a proper background for the learner’s concept (and conceptual) representations. They specify the learner’s inferences and can satisfy various conditions for definitions of truth. We saw that everything is about concepts and conceptual representations. Conceptual representations attempt to investigate the origins of human’s thought and roots of the constructed knowledge. In section 3 I will elaborate the description of schemata and will focus on structural and logical specifications of concepts as the key elements of the conceptual domains representation.

2.2 Inductive Concept Learning

Machine learning problems can be seen and analysed from different points of view and be divided into several categories. One categorisation could divide them into supervised, unsupervised, and reinforcement learning methods. In supervised learning method the pair (*input,output*) training examples are supplied by a trainer who is a human. So, the learner that is a machine searches for function mappings from the inputs into the outputs. In this research I am concerned with ‘inductive learning from examples’, which is a subfield of supervised machine learning. To induce means to infer general principles and rules from specific facts as the instances. I shall emphasise that these facts are different from the facts presented in the revised Bloom’s taxonomy. All existing facts, procedures, concepts and contexts in Bloom’s taxonomy could be captured as some principles (i.e. actuality, objectivity and reality) in machines. In Inductive Learning, we describe the main terminologies, axioms and rules by descriptive logical languages, e.g., First Order Predicate Logic (FOL) and Description Logics (DLs). *Inductive Concept Learning (ICL)* is a specified Inductive Learning. ICL attempts to logically describe concepts and their relationships. It employs the members (instances) and non-members of a concept that may be known as a class. A characteristic feature of most inductive learning approaches is the use of background knowledge. This feature supports more complicated and specific learning scenarios, because not only the factual description of the given examples can be used by the machine, but structurally rich knowledge representations can be taken into account as well, see [Mitchell (1997), Lehmann (2010)]. In parallel with [Lavrac (1994)], I focus on specification of concept learning with background knowledge. In concept learning with background knowledge, a machine with regard to the given set of training examples and background knowledge finds a *hypothesis*. A hypothesis can be expressible in concept description languages. Also, based on the background knowledge and given examples (to machine) a hypothesis can be complete and consistent, i.e. correct. So, one may assume that a hypothesis is generated based on ideas and can determine the applications of a term and a phrase. Furthermore, a hypothesis is a significant part in the use of reason and language. It has a very strong dependency to the background knowledge.

3. CONCEPTS: STRUCTURAL AND LOGICAL SPECIFICATIONS

There has always been a general problem concerning the notion of ‘concept’, in philosophy, in linguistics, in psychology and in computer and information sciences. This research is focusing on knowledge acquisition and learning relying on concepts and concept representations. Thus I need to ascertain a realisable interrelationship between the description of concepts within human and information sciences. Actually, I am constructing a conceptual linkage between constructivism/constructionism and inductive concept learning. As mentioned, schemata provide proper backgrounds for the learner’s concept (and conceptual) representations. In a simplified version of Kantian philosophy a non-empirical (pure) concept has been

defined as a category. According to Kantian philosophy², schemata are the procedural rules by which a category is associated with a sense impression. Kant claimed that the schemata provide a reference to intuition in a way similar to the manner of empirical concepts. According to the Kantian account of schemata there are three types of concepts that employ schemata.

1. Empirical concepts³: For instance, the concept of *Spring* can describe a rule according to which human's imagination can visualise a general figure of '*a green season with beautiful trees and colourful flowers*' without being restricted and closed to any particular and specific shape produced by experience.
2. Pure mathematical concepts⁴: They are the construction or mental drawing of what is common to several geometrical figures. They can be concerned with numbers, algebras and arithmetics. I shall stress that these concepts are not based on objective visual images.
3. Pure concepts of the understanding⁵: They focus on characteristics, predicates, attributes, qualities or properties of an object, that are, also objects in general or as such.

The third employs transcendental schemata, see [Kant (1781,1790,1999)]. Here I focus on some specifications of concepts and then relate them to the Kantian philosophy. Concepts are the furniture of human beings' minds. A well furnished mind can be a source of successful knowledge acquisition and learning, see [Parker (2008)]. Concepts are realised (by some philosophers and psychologists) as representations of reality in mind. Regarding this grasp of concepts, they could be understood as some general objects and labels, where objects are the constituents of propositions that mediate between thought, language, and referents, see [Bartlett (1932)]. From these characteristics, I conclude that it's possible to say that concepts might be understood to be the representations of actualities and objectivities in humans' minds. The mental representations of actualities can affect the human's languages. More precisely, a concept is may be said to be a linkage between linguistic expressions (descriptions) and the mental images (e.g., representations of the world, representations of inner experiences) that a human being has in her/his mind, see [Götzsche (2013)]. Relying on logics and their descriptive features, a concept can be seen as an *idea* and the idea can be transformed into a hypothesis in order to correspond to a distinct entity (or even to a group of entities) or to its (their) essential features. The ideas determine the application(s) of terms and phrases. It's really important to say that any idea is a significant part in the use of reason and language. These characteristics and properties are being applied in order to support the metaphorical usages of concepts in machine applications. In fact the existing linkages between mental images and linguistic expressions can be mapped (be transformed) as multiple ideas into hypotheses in order to determine different applications in artificial systems. As mentioned, a concept can be expressible in some concept description languages and it's possible only in virtue of terminologies. In fact, various concepts and the relationships between them can be used to establish the fundamental terminologies adopted in a modelled conceptual domain regarding the hierarchical structures. According to the characteristics of human ideas, when a human being forms⁶ an idea from its examples, s(he) gets to know more than just some definitions. This demonstrates the deep learning rather than superficial knowledge, see [Parker (2008)]. I shall emphasise that the human learner is the developer of her/his personal conceptions over the individually designed schemata. In my opinion, the relationships between 'Kantian account of schemata' and the 'empirical concepts' supports the human's mental representations of the objects. It also sees a 'pure concept of the understanding' as a characteristic and predicate of an object that can express what has been said about that object. The first one employs schemata and the second one employs transcendental schemata. In fact, this is how a learner deals with fundamental concepts within constructivist learning. Accordingly, the learner employs inductive rules to expand her/his

² [https://en.wikipedia.org/wiki/Schema_\(Kant\)](https://en.wikipedia.org/wiki/Schema_(Kant))

³ <http://kantwesley.com/Kant/EmpiricalConcepts.html>

⁴ <http://plato.stanford.edu/entries/kant-mathematics/>

⁵ <http://userpages.bright.net/~jclarke/kant/concept1.html>

⁶ <http://teachinghistory.org/teaching-materials/teaching-guides/25184>

general ideas into more specified ones. The generalisation of various specified hypotheses (based on ideas) supports the learner in discovering new hypotheses and generating new ideas. S(he) searches for and lists attributes and properties that can be used to distinguish exemplars (of various hypotheses) from non-exemplars. But what s(he) really does is more than just specifying and generalising from different examples; S(he) is highly concerned with identifying and relating the induced examples. Let me be more specific. As mentioned in 2.2, a machine with regard to the given set of examples and its background knowledge finds hypotheses. The logical description of a concept, which arises during the knowledge acquisition and learning processes, is called a hypothesis, since it is an experimental explanation of why the objects are members (or non-members) of the hypotheses (concepts). Also, considering a concept as a hypothesis, if an example belongs to a hypothesis, we are able to conclude that the hypothesis covers the example. Then, the example has all features and characteristics of that concept, see [Baader (2003)].

3.1 Concepts in the Common Ground between Human Constructivist Learning and Machine ICL

Obviously, there is an important characteristic of concepts held in common ground. The concepts in the common ground are the images of the Idea transformations (the transformations from human being into machine). The mappings epitomise humans' conceptual representations and generate hypotheses. In the common ground a concept is a specialised or generalised experience. The concepts could be recognised by their instances that are other concepts as well and they all can be represented in different hierarchies. In human scientific approaches an experimental explanation of why some objects are the members of a concept may support learners in representing their own ideas and in providing ideal (and conceptual) representations. In fact, the quality and the modality of the concept representation is affected by observing 'empirical concepts' and the 'pure concept of understanding' with regard to a Kantian account of schemata and transcendental schemata. On the other hand, in machine learning approaches, a machine generates the represented concept from its given instances. In the common ground, an experimental and empirical explanation of WhyNess of existence of some 'concepts, ideas and hypotheses' as the instances of other 'concepts, ideas and hypotheses' can provide a strong background for improving the quality of conceptualisations. Here are a number of transformations (from human into machine) and reflections (of human in machine) that make a conceptual and epistemological connection between human learning and machine learning:

- Transformation of a human being's knowledge and knowings into multiple principles (and axioms) in machines that are mainly object-oriented. Accordingly, the human being's knowings get classified into the specified classes (and under the determined labels) in machine's knowledge base.
- Transformation of a human being's experimental and empirical achievements into various categories of positive and negative examples in machines. Thus the human being's experiments get divided into exemplars and non-exemplars of the specified classes with determined labels.
- Transformation of a human being's real 'problems', real 'tasks for solving problems' and real 'performances' into provided classes with the same labels (Problem, Task and Performance) in machines.
- The reflection of human learning and knowledge acquisition in machines and artificial agents. This reflection is equivalent to transforming a taken metaphorical image of learning and knowledge acquisition into machines and artificial agents.
- The reflection of human concepts in the hypotheses. The linkages between a human being's mental representations and linguistic expressions (and descriptions) are getting mapped as some ideas into hypotheses in machines. They correspond to multiple entities or to their essential features in order to express different significant parts in the use of reasons and languages.

- The reflection of humans' conceptual representations in hypothesis representations and representation of hierarchy of hypotheses in machines' knowledge bases.

4. SUMMARY AND CONCLUSIONS

In this article I have focused on a conceptual and epistemological linkage between concept-based human learning and concept-based machine learning. Regarding the structures of human oriented sciences and information sciences and according to the fact that human oriented sciences and information sciences support distinct types of frameworks, I have had to specify and to analyse knowledge, knowledge acquisition and learning from two separated points of view. In human systems, knowledge acquisition is a reflective activity that enables a human being to draw upon her/his experiences and background knowledge to understand, conceptualise and evaluate the present, so as to build up and shape her/his future actions and to construct and develop new knowledge. On the other hand, a machine program is said to learn (and acquire knowledge) from an experience if there is a set of tasks and a performance measure for it, and also if its performance at those tasks, as measured, improves with its given experiences. In this article, according to (i) constructivism as a model of knowing and a theory of learning and constructionism as a theory of conceptualising learning, and (ii) inductive concept learning as a supervised machine learning paradigm, I have focused on building a conceptual linkage between human learning and machine learning. The constructivist and constructionist theories of human learning and the inductive concept [machine] learning paradigm are all shaped based upon concepts. The first two are focusing on concepts and conceptual representations and the third one focuses on representing concepts in information sciences within electronic systems for hypothesis representation and hypothesis generation. My main concern has been analysing concept representations in the mentioned frameworks and on their common ground. A concept can be seen as a linkage between linguistic expressions and the mental images that a human has in mind. It can be observed as an idea and be transformed into a hypothesis in order to be corresponded to entities or to their essential features. In fact, schemata provide proper backgrounds for the learner's concept (and conceptual) representations. A Kantian account of schemata sees the empirical concepts in the human's mental representation of the objects. It also sees a pure concept of the understanding as a characteristic and predicate of an object. It can express what has been said about a thing. The first one employs schemata and the second one employs transcendental schemata. In fact, this is how a learner deals with fundamental concepts within constructivist learning and transforms her/his concepts into multiple hypotheses in order to be applied by inductive concept learning frameworks in machines.

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PLATFORMS OF DIGITAL COMMUNICATION TO THE EDUCATION

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ABSTRACT

Contemporaneously, the multimedia interfaces are being used as an educational interface in virtual learning environments responsible for the divulging of various cultural activities on schools or universities, with programs dedicated education, culture and entertainment. In other words, this is a new way of learning and cultural production to those with access to cyberspace, characterized by mutual interaction, where each member is involved in building the cooperative relationship, affecting each other of reciprocal way. The present paper features a conceptual approach concerning the foundations of Web Radio, Podcast, Vodcast and Weblog, showing the main differences theoretical and technical between the concepts and their educative potentialities in cyberspace. The methodology used is empirical descriptive based on qualitative data survey in papers, PhD dissertations and Master's theses, books and Internet, collected on the first semester 2015.

KEYWORDS

Web Radio, Podcast, Vodcast, Weblog, Educational Technologies.

1. INTRODUCTION

The tools of Web 2.0 brought facility of access to communication by the increase of storage capacity of news and by the processing speed of information in real time, promoting their educational applications inside and outside classrooms, with the possibility of sharing and storing audiovisuals contents. Now, more than ever, the institutions are making intensive use of technological resources in virtual learning environments based on a new communicative paradigm. Thereby, the global interaction based on the sharing of information, knowledge and advances in communication technologies, have changed the concept of economy and society - consumers become producers, and producers become consumers of content, goods and services in a new global economic model, without restrictions or barriers, induced by a process of massive collaboration. Communications technologies allow for the annihilation of distance and for globalization; the potential for rapid, synchronous and asynchronous communication also changes the relationship to time. This is because communication technologies, such as the Internet, allow for decentralization of operations and focusing of control, increasing the effectiveness of networks relative to hierarchical structures, says Castells (2010).

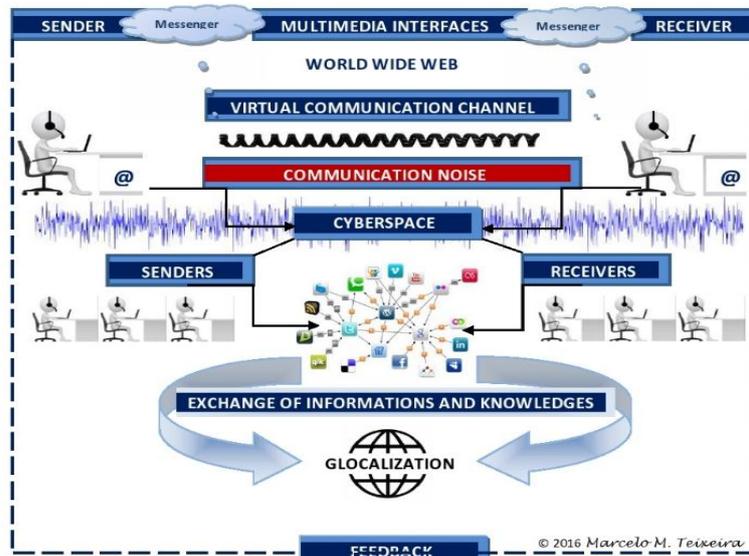
In this sense, emerges the concept of glocalization as one of the main aspects of media convergence (mass media to net media). "glocalization is essentially a hybrid of globalization and localization". "Glocalization is likely to empower local communities through strategic linking of global resources to address local issues for positive social change and to balance changing cultural interests and community needs" (Mendis, 2007, p.2). However, it was the ability to connect these technologies together, giving rise to such networks, which expanded and integrated the individual and groups into a wider setting and new standards of globalization. As regards education, it is considered that this new configuration allows communication to expand the territory of the local school to deterritorialized areas of knowledge, enabling viewing school as a true learning community (Silva, 2002). Thus, the societies have gone through major changes over the years caused by the influence of technological advances in all social spheres and areas of knowledge. Live to the online era, where new understandings of time / space confer a new status for education, mainly through the phenomenon of socialization of knowledge that occurs on a global scale in an environment of sharing

experiences, information, experiences and learning distance. In turn, the "Information Society" has become a natural stage in the evolutionary and social development of people, from a world increasingly interconnected by new technologies. This process belongs to a cycle that is based on the assumption that new technologies applied to education would solve all time, distance and transport issues, although never dissociated from traditional teaching methods (Teixeira, 2009).

That is the case of Vodcast representing a valuable space for the popularization of information, education and the socialization of culture, and that can be accessed at anytime and anywhere in the world. The Vodcast no more is seen simply as an informative interface, but as a pedagogical and methodological component to be used in teaching and learning. The relatively recent development of the digital era has spawned interest in what has come to be called "virtual reality" and in delineating what this means for learning and creation of virtual learning environments. The present paper features a conceptual approach concerning the foundations of Web Radio, Podcast, Vodcast and Weblog, showing the main differences theoretical and technical between the concepts and their educative potentialities in cyberspace, that's the central contribution of the paper.

2. THE COMMUNICATION MODEL OF VIRTUAL UNIVERSE

The type of communication which prospers on the Internet is related to the free expression in all its forms, according to the predilection of each person, write Manuel Castells (2002) in Teixeira (2013). Because of this, has to be highlighted that a new communication technology sharpens the scientific investigation about the possible contributions which the media can provide to the cyber audience and the different knowledge fields. Because on the education, referring to the teaching/learning process, lacks contemporaneously of macro and micro studies which come to clarify doubts or show on practice how the educational action occurs, and its relation with the learner community. As says Teixeira (2015), at the present, we have a new model of communication:



Source: Teixeira (2016)

Figure 1. The Communication Model of Virtual Universe

3. THE CONCEPT OF WEB RADIO

Radio isn't what it once was. That 30-year-old battery-powered work-of-art that sits on your bathroom window sill may be what you immediately think of in terms of 'radio', but it's now so much more than that. The lines where radio and music-listening meet have blurred, making it difficult to distinguish what's what. In the analog days or yore, it was easier to differentiate 'radio', from someone listening to music, say, on their record player, says (Sawers, 2013).

The web radio can be defined as the radiophonic emission on the Internet in real time, usually in audio formats (MP3 or MP4, OGG Vorbis, WebPlayer, Real Audio, Windows Media Audio and HE-ACC). Different to traditional radio, your transmission could be followed by images, videos, texts, pictures and links. This advance allows the listener to do much more than just listen, making communication much more dynamic. Currently, it is possible to conduct online education, offering didactic material in PDF files or Word documents, video, podcast, and have access to up-to-date information through the RSS feed, clear up doubts with the instructor / educator through messenger, e-mail, chat, twitter, forums, as well as the interactivity in real time, through audio-conference or video-conference. It is about the combination of various elements: Ubiquity; flexibility; low cost; emission in real time; synchronous and asynchronous communication; multi-directed connectivity; multimedia sharing; streaming; collaboration and the interactivity integrated with e-learning, says Teixeira (2019).

Frequently, the online reproduction of hertz signals through codification in the personal computer, through streaming, reproduces the emission on the Internet. The data is sent from PC packages for audio, video, text, images for Internet, which are stored on the platform online and made available to the public, which has access to a range of interactive resources. To Prata (2008), the web radio is nothing more than digital radio with support of the Internet, which allows the presence of audio, video, text, and promoting the emergence of new genres and new forms of interaction.

Thus, the main differences between traditional radio and Internet radio are: A way of accessing radio: By the computer; the flexibility of synchronous and asynchronous programming; geographical coverage (from local to global); the quality of emissions (without interference or noise), and active participation of the public. The user not only listen, but reads, writes and assists the programs of radio, having at their disposal a set of integrated interfaces. Finally, the interactive multimedia together with the audio in virtual environment is the essence of what has been called "Web Radio", which has the potential advantage of network, enriching its programming with multimedia content and additional resources, allowing a constant interaction transmitter-receptor (Teixeira, 2016). It is this way that the university web radios, functioning as a social communication vehicle of local communities and as a valuable space for the divulgation, socialization and popularization of science and technology, produced by different departments at the teaching institutions. This way, the educommunicative potentialities of the web radio started to be found by lecturers, school managers, educational institutions and university radios, based on successful experiences with the use of the interface, producing cultural practices. Although similar, but with distinct features, the web radio and the podcast are complementary, for the sake of interactivity, ubiquity and flexibility, representing to the user the facility of access to information, culture and entertainment.

In some countries, the web radio is being used as an educational interface in virtual learning environments responsible for the divulging of various cultural activities on schools or universities, with programs dedicated to music, theater, cinema, education, science, technology, politic, poetry, literature, economy, news and transmission of popular festivals. At the present time, the web radio university, it develops its activities based on the following categories: The formative, the informative, the academic and the cultural-educative. The formative category is established through periodic courses of formation and recycling for speakers, editors/speakers and technicians, besides the realization of didactic programs in collaboration with public and private institutions; the informative category is a space focused on the debate and news of university; the academic category dedicates an ample space in its program grid to the academic life, transmitting the main occurrences of the learning institution; at last, the cultural-educative category is responsible for the divulging of various cultural activities on the university.

So, web radio involves streaming media, presenting listeners with a continuous stream of audio that typically cannot be paused or replayed, much like traditional broadcast media; in this respect, it is distinct from on-demand file serving. Internet radio is also distinct from podcasting, which involves downloading rather than streaming.

4. THE CONCEPT OF PODCAST

The concept of podcasting can be understood as the whole process of production of digital material (audio, video, text or image), with publication and distribution on the Internet, and the possibility to download for subscribed. Thus, a technology that provides the practice of this concept is the RSS, dialect of XML (Extensible Markup Language - Extensible Markup Language), responsible for updates to Internet sites (Paz, 2007).

The term “podcast” results from the junction between the Ipod (equipment developed by Apple and that plays MP3) and Broadcast (radio). Commonly is used in the podcast audio files in MP3 format (MPEG Audio Layer 3), but technically it is possible to use other file formats for compression of audio (AAC, AIFF, WAV, OGG). So, Maybe you're still wondering what all the hype is about. MP3s have been on the internet for quite some time. Internet radio is nothing new. Audio blogs have been around for a while, too. What sets podcasts apart is that they can be automatically downloaded to your computer and synced to your MP3 player without you lifting a finger. You can wake up each morning with new shows on your MP3 player ready to listen on your way to work. This ease and convenience of this automatic delivery is powerful. This is what sets podcasting apart and made it so popular. Imagine walking into Starbucks to get a drink and by the time you leave you have new shows to listen to on your MP3 player. We haven't reached that point yet, but we are headed there. This amazing technology came out of the minds of David Winer and Adam Curry (you may remember Adam was a VJ on MTV in the mid-80s). Adam wanted an easy way for people to create audio content and for listeners to automatically receive it to their MP3 players. To subscribe to a Podcast you use a software program called a podcatcher. Sometimes this is also called a podcast aggregator (but again this is geek speak). Just know that podcatcher and aggregator mean the same thing. It's the software that you use to subscribe to and receive podcasts. The podcatcher regularly checks the feed for new content that has been posted. When a new podcast show is found, it's downloaded. The next time you plug your MP3 player into your computer, the new podcasts shows are synced by your media player (such as iTunes), (<http://www.howtopodcasttutorial.com/what-is-a-podcast.html>).

When the multimedia content has a large volume of information, the files of podcast are generally compressed for both storage and streaming of audio and video on the web, to be accessed using any computer, operating in different systems (Microsoft, Linux or Macintosh). The fact is that the standard of digital files of the Moving Picture Experts Group, in the early 20th century, became devoted to worldwide as the most used in the music market. Ever since the podcast is associated with a change in social behavior, since the public learned that he could hear other things in addition to music and almost no cost. The entertainment is only part of the history of art and science on the transmission of audio over the network. This makes the podcast becomes an attractive technology in different areas of society, including the Education (Moura & Carvalho, 2008).

Thereby, the educational institutions can through web radio make available educational materials with different themes in text, video or audio in the podcast, which will be provided in the virtual environment and can be accessed at anytime and anywhere in the world. *“There is a growing feeling that there exists a strong correlation between communities collective intelligence and the degree of their human development. As digital technologies give us more and more powerful tools to augment personal and collective cognitive processes, it becomes essential to understand how the collective intelligence processes can be multiplied by digital networks”*, according Pierre Lévy (2010, p.71).

According to Geller (2007), if you can create quality programming, and consistently stick a host, program, or format over the time it takes to find its audience, you will likely have your own success story. Despite the abovementioned obstacles, any course or discipline in school or at university, made available in a virtual learning environment, could use the podcast program, or produce, in a local radio station, contents to be shared by the students. It is only question of believing in the potential of the radio on the Internet and its potentialities, to make the dream of Guglielmo Marconi (considered the father of broadcasting) worth, transforming it definitively in an educational mean. The great challenge of the educators is to know the educommunicative contributions that the podcast offers and to use on their pedagogical practice, affirm Teixeira (2013).

5. THE CONCEPT OF VODCAST

The concept of Vodcast can be understood as the whole process of production of digital material (audio, video or image), with publication and distribution on the Internet, and the possibility to download for subscribed. Thus, a technology that provides the practice of this concept is the RSS (Real Simple Syndication), dialect of XML (Extensible Markup Language - Extensible Markup Language), responsible for updates to Internet sites. Meng (2007) extends the concept: The word “podcasting” is an amalgam of the word broadcasting and the name of the popular MP3 player from Apple Computer called the “iPod”. It’s a bit of a misnomer in that it implies that an iPod is required to Podcast. In fact, Podcasts can be used with a variety of digital audio formats and play on almost any MP3 player or portable digital audio device - as well as any brand of desktop computer or laptop. To define it: podcasting is the process of capturing an audio event, song, speech, or mix of sounds and then posting that digital sound object to a Web site or “blog” in a data structure called an RSS 2.0 envelope (or “feed”). RSS is an agreed specification of XML tags used to define objects which can be subscribed to through a “RSS news reader”. Using specialized news readers like iPodder or iPodderX users can subscribe to a Web page containing RSS 2.0 tagged audio files on designated web pages and automatically download these files directly into an audio management program on their personal computer like iTunes, Windows Media Player or Music Match. When a user synchronizes their portable audio device with their personal computer the Podcasts are automatically transferred to that device to be listened to at the time and location most convenient for the user, contextualizes the researcher.

Such practices allow communicative resources to be inserted in the online educative environment, not only as didactic interfaces (educative technologies as e-learning platforms) or objects of analysis (critical reading of the media) but mainly as a way to express oneself and to produce cultural practices. In this sense, the educommunicative paradigm demands a new way of thinking about the pedagogic models and new strategies to intervene in society; strategies that could respond to media and education contemporary processes. This demand is valid because both the technological development and the social and economic changes, as producers of new cultural patterns, have caused the school to realign itself regarding what is demanded from it: intentional actions that prepare people to insert themselves with a critical posture towards society.

However, given the similarity of some characteristics, some authors claim that the Web Radio, Podcast and Vodcast are the same interface. In fact, is a method of distributing video over the Internet or a computer network that uses the tools developed in the Podcast to create a list in the form of streaming videos and updates itself automatically as new videos are embedded in a Web page. The method was developed by called Jet-Stream, in 2005, but the technology behind Vodcast is the same as the makes up Podcast, since 2004. According to (Schnackenberg, Vega & Relation, 2009), Vodcasts follow much the same genres as Podcasts in terms of types and fee/free options, with the additional option of movies and television programs being more popular than music for downloading (of course, music videos are available for download as well) “As with Podcasts, famous directors, producers, and actors are now not only offering some clips, shows, or films for free, but they are creating special programming that is available only as a Vodcast. This then creates an entirely unique product, audience, and market, driven entirely by the development of the portable media player and its associated Pod/Vodcast needs”.

To education, its transmission could come followed by images, videos, pictures, and links or through message boxes and chats (Priestman, 2002). This advance allows the listener to do much more than just listen, making communication much more dynamic. Today, it is possible to conduct an online formation, offering didactic material in video and have access to up-to-date information through the RSS feed, clear doubts with the instructor / educator through messenger, e-mail, chat, forums, besides the interactivity in real time, through audio-conference or video-conference, like web radio, says Teixeira (2016). In other side, Podcasting and vodcasting also have implications for the constructivist approach to education and student engagement. The constructivist theory is grounded in the idea that students learn best when they are actively engaged in the process, not merely bystanders who digest information while sitting passively in a classroom, to Beldarrain (2006) in Schnackenberg, Vega and Relation (2009). Many have argued that podcasting and vodcasting can free class time by disseminating relevant information before class begins, thus allowing for meaningful and active discussions when students arrive for the in-class portion of a given course (Hatak, 2008; Lum, 2006). Furthering this notion is the idea that educators should view podcasts and vodcasts as additional interactions with students, and not simply a replacement of class time (Ibidem).

6. THE CONCEPT OF WEBLOG

In order to understand the functioning of Weblogs, the first thing to be done is to address their nature. Different interested parties have attempted to define blog and blogging, including practitioners, technology companies, academics, and mainstream media. According to Teixeira (2014), Jorn Barger coined the term Weblog in December 1997 and Peter Merholz coined 'blog' in April/May of 1999 when he "broke the word Weblog into the phrase 'we blog'" on his site confirm Boyd (2006). Both terms were devised to identify websites that had a particular look and feel distinct from homepages. Blogger, an early blogging tool, was unveiled by Pyra Labs in 1999 to make it easier for people to create blogs. Its popularity helped spread the term across the web and to solidify the look and feel of blogs (ibidem). A typical Weblog combines text, images, videos and links to other blogs, web pages, and other media related to its topic. So, the information can be written by the site owner, gleaned from other sites or other sources or contributed by users in the virtual space.

Luján-Mora and Juana-Espinosa (2007) recognize that Weblogs are the development of traditional learning logs for students and teachers, whether as a complement to traditional lectures or as a e-learning tool. The importance of these applications has increased due to the changes in the classroom dynamics that Bologna will bring shortly to the European Higher Education Area, which entail the substitution of conventional education for autonomous learning. Also, the number of Open Universities and virtual environment courses offered by traditional Higher Education Institutions (HEIs), potential users of Weblogs, has boosted in the last decade. The aim of this paper is to contribute to the scarce knowledge that HEIs have regarding the functionality of Weblogs as tools for enhancing the teaching-learning process, especially in terms of identifying the barriers and benefits that the deployment of these tools may present. To do so, both a theoretical and practical approach have been employed (ibidem). With the possibility of sharing and storing contents in audio, video, image or text. When it comes to net media that develops "sociocultural activities" for informal and non formal education, they almost always include formal programs when oriented directly to the school's curriculum. The relatively recent development of the digital era has spawned interest in what has come to be called "virtual reality" and in delineating what this means for learning and creation of virtual learning environments. Therefore, communication gains a major role in knowledge building, turning the educational act into something more dynamic and appealing, like shows figure 2:



Source: Retrieved December 15, 2014, from «<http://edublogs.org>»

Figure 2. The Weblog

7. DIFFERENCES BETWEEN THE CONCEPTS

The interactive multimedia together with the audio in virtual environment is the essence of what has been called “Web Radio, Vodcast, Podcast and Weblog”, which has the potential advantage of “network”, enriching its programming with multimedia content and additional resources, allowing a constant transmitter-receptor interaction that cancels the linearity auditive, but there is some technical differences. Look the Table below:

Table 1. Features of Podcast, Weblog, Vodcast and Web Radio

Features	Podcast	Weblog	Vodcast	Web Radio
Interactivity in Real Time	No	No	No	Yes
Feed RSS	Yes	Yes	Yes	Yes
Streaming	Optional	No	Optional	Optional
Interactivity Resources	No	Yes	No	Yes
Asynchronous and Synchronous Interface	No	No	No	Yes
Contents in Audio, Video, Image and Text	No	Yes	No	Yes
Video/Audio On Demand	Yes	Optional	Yes	Yes
Integrated in the Learning Platforms	Yes	No	Yes	Yes
Open Source	Yes	Yes	Yes	Yes
Educational / Commercial Technology	Yes	Yes	Yes	Yes

New networks have created high and growing expectations regarding quick and transboundary communication flows. To Teixeira and Ferreira (2013), the global interaction based on the sharing of information and knowledge, and advances in communication technologies, have changed the concept of economy and society - consumers become producers, and producers become consumers of content, goods and services in a new global economic model, without restrictions or barriers, induced by a process of massive collaboration, say Tapscott and Williams in Teixeira (2012). In its turn, the “Information Society” has become a natural stage in the evolutionary and social development of people, in a world increasingly interconnected by new technologies. Manuel Castells adds to that, asserting that the web allowed interest groups and network projects to overcome time-costs problems associated to the chaotic pre-www information, as, in this basis, groups, individuals and organizations could interact significantly with what has become, literally, a wide world web of interactive and individualized communication.

8. CONCLUSIONS

Although similar, but with distinct features, Web Radio, Vodcast, Podcast and Weblog are complementary for the sake of interactivity, ubiquity and flexibility, representing to the user the facility of access to information, entertainment and knowledge. On the educational field, the cyberspace has enabled the development of virtual learning environments, focused on the utilization of interaction software and the Internet itself as a pedagogic interface potentially capable of decreasing geographical distances and increasing interaction between student and instructor pairs, above all those who act on the distance education modality.

The use of ICTs in education is related to the revolution on the communication. Old education methods are being remodeled to absorb the benefits of the Web 2.0 tools. This new resource allows interaction and information exchange, and consolidates the teaching/learning process. The use of these tools on education opens a variety of possibilities for the teachers and students. However, this study showed that many teachers still don't know the term Web 2.0, and the ones who know, don't use because of lack of knowledge about how to use them correctly. In the end of the research, became evident that, once the teachers are presented,

directed and trained to use correctly the Web 2.0 tools (as Podcast, Weblog, Vodcast and Web Radio), they will be inclined to use these new teaching methods on their educational practice. So, the main result of this study was the conception of good practices to the use of the web 2.0 tools on education. In light of this context, is necessary to improve the initial formation of the teachers with knowledge about these tools, encourage them to retrain and motivate them to use these tools on their classes. This will result on new pedagogical practices that allows a smarter teaching.

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USING BUSINESS INTELLIGENCE SYSTEMS FOR ENTERPRISE ARCHITECTURE VISUALIZATION

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ABSTRACT

In today's business the optimization of the alignment between Business and IT can be assessed as a critical success factor for enterprises. For this reason the business management of an enterprise and the Enterprise Architecture Management (EAM) of the company should be integrated in a more consistent way to minimize application proliferation and to avoid information system silos. One possibility for achieving this is to provide and to visualize all necessary management information in only one IT-tool. In the enterprise management context Business Intelligence (BI) systems are information integrators which allow visualization and analyses of high quality and integrated business data. Also EAM systems have to collect, to manage and to visualize information from one or various sources. In this paper we demonstrate how information needed by EAM can also be modelled, stored, and business friendly visualized within a BI system. Thus, we demonstrate how Enterprise Architecture Visualization can be managed by a BI system.

KEYWORDS

Enterprise Architecture Management, Visualization, Business Intelligence, IT-Alignment

1. INTRODUCTION

Enterprise Architecture Management (EAM) is a discipline receiving ongoing interest from practitioners, academia as well as from tool vendors and standardization bodies. In the last two decades many papers and books have been published about EAM and many approaches and viewpoints have been discussed (a good literature overview can be found in (Buckl and Schweda, 2011)). EAM should not be seen as an isolated management discipline and should be integrated with other management functions (Matthes, 2014).

The key objective of EAM is the optimization of the business-IT alignment. To achieve this objective, EAM creates and analyses models of the current and future state of the Enterprise Architecture (EA) and use this model for decision support in IT management in enterprises (Farwick et al., 2014; Ekstedt et al., 2004). Thereby the Enterprise Architecture serves as a common means to look at an entire organization as a whole. It captures business aspects (e.g., business processes, business objects), and IT aspects (e.g., interfaces, IT-services, networks, devices) as well as their interrelations (Buschle et al. 2012).

The Enterprise Architecture model building is based on data which have to be collected from different data sources (e.g., CMDBS, process log files, Excel spreadsheets) with varying data quality. The issue of cost-intensive gathering, maintaining, and disseminating of EA information is discussed in (Buckl et al., 2011) and can be seen as a challenge in EAM (Hauder et al., 2013)

The Enterprise Architecture models supported the "architecture life cycle" described by (Arbab et al., 2007; Lankhorst, 2009). This life cycle consists of the phases 1) design, 2) communication, 3) realization, and 4) feedback. Especially with respect to the communication of EAs, the importance to visualize architectural aspects relevant to particular stakeholders is repeatedly discussed (e.g. in (Jonkers et al., 2006), (Tribolet et al., 2014)).

In the business management context BI systems are intensively used for decision support. For this reason BI systems a) collecting business data from various data sources, b) consolidating these data and c) make these data available for analysing and visualization regarding stakeholders information requirements and visualization needs. In the last couple of years BI systems have become the most important tool for strategic and operative management and decision support in enterprises (Bansal, Awasthi, Gupta, 2013).

Thus, the essential objectives and tools/methods used in BI are very similar to the ones in EAM. For this reason we study in this paper, how relevant data of EAM can be modelled in BI systems and which visualization types of Enterprise Architecture models are offered by BI systems.

Our approach is evaluated by a prototype implementation using a case study from an insurance company. The prototype implementation is made by using the BI system IBM Cognos, which is used by this company.

Therefore this paper makes a contribution to a stronger integration of EAM with business management. Besides data collection and visualization of EAs by using a BI tool our approach provides new opportunities to combine EA with business data (e.g., cost (activity cost, project cost etc.), returns) which will be allocated by the BI data base.

Our research design is based on the System Research Development Process (Nunamaker et al, 2001)). In consequence, the paper is organized as follows. In the next section we state the research question and we investigate the different necessary visualization types of EA models. Further we study the possibilities to visualize these models in IBM Cognos. In section 3 we design the data model of EA data based on a multidimensional data model which is used by IBM Cognos.

2. ENTERPRISE ARCHITECTURE MODEL VISUALIZATION

For the purposes of EAM it is necessary to collect a vast amount of data from different data sources. These data become valuable if they will be used to build an architecture model which visualizations fit the information requirements of the EAM stakeholders. Thus, these visualizations should enable the stakeholders to choose their specific views on the Enterprise Architecture model (Niemann, 2006).

The architecture-life-cycle topic of communicating Enterprise Architecture plans in a stakeholder- and organization-specific manner has been addressed by (Hanschke, 2010). Further this was concretized in multiple exemplary and best-practice visualizations for the four EAM relevant landscapes (cf. figure 1).

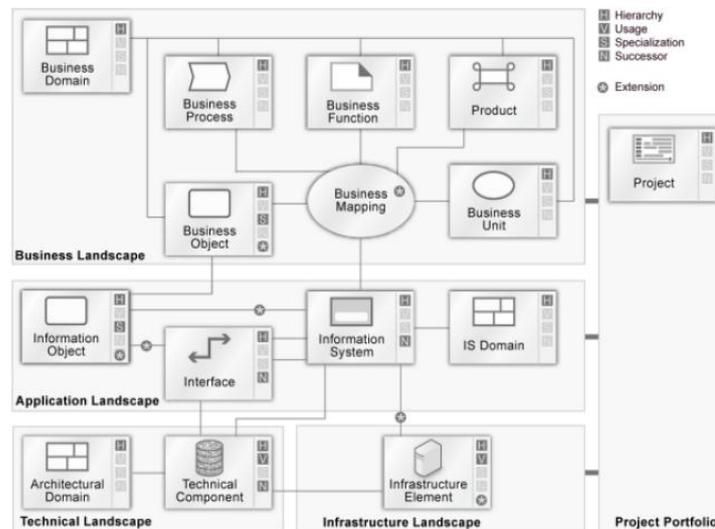


Figure 1. Enterprise Architecture model (Hanschke, 2010)

This landscape model documents the application landscape in interaction with the business, technical and infrastructure landscapes and with the current project portfolio. By assigning the business landscape elements to the elements of the application landscape model, it becomes transparent which IT system delivers support to the business.. The mutual dependencies and connections in and between the business and IT sides of the enterprise become visible. Links from the application landscape to infrastructure elements map the connections with the operating infrastructure of an enterprise. Links from the application landscape to the technical landscape documents how applications and interfaces are implemented in technical terms. With the help of this links a company will be enabled to identify technical dependencies and points where there is a need for action or potential for improvement (Hanschke, 2010).

For the different landscapes of the EA model the following visualization types are proposed (Hanschke, 2010), which are sometime overlapping regarding the visualized information:

- *Lists*: Showing specific and detailed attributes of an element of the EA;
- *Cluster graphics*: Showing the functional and technical organization of an enterprise (e.g., process- and product map, blueprint or reference model);
- *Layout plans*: Showing relationships and interdependencies between different elements of the business and IT architecture (e.g., matrix diagram);
- *Portfolio graphics*: Describing different elements of the IT and business architecture by using up to five dimensions (x- and y-axis; size, colour and shape of the symbol);
- *Information flows*: Showing relationships between IT systems, information objects, interfaces and the logical data flows;
- *Allocation tables*: Showing mappings between different elements of the EA. The type of mapping could be explicitly specified;
- *Masterplan*: Showing time-dependencies between projects, IT systems and/or products.

For being able to fit specific information and specific user needs an EAM tool should offer a wide variety of visualization possibilities. Otherwise the information provided by an EAM tool is less valuable. Thus the visualization of information can be seen as a success critical functionality within EAM.

Based on these observations for visualization requirements within EAM we formulate the following research question:

Is it possible to use a BI system to fulfil the visualization requirements of Enterprise Architecture Management in an adequate extent and thereby contributing to a stronger merging of business management and Enterprise Architecture Management by using the same systems for data visualization and data analyses?

Though BI systems like IBM Cognos offer a wide range of data visualization possibilities, it has to be carefully evaluated, if they can comply with the specific EAM requirements. The results of our evaluation are summarized in table 1.

Table 1. EAM visualization in IBM Cognos

Type of Visualization (EAM)	In IBM Cognos 10.2.1.3		
	Standard Graphic Engine	RAVE Graphic Engine	Not possible
Lists	X		
Cluster Graphics		X	
Layout Plans			X
Portfolio Graphics	X	X	
Information Flows			X
Allocation Tables	X		
Masterplan		X	

In table 1 we distinguish between the standard graphic engine in IBM Cognos and the Rapidly Adaptive Visualization Engine (RAVE). RAVE is introduced in IBM Cognos Version 10.2.1 and can be used only in active reports. Our results demonstrated that many visualization types used in EAM can be created in IBM Cognos. But layout plans can be visualized only in simple forms (though we show in chapter 4 that this is often sufficient). If many interleaving have to be visualized in a layout plan then this is not possible with IBM Cognos. Further, IBM has announced a new graphic type for information flows within RAVE, but currently this is not available.

Summarizing our results we can conclude that a great variety of visualization types are necessary within EAM to achieve a stakeholder-centric information support. Most of these visualizations types are (or will be) provided by the BI system IBM Cognos.

3. MODELLING OF EAM DATA IN A BI SYSTEM

The visualization of data within a BI system is based on some specific data structures. These data structures correlate with the objective to allow different views on business data. In this chapter we demonstrate how EAM data can be modelled within IBM Cognos by adapting EAM data to the data structures of this BI tool.

Most of the EAM relevant visualization types of IBM Cognos need a multidimensional data structure. This data structure consists in a BI context of a cube (including business key figures/measures, e.g., sales volume) and multiple dimension tables (reflecting the different views for analyzing the key figures). Each dimension (e.g., article) includes attributes (e.g., weight) as well as hierarchies (e.g., article group -> article family) and levels (indicating the position of an entity within the dimension hierarchy) (cf. figure 2).

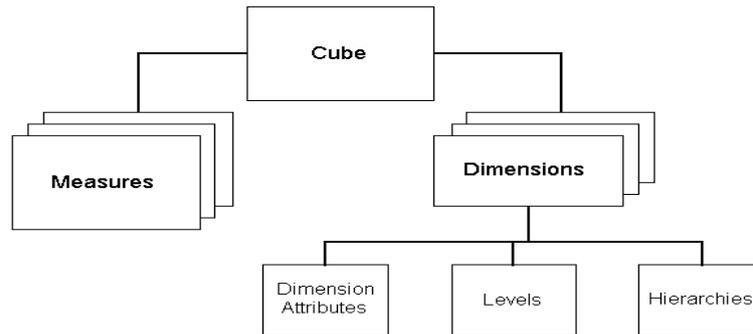


Figure 2. Multidimensional data model in BI systems
<https://web.stanford.edu/dept/itss/docs/oracle/10g/olap.101/b10333/multimodel.htm>

This multidimensional data model will usually converted into a relational data base model by using a star schema (cf. figure 3). The star schema consists of one fact table (including the measures (or facts)) and for each dimension one dimension table.

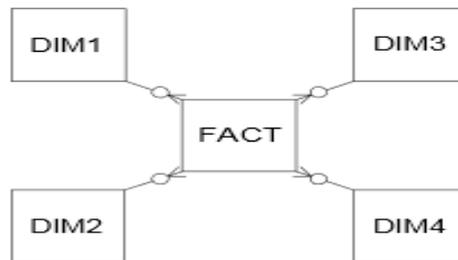


Figure 3. Star Schema (Song et al., 2007)

In the case of EAM data we do not have explicitly facts in terms of a BI system, but the EAM data represent relationships between different Enterprise Architecture aspects. For this reason we are using a factless fact table (Kimball and Ross, 2013:44) which allows describing events and states. Attributes of different EA elements are modelled as (descriptive) attributes of dimensions. Hierarchies regarding EA objects can be modelled as a hierarchy within a dimension table.

For this reason the fact table includes the primary key attributes of the different EA elements which have to be visualized, and an artificial fact attribute with a constant value.

4. THE EAM-BI-PROTOTYPE

As a proof-of-concept for Enterprise Architecture model visualization in a Business Intelligence System we implemented a prototype in IBM Cognos.

4.1 Context

The prototype was developed in the context of an insurance company which was establishing a project to implement a new BI system or which at least wanted to reengineer an already existing BI system and were supported by an external consultancy company.

One of the first steps in such a development project is to get an overview of the functionalities which should be provided by the BI systems (BIF), the information areas (IA), the business domain (BD) etc. (for details of the relevant EA objects cf. table 2). This kind of information can be visualized in the EAM context with the help of a technical layout plan.

Table 2. Definitions of EA objects

Object	Definition
Technical BI Functionality (BIF)	BIS describes an occurrence of information usage for reporting or analyses. BIF cover a wide range of different applications (e.g. Dashboards, Standard-Reporting, Data Mining applications).
Information Area (IA)	An IA covers a specific business skill in terms of a solution to a business task or business question. Thus an IA corresponds with the "Business Capability" used in EAM. An IA establishes a link between business processes, key figures, and business domains by providing the necessary information for answering the relevant technical questions.
Information Cluster (IC)	An IC is an optional part of a layout plan. An IC merges different IAs, which are connected from a business perspective.
Business Domain (BD)	A BD describes a business object from a data perspective.
Substantial Business Task (BT)	A BT is a task which is directly derived from the business strategy or the business model of an enterprise. The results of a BT contribute directly to the achievement of strategic business aims.
Stakeholder (SH)	SH of a layout plan are user or groups of users which are directly or indirectly connected to an IA in the context of working on BTs regarding this IA.
Key Figure Group (KF)	KF is a group of coherent key figures from a business perspective, which are relevant for the BTs of an IA.
Relevant Dimensions (RD)	RD is a group of dimensions (e.g. time, product, sales region), which is relevant for the BTs of an IA.
Data Source System (DS)	DSs are the IT system which provides data for a BD.

4.2 Requirements Elicitation

The EA prototype implementation is based on the results of a comprehensive requirements elicitation of this project. In the elicitation process we gathered 59 requirements in total, which were classified in 6 categories.

In the following we give a short summary about the categories, the quantity of requirements within each category and one example of a requirement per category:

- *Required data*: 15 requirements (e.g., "A business domain is characterized by the attributes Name, Description, Information Areas, Data Source Systems");
- *Data usage*: 13 requirements (e.g., "Business domains should be provided by an extendable drop down list");
- *Visualization*: 12 requirements (e.g., "A user in the role 'external consultant' should be able to generate an overview of all information clusters and the related information areas");
- *Interfaces*: 4 requirements (e.g., "The prototype has to be able to export all data into a file");
- *Quality*: 9 requirements (e.g., "The response time for generating a report has to be less than 1 minute");
- *Other constraints*: 6 requirements (e.g., "The prototype should allow reading access on mobile devices").

4.3 Logical Data Model

Based on these requirements we developed a logical data model based on a star schema for the EA visualization in IBM Cognos (cf. figure 5). Thereby we are using a factless fact table with an attribute 'Size' with constant value '1' as well as multiple parallel hierarchies within different dimension tables. The dimensions correspond with different EA objects and their interrelations which should be visualized.

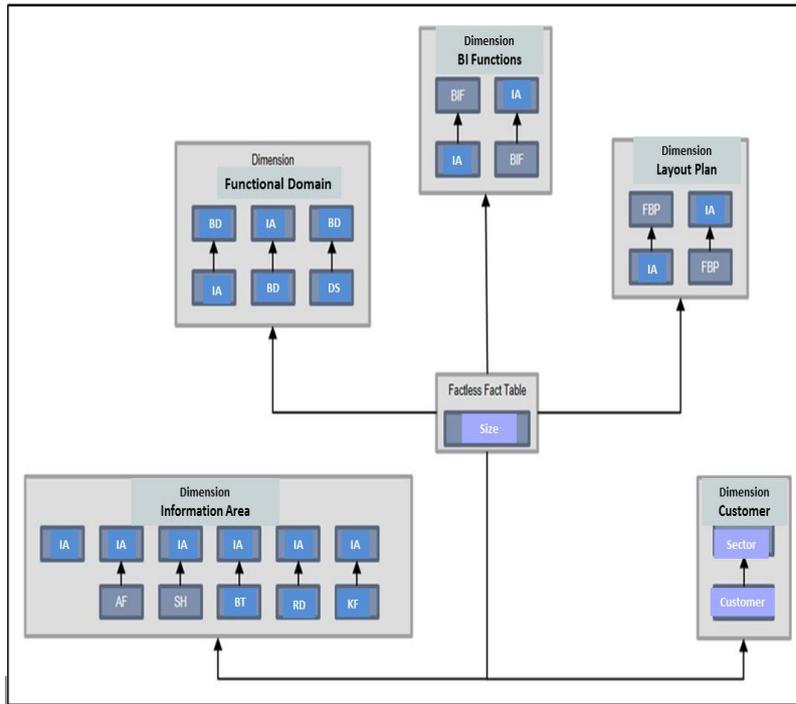


Figure 4. Multidimensional data model for the prototype

The concept of hierarchies is well-known in BI systems for enabling drill-down or roll-up data analysis. We are using hierarchies in the context of EA visualization for displaying EA information on different aggregation levels. Parallel hierarchies allow additionally the visualization of different EA objects within one context where no hierarchical relationship between the EA objects exists.

We will demonstrate the concept of parallel hierarchies with help of the dimension ‘Information Area’. In these dimension six parallel hierarchies exists (cf. figure 4). These hierarchies allow the aggregation of EA information from e.g., a group of business tasks (BT) to the correlated information area (bottom-up analyses) or the disaggregation from an information area to all relevant key figures (KF) of this information area (top-down analyses) in the EA layout plan. Further on different aspects of an ‘Information Area’ like ‘relevant dimensions’ or ‘substantial business tasks’ can be visualized. Using a dimension ‘Information Area’ with parallel hierarchies is enabling to deliver this kind of information which is currently needed by the user.

4.4 Visualization Implementation

To be able to implement the specific requirements regarding the layout plan, we have created a new RAVE visualization type with help of the Visualization Customizer. For this reason we extended RAVE graphic types by adding e.g., a new hierarchy level, which allows displaying the relationships between information clusters and information areas. The specifications of these new graphic types were imported as a library by the IBM Cognos BI Suite.

For the implementation of the different visualizations we used the Report Studio of IBM Cognos. Thereby we implemented a dash board which allows generating different EA visualizations by using the graphic types of the imported library and of the EA data structured by the underlying multidimensional data model. The prototype allows filtering of the EA data for specific information needs of users and visualizing this information in a graphic which is adequate for the user (cf. figure 5).

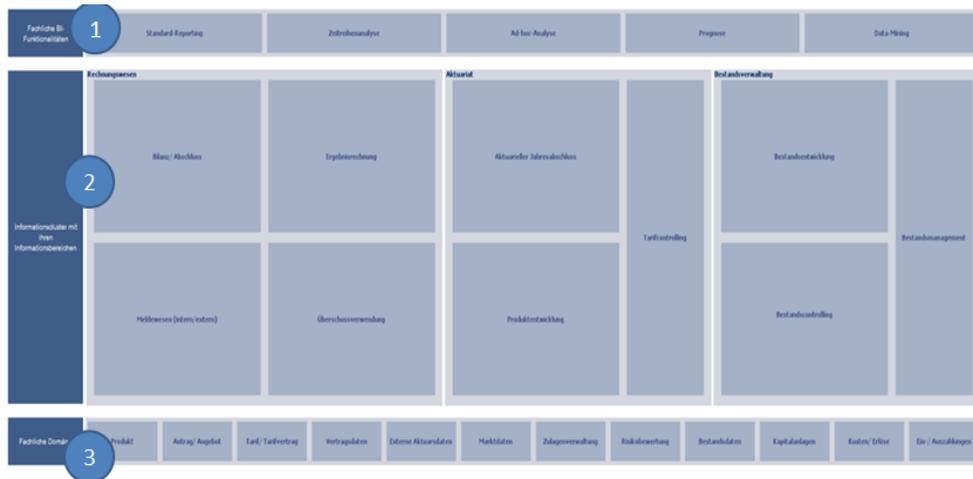


Figure 5. Example of EA layout plan generated by the BI system IBM Cognos

The layout plan in figure 5 shows in the top row (segment no. 1) the necessary BI functionality (e.g., standard reporting, time series analysis) for the different information clusters (e.g., accounting) and the corresponding information areas (e.g., profitability analysis, reporting procedure). Three information clusters and their associated ten information areas are shown in the middle segment (no. 2) of the layout plan. The bottom row (no. 3) in figure 5 shows technical domains (e.g., product, contract data). The prototypes allow users to get detailed information for the different information areas by just clicking the corresponding segment of the layout plan (cf. figure 6).

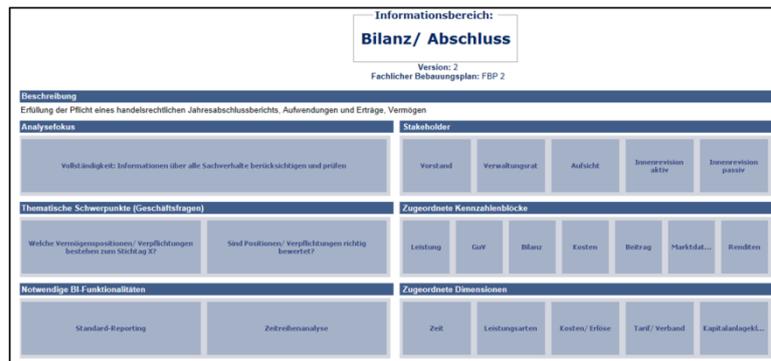


Figure 6. Detailed information report for the information area “Balancing of accounts (in German: Bilanz/Abschluss)”

In the detailed report in figure 6 you will find all information which are corresponding with an information area and which are modelled in the dimension table “Information Area” in the multidimensional data model in figure 4 (e.g., corresponding key figures, stakeholders, required BI functionality).

5. CONCLUSIONS

Enterprise Architecture Management is an important management discipline which helps an enterprise by achieving a better IT- alignment to the business objectives and strategies. Business Intelligence systems are extensively used for strategic and operative management activities. For a company to be successful Enterprise Architecture Management should be integrated with business management.

One possibility for this kind of integration of different management disciplines can be by using the same IT-based management tools.

For this reason we demonstrated in this paper how data of the Enterprise Architecture can be integrated in a Business Intelligence system and how these data can be used to visualize Enterprise Architecture information within a BI system.

We implemented a prototype based on the IBM Cognos system to demonstrate our concepts and findings by using an extensive real-life example.

This prototype and the visualization results should be evaluated in future research.

Additionally, further research should examine the impact of using one (integrated) management tool for business and EA management on the success and agility of an enterprise and a better communication and understanding between different groups of stakeholders in a company. For this reason it should be evaluated how business data and EA data could be merged (and visualized) together to create meaningful information models.

Additionally future activities have to concentrate on analyzing how the different data sources relevant for EAM can be connected to BI systems and how to transform the data into the internal multidimensional data structure. Because BI systems are able to integrate multiple data sources and to implement transformation routines these integration of EA data sources seems to be possible by standard procedures.

In addition other BI systems have to be analyzed regarding their possibilities for EAM relevant visualization types.

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INTELLECTUAL PROPERTY AWARENESS OF SULSIT STUDENTS: SURVEY RESULTS AND CURRICULA REFLECTION

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ABSTRACT

Intellectual property is directly related to the information that contains in its objects. In other words, Intellectual property is the ownership of information containing in intellectual products and their creators have full ownership of them. Developing with an unusually rapid pace, the Internet is a phenomenon not only in geographical but also in socio-legal sense. Internet is changing the familiar socio-economic paradigms and Intellectual property law is no exception to this. Problems studied in this paper are gaining currency in order to increase the role and importance of the Internet which has become an integral part of the look of the modern student society. The fact is that students are the largest group of our society which benefits research products and materials on the Internet. This paper presents a sub-study which is a result of a survey that explores the attitudes of young people, students, respectively, to the protection of Intellectual property in the digital space. The survey is part of the empirical study "Intellectual Property Protection on the Internet", conducted among the students in nine Bulgarian universities accredited in the educational and professional field "Public Communication and Information Science". The State University of Library and Informational Technologies (SULSIT) is one of these nine universities as one of the main universities in Bulgaria, accredited in the mentioned yet professional field. In SULSIT the survey covered students from six different Bachelor programs at the Faculty of Library Studies and Cultural Heritage (FLSCH) and was conducted in the period October-November 2012. The target group consists of 190 effectively completed the questionnaire students of the Faculty. The analyses of the results outline two problem areas which need more attention from the academic staff and further improvements: 1st of them is the effectiveness of intellectual property training at the FLSCH of SULSIT (based of different IP courses); 2nd of them is the attitude of SULSIT students about intellectual property protection issues (based of a complex of question, combined in a profile).

KEYWORDS

Intellectual Property, Internet, students' knowledge and awareness, State University of Library Studies and Information Technologies (SULSIT)

1. INTRODUCTION

In the modern era, called "information society" (already transformed as a knowledge society), we have witnessed the rapid development of human intellectual activity, with the result that produces unique creative results products to personal creativity and the innovativeness of the human personality. Exactly this kind of creative goods provoke the development of Intellectual Property. In the theoretical literature there are many definitions and interpretations of Intellectual Property, which are constantly evolving with the change of technology. By itself Intellectual Property, very broadly, means the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields (Trencheva, Denchev, 2013).

Scientific interest in the problems of Intellectual Property in the digital realm takes an important position in the research. Copyright and legal issues in the digital reality are of interest for researchers and practitioners, in both, the member countries of the European Union and throughout the world. There are many discussion issues related to the problematic of Intellectual Property Rights, Copyright and the Internet, but a thorough study of Intellectual Property as part of the information literacy of students is missing in some European countries including Bulgaria. Intellectual property is directly related to the information containing in its objects, and in this sense the information resources on the Internet can be assigned to the objects of

Intellectual Property. In other words, Intellectual Property is the ownership of the information contained in Intellectual Products and their creators have full ownership of them. Developing with an unusual rapid pace, Internet is a phenomenon not only in geographical but also in socio-legal sense. Internet is changing the known socio-economic paradigms and the Intellectual Property Right is no exception to this (Trencheva, Denchev, 2014).

Internet was created initially as a tool for military and research purposes in 1969, today it is a global telecommunication network linking computers around the world. Its usage is growing extremely fast. According to the latest statistics from June 30, 2015 Internet users are 3,270,490,584 people, or about 35.% of the world population¹. Some of them are so grown accustomed to the "surfing" in its vast space that could hardly imagine their daily life without Internet. This is easily explainable, considering the fact that through the opportunities offered by the network, people around the world achieve nearly simultaneous access to virtually unlimited number of products, services and information (Kostov, 2015).

The surveyed issues are gaining currency with a view to the increasing role and importance of the Internet, which has become an inseparable part of the character of the contemporary student society. The fact is that students are the largest group of our society using scientific products and materials via the Internet. Another key feature, determining actuality of the topic is the increasing importance of the trends for free use of information sources in the digital space for scientific and educational purposes (Trencheva, 2013).

Accession of Bulgaria to the European Union increased the mobility of teachers and students. For the development of this process helps the right to work in each of the Member States which imposes the uniformity of training of specialists related to their awareness on the copyright protection.

2. INTELLECTUAL PROPERTY AT THE UNIVERSITY INFORMATION ENVIRONMENT OF SULSIT: SURVEY METHODOLOGY

The contemporary knowledge society imposes new requirements on the competences and adequate knowledge of modern young professionals, graduated their higher education. This is especially true for the professional fields related to information and social sciences, as currently these sciences are one of the most dynamically developing. Analysis of completed procedures for program accreditation of professional fields "Public Communications and Information Science" in Bulgaria gives reason to claim that trained professionals in this field have the knowledge and skills necessary for a successful career. Trained in the professional field are with good theoretical and practical preparation that matches the needs of the country by university graduates in this field (Trencheva, Denchev, 2014, Peteva, 2015).

As the main spheres of realization of these specialists are: regional and national media, institutions, governmental and non-governmental organizations, and the use of information resources is the basis of their professional activity and condition for their successful realization, they need to be well informed on the issues of the protection of Intellectual Property. T. Todorova and I. Peteva emphasize that the Intellectual Property competence is an essential part of information literacy of students in this professional field in terms of Internet usage and digital content (Todorova, Peteva, 2013; Saunders, 2015).

For this reason, as a target group of the presented survey "Protection of Intellectual Property in the Internet", are preferred students from professional field "Public Communications and Information Sciences" of the Faculty of Library Studies and Cultural Heritage (FLSCH) at SULSIT.

The objective of the empirical study is to identify, analyze and summarize how the students are familiar with Intellectual Property issues from the lecture courses at the SULSIT, and what is their attitude to the problems of copyright protection on the Internet.

Within empirical research goal is achieved by solving the following research tasks:

1. To establish the effectiveness of intellectual property teaching at FLSCH/SULSIT.
2. To establish the attitude of the surveyed students towards the infringements in the use of products of intellectual property on the Internet.

¹ The data are according Internet World Stats: <http://www.internetworldstats.com/stats.htm>

The theoretical model of research and the collected and analyzed data information in the form of publications of the authors allows for the empirical part of the study to be approached with a *hypothesis* formulated in the course of the theoretical issues related to the protection of intellectual property in the Internet by respondents and the direct connection of teaching Intellectual Property in university environment with rising powers and change their attitude to the problem, namely:

Object of the training in the professional field 3.5 "Public Communications and Information Science" is a wide range of information products, services, equipment and technologies that are inherently intellectual products of which intellectual property is logical students should be in well aware. The lack of competence in the field of intellectual property of graduated students in the aforementioned professional field reduces the efficiency of their realization and this reflects on the state of their information literacy. Therefore the inclusion of training in intellectual property in the curricula of students of the aforementioned professional field in FLSCH of SULSIT is natural and necessary.

The questionnaire is made for the purposes of the particular survey. It uses a different type of scales - nominal, grades and interval (ex. 5-degrees Likert scale). The questions in the questionnaire have been prepared in accordance with sub-goals resulting from the basic purpose.

After the survey of all respondents the inquiry materials are subjected to logical view and control data then entered and subsequently processed with statistical package SPSS for Windows 19.0.

For clarifying the psychometric characteristics of the methods and test the hypotheses are applied the following methods of statistical treatment: descriptive statistic, correlation analysis (Traykov et. al. 2015).

The survey was done on the principle of systematic random selection with stratification compared to 20% of students in the professional field 3.5 "Public communications and information science" in FLSCH of SULSIT. The sample covers six specialties from FLSCH, namely:

- Library and bibliography (LB)
- Library and Information Management (LIM)
- Printed Communications (PC)
- Information funds of the cultural heritage (IFCH)
- Archival and documentary (AD)
- Information Resources Tourism (IRT)

The general aggregation consists of 190 effectively surveyed adult Bulgarian citizens (Bachelor students in the aforementioned professional field), which makes the survey representative for the university.

The data for the general aggregation are from the register of Academic Affairs Department at SULSIT, the data refer to the month of September 2012.

To achieve maximum accuracy in the study of the general aggregation in view of specificity obtained from the survey information there is a limit, which relates only to students in degree "Bachelor". Data were collected using a questionnaire in the period 1 October - 15 November 2012.

2.1 Effectiveness of Intellectual Property Training in FLSCH of SULSIT.

In the research tools for achieving the main goal of the study is included a relatively independent questionnaire containing a block of questions through which is collected information about the effectiveness of intellectual property training at the FLSCH of SULSIT (see Table 1).

Table 1. Descriptive statistics of the results of the survey

Questions	Min	Max	M	SD
Contribution of Lectures and Seminars on Intellectual Property to Promote Information Literacy (1)	-2	3	1.75	1.0
Level of Complexity on the Intellectual Property Educational Content (2)	-1	2	.37	.78
Relevance of the Themes and Issues Covered in the Curriculum for Intellectual Property (3)	-1	2	.81	.81

It is notable that the picture of the individual opinions of the students regarding the Intellectual Property and Copyright teaching is quite colorful. Averages, minimums and maximums, and the great dispersion of the responses to some questions indicate that respondents are impossible to be approached as a homogeneous mass. From the data in the table it is clear that the answers of the respondents are in the full range of available options. It is clear that with respect to all matters estimates range from -3 to +3, so the analysis needs to develop in the direction of the distribution of the answers of the respondents in each of the questions in this block of the survey (see Table 2).

Table 2. Distribution of the respondents' answers according the survey questions.

Questions	-3		-2		-1		0		+1		+2		+3	
	N ₂	%	N ₂	%	N ₂	%	N ₂	%	N ₂	%	N ₂	%	N ₂	%
Contribution of Lectures and Seminars on IP to promote information literacy (1)			2	2.0	2	2.0	5	5.1	18	18.2	55	55.6	17	17.2
Level of Complexity on IP educational content (2)					12	12.4	45	46.4	32	33.0	8	8.2		
Relevance of the themes and issues covered in the curriculum for IP (3)					5	5.1	28	28.6	127	52.0	47	19.4		

It is noteworthy the high proportion of students (91%) who think, it is indisputable contribution of lectures and seminars on Intellectual Property to enhance their information literacy. Only 4,0% see no benefit from training, and 5,1% have no clearly formed position.

The proportion of respondents who believe the educational content in complex Intellectual Property is 41,2%, with predominance this time are the students that do not have clear position on the issue of the complexity of Intellectual Property Programs – 46,4%. Only 12,4% of students in the professional field "Public Communications and Information Studies" are of the opinion that the educational content is simple.

Extremely encouraging is the fact that 66,3% of the respondents consider that the issues and problems involved in curricula Intellectual Property are current. The proportion of students with no opinion on the matter is 28,6%, and only 5,1% believe that the topic is not relevant.

Data show that in the studied professional field there is a certain potential to be channeled, developed and effectively used for the development and implementation of educational programs on Intellectual Property, which will contribute to the professional development and prosperity of graduates falling in this direction. This, on the other hand, will contribute to enhancing the information literacy of students and thus enhance their competitiveness.

2.2 Attitude of the Surveyed Students of the FLSCH of SALSIT about Intellectual Property and Copyright Issues.

A systematic approach in the current study prerequisites formulation and implementation of the second research task, namely to establish how respondents refer to the problems associated with infringements in the use of Intellectual Property products on the Internet, and to trace the current status of the individual students attitude, studying in the explored professional field of FLSCH of SALSIT about the problems relating to the protection of Intellectual Property and Copyright in the Internet (see. Table 3). This is necessary and is indicative of the points raised in the study so far in psychology proven fact is that individual behavior is planned, implemented and evaluated based on individual perceptions of people about things instead objective facts.

Table 3. Descriptive statistics of the results of the survey

Questions	Min	Max	M	SD
Perception of the appropriation of Intellectual Property Rights (IPR) as a crime	-2	2	.15	1.08
Opinion about criminal penalties provided in the law associated with forfeiture of IP and copyright infringement	-2	2	.00	.75
Attitude towards the attempts of entertainment companies to tighten the control over the IPR and Copyright	-2	2	.18	.92
Level of interest towards issues related to IPR and Copyright	-2	2	.10	.80
Attitude towards persons who systematically use pirated products	-2	2	.20	.81
Attitude towards structures involved in the distribution of foreign IP products in order with material benefits	-2	2	-.51	.91
Attitude towards structures and legal persons active defenders of the IPR and Copyright	-2	2	.34	.84

Average values, minimum and maximum, as well as greater dispersion of responses to some of the questions show that the picture of the individual opinions of students regarding intellectual property and copyright is quite colorful. The data in the table became clear that the answers of the respondents are located throughout the range of available options.

It is clear that in respect of all questions assessments range from -2 to +2. Therefore, in planning, organizing and implementing learning process in the disciplines related to the protection of Intellectual Property and Copyright towards students can not proceed as a homogeneous in terms of mass opinion. For a complete clarification of the finding above fact analysis needs to deepen in the direction of the distribution of the answers of the respondents in each of the questions asked in the survey (see. Table 4)

Table 4. Distribution of the students' answers according of the scale of the survey questions.

Questions	-2		-1		0		+1		+2	
	N ₂	%	N ₁	%	N ₀	%	N ₁	%	N ₂	%
Perception of the appropriation of Intellectual Property Rights (IPR) as a crime	15	7.9	38	20.1	54	28.6	67	35.4	15	7.9
Opinion about criminal penalties provided in the law associated with forfeiture of IP and copyright infringement	5	2.6	30	15.9	122	64.6	24	12.7	8	4.2
Attitude towards the attempts of entertainment companies to tighten the control over the IPR and Copyright	6	3.2	38	20.1	71	37.6	64	33.9	10	5.3
Level of interest towards issues related to IPR and Copyright	7	3.7	29	15.3	94	49.7	56	39.6	3	1.6
Attitude towards persons who systematically use pirated products	3	1.6	22	11.8	111	59.4	36	19.3	15	8.0
Attitude towards structures involved in the distribution of foreign IP products in order with material benefits	24	12.8	74	39.4	67	35.6	19	10.1	4	2.1
Attitude towards structures and legal persons active defenders of the IPR and Copyright	2	1.1	26	13.9	80	42.8	65	34.8	14	7.5

Data show that almost half of young people (43.3%) perceived misappropriation of Intellectual Property as a crime, but really worrying is the fact that 28.6% of respondents do not have a formed opinion on the issue, and the other not considered as a crime the appropriation of Intellectual Property. Only 4.2% of respondents are of the opinion that the penalties provided in the law associated with forfeiture and the unauthorized commercial use of another's Intellectual Property, in particular copyright violations are very

mild, 12.7 percent believe penalties for minor and again a preponderance of individuals with no formed opinion on the matter (64.6%). The rest of the respondents claim that the penalties provided in the law are severe. Hence to conclude that the courses it is necessary to pay special attention to this issue, as it undoubtedly is a major in the field of protection of Intellectual Property.

The question of the attitude of students towards the attempts of companies in the field of entertainment to tighten control over intellectual property and copyright more than 45.2% accept the requests of companies in the entertainment industry as well founded; for 8.6% they are fully justified; for 20.1% are unfounded; to 3.2% - completely unfounded. Hampered in its assessment are 37.6% of respondents. The interpretation of these data could be sought in the direction of access to the Internet in Bulgaria to products of companies in the entertainment industry. In Bulgaria, the state does not exercise restrictive interference with Internet content. Exceptions can be made when it comes to child pornography and other crimes. Consumers in Bulgaria are accustomed to receive movies, music and other products for free. It has had over the years and consumers now consider that it is right. The fact that they could be withdrawn in a matter of them discontent.

Worrying is also the fact that the question about the level of interest in intellectual property and copyright 49.7 % of respondents answered evasively, and 39.6% state their interest towards a particular research problem.

It should be paid attention to the fact that all respondents, of course in varying degrees, but entirely positive, refer to problems relating to the protection of intellectual property and copyright. This understanding would be very strong reasons for including the disciplines, concerning the legal protection of intellectual property in the digital space in the curricula of students in the studied professional field.

There is a positive attitude to almost 27.3 percent of the respondents towards those who systematically use pirated products. Again, the percentage of students formed without a clear position on prevail (59.4%).

Encouraging is the fact that more than half of the surveyed students studying in the professional field 3.5 "Public Communications and Information Science," clearly state its negative attitude to the structures involved in the distribution of foreign intellectual property for the purpose of material gain.

Also interesting are answer to the question, which concerns the views of the students in terms of structures, in particular legal entities that are active defenders of intellectual property. More than 42.3% declare their positive stance, again 42.8% can not judge the importance of this type of structures.

The following chart displayed discussed above posts and profile shows the attitude of students towards problems related to intellectual property protection (see. Fig. 1).

The positive trend that has emerged in the analysis of this graph is that the majority of the views of respondents are in positive part of the continuum. Surveyed students timidly, but positively stated that they recognized as a crime misappropriation of intellectual property and copyright and have a positive attitude as towards the penalties associated with commercial use and towards tighten controls on intellectual property and copyright, they are interested in issues related to intellectual property and copyright, but show a positive attitude towards people using pirated products.

Students show a negative attitude towards structures distributing intellectual property for the purpose of material gain, and positive attitude towards the structures actively protecting intellectual property and copyright.

From the analysis of the profile it can be concluded that, thanks to training on Intellectual Property FLSCH of SALSIT has built a positive attitude of respondents to issues relating to intellectual property, which proves the hypothesis that the inclusion of the discipline-oriented issues protection of Intellectual Property in the curricula of students from the aforementioned direction is natural and necessary.

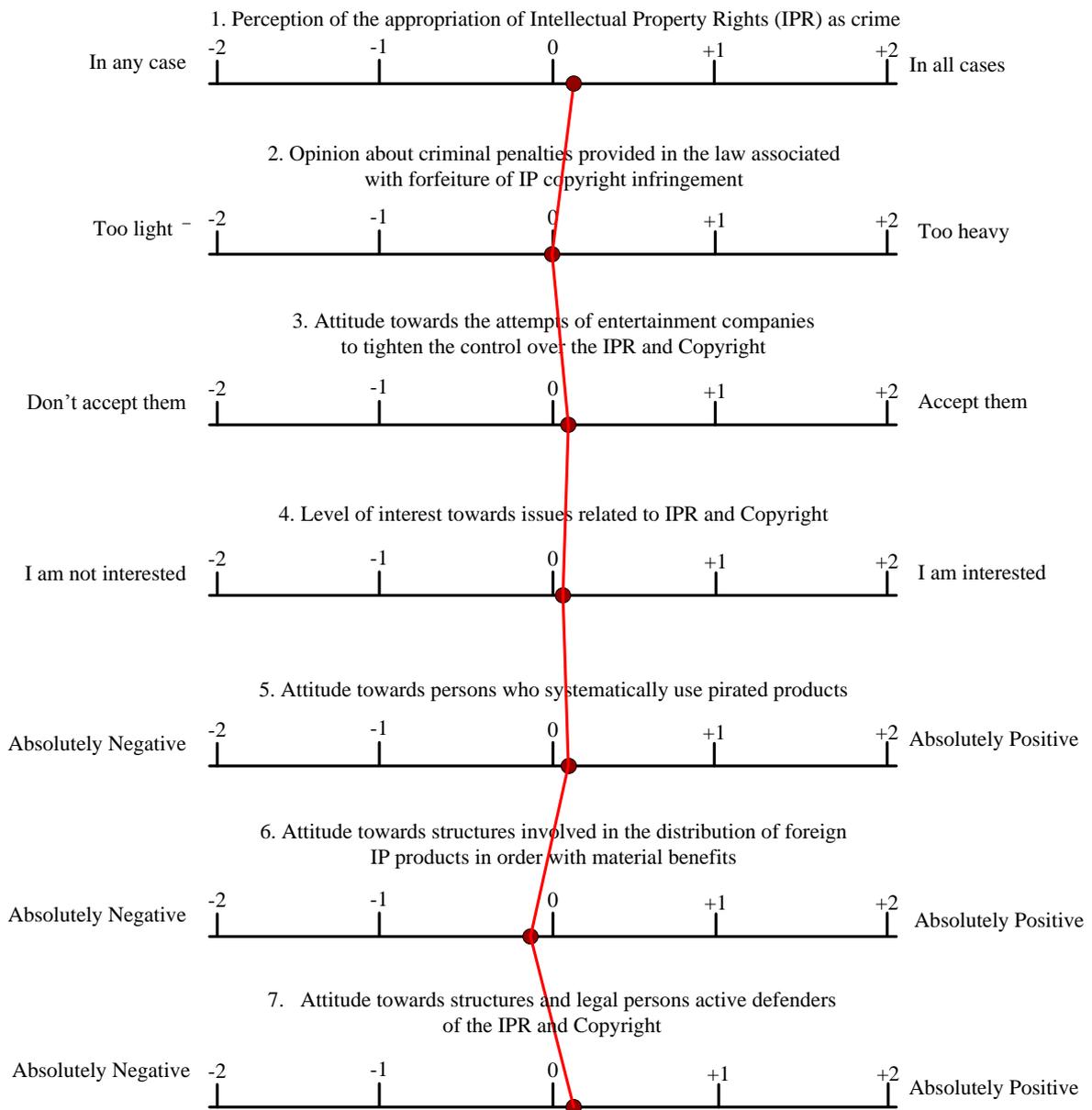


Figure 1. Profile of attitude of the respondents about the survey questions.

3. CONCLUSION

The analysis in this study empirically allowed to look behind the strict logic of theories and to follow what happens in the actual use of the products of Intellectual Property of students in FLSCH at SULSIT. This created an opportunity to analyze the actual level of knowledge and awareness and attitudes of students in the professional field 3.5 "Public communications and information science" to the problems associated with protecting of Intellectual Property on the Internet.

From the analysis in the current study can draw the following conclusions:

1. The sample of empirical research is selected correctly and although unbalanced in some of the indicators enable you to create a proper database to be interpreted in the context of the objective in this study.
2. Developed, approbated and applied in the survey questionnaire covered key issues about the level of knowledge and awareness of students and their attitude on issues related to the Intellectual Property protection on the Internet.
3. The profile of the level of knowledge and awareness of the respondents regarding the effectiveness of training on Intellectual Property showed that studied professional field has a potential that needs to be channeled, developed and effectively used for the development and implementation of curricula for Intellectual Property, which will contribute to the professional development and prosperity of graduates falling in this direction.
4. The profile of the opinions of the groups of persons on various issues related to their treatment of Intellectual Property, is entirely in the positive end of the continuum, which shows that thanks to the teaching of Intellectual Property at SULTSIT as university accredited in the professional field "Public Communications and Information Science " has built a positive attitude of students to issues relating to Intellectual Property, which proves the hypothesis that the inclusion of the discipline-oriented issues of Intellectual Property protection in the curricula of students from the aforementioned direction is natural and necessary .

ACKNOWLEDGEMENT

The paper and the survey is part of the scientific project of SULTSIT "Analysis of the Common Practices in the Use of Products of Intellectual Property in University Information Environment" (2012-2016), financed by National Science Fund of the Bulgarian Ministry of Education and Science, Contract № DMU 03/3-19.06.2012 in competition for "Young Scientists", led by Assoc. Prof. Tereza Trencheva PhD.

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RESPONSE TO THE CHALLENGING REFUGEE INFLUX: A POTENTIALLY INFINITE FAMILY OF SERIOUS GAMES FOR LEARNING OF FOREIGN LANGUAGES PLAYFULLY

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ABSTRACT

The contemporary influx of refugees is a challenge to Europe. Methods and technologies of the e-Society are needed to master a wide spectrum of problems ranging from refugee registration when entering the European Union through issues of transportation and housing to all aspects of daily life at the final destination. Human communication plays a crucial role. Language learning is an urgent problem for hundreds of thousands of refugees. Fast progress in small steps is required. Meme media technology is appropriate for the design of small and flexible software tools. A generic digital games concept has already been designed. The core implementation is available on the web and runs on mobile devices such as tablets and smartphones, on conventional desktop PCs and on special purpose devices such as interactive learning tables. The core implementation allows for a very flexible and fast exchange or modification of contents to fit varying needs. Based on this core implementation, a games suite of variants for different educational scenarios is under development.

KEYWORDS

Meme Media, Webble Technology, Game-Based Learning, Language Learning, Direct Execution, Exploratory Learning.

1. MOTIVATION & INTRODUCTION

The current influx of refugees into the majority of European countries is challenging the society as a whole. There are particularly high expectations of science and technology of what we nowadays call the e-society. Language learning is of a particular importance. Due to the enormous number of humans in need of learning, digital offers are necessary which work both in classroom settings and for individual self-accessed learning. They must be available on literally every terminal device, should be lightweight and very easy to administer.

To make the offer attractive, especially in unsupervised learning situations, and to motivate human users to stay longer, to come back and to use the offer again, the authors decided to focus on a digital learning game. Game play should be short to enable learning everywhere. Naturally, all essentials are language-independent.

But how to make game-based learning (GBL) a reality? The didactic concept underlying the authors' game design and development is exploration or, more precisely, exploratory learning. Learners are offered text fragments of the target language. To play the game successfully, players need to read texts and to find out which pairs of text fragments are semantically related. Due to combinatorial reasons (see section 2 below), there is no hope for blind trial and error. Players use text fragments exploratory, read them, combine them, get immediate feedback, and resolve combinations in case they are not satisfactory.

The main focus of this contribution is on the concept of a potentially infinite family of digital games for learning not restricted to language learning. The games family is introduced in section 2. An understanding of essentials of game play leads to expectations of the system behavior and, thus, to technological requirements. The technology of choice is surveyed in section 3. The following section 4 deals with extensions of the basic approach based on varying educational scenarios and pedagogical principles. An outlook completes the paper.

2. DINNER TALK – AN INFINITE FAMILY OF DIGITAL GAMES

DINNER TALK (DT) is really an infinite family of digital games. It has many parameters. Every instantiation of parameters leads to a particular game of the DT family.

2.1 The Core Design and Implementation of the Dinner Talk Games Family

Every game of the DT family is a combinatorial game. Within the family of combinatorial games, the board games form a fairly prominent category. Board games are characterized by a board which consists of cells and by pieces which may be placed on cells, moved on the board, and so on. A board game is a path game, in particular, if most of its cells have exactly two different neighboring cells. Apparently, this is a fuzzy concept due to the imprecision of the term “most”. A path game is a perfect path game, if all cells have exactly two neighbors. The simplest variant of games in the DT family is a perfect path game.

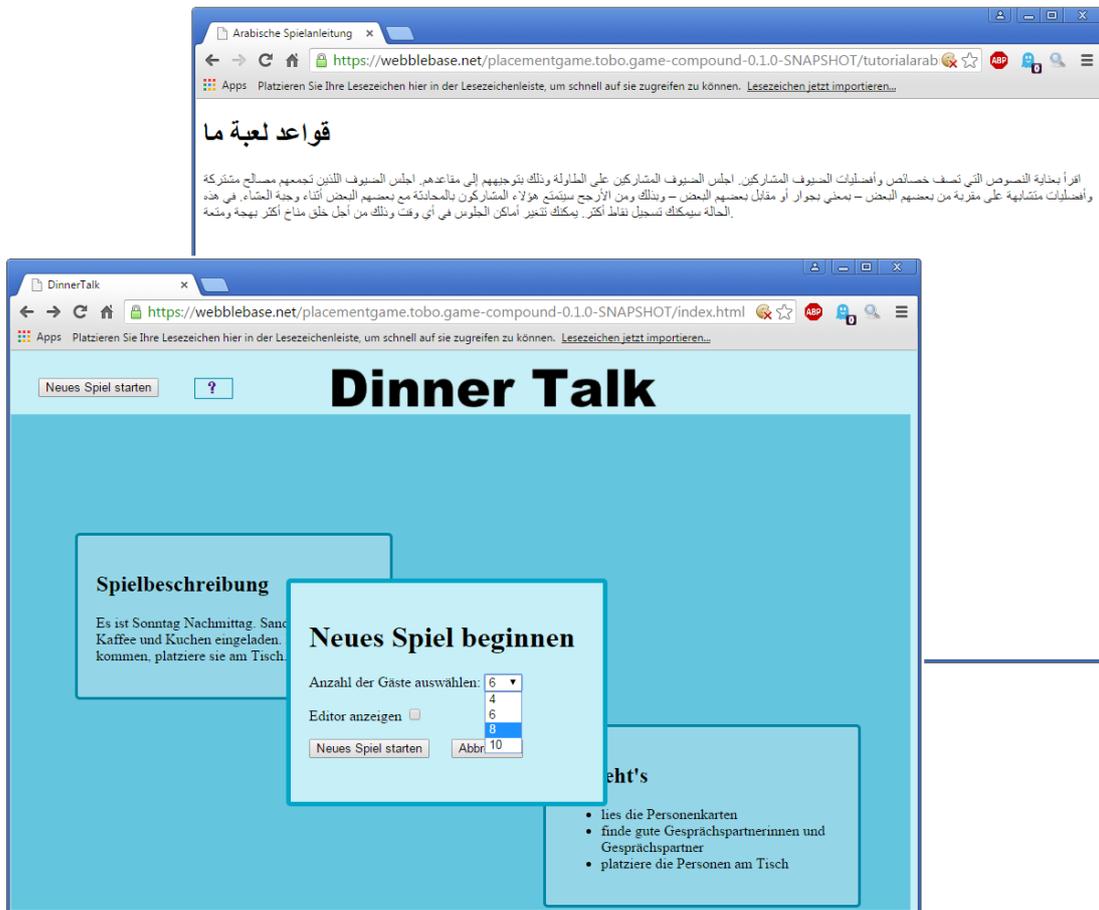


Figure 1. Starting DINNER TALK: Players may read information how to play and select how many guests to be seated

The game idea of DT is to consider the board (more precisely: the path) as chairs around a certain table. The pieces are understood as guests to be seated. The size of the table, i.e. the number of guests to be seated, may be chosen initially (see figure 1). Seating a guest is performed by placing a piece on a cell. In contrast to many other board games like CHESS, CHECKERS, NINE MENS’ MORRIS, e.g., pieces must not be moved on the board along the path. DINNER TALK belongs to the particular category of placement games like, e.g., REVERSI. In contrast to the latter one, DINNER TALK is a (family of) dynamic placement game(s), because players have the permission to take pieces back, i.e. to undo an action.

Pieces carry texts or text fragments which are interpreted as their interests. Intuitively, players should seat guests in such a way that neighbors at the table share some interest. If this happens, they score points. The goal of every game of the DT family is to seat guests in such a way that the human player scores many points. It is practically impossible to find good seating solutions just by trial and error without checking the texts. By way of illustration, if there are 8 seats around the table, there exist 10,080 different variants of placements. For 10 chairs, the number of possible placements sums up to 907,200 (for the reasons, see the end of section 2).

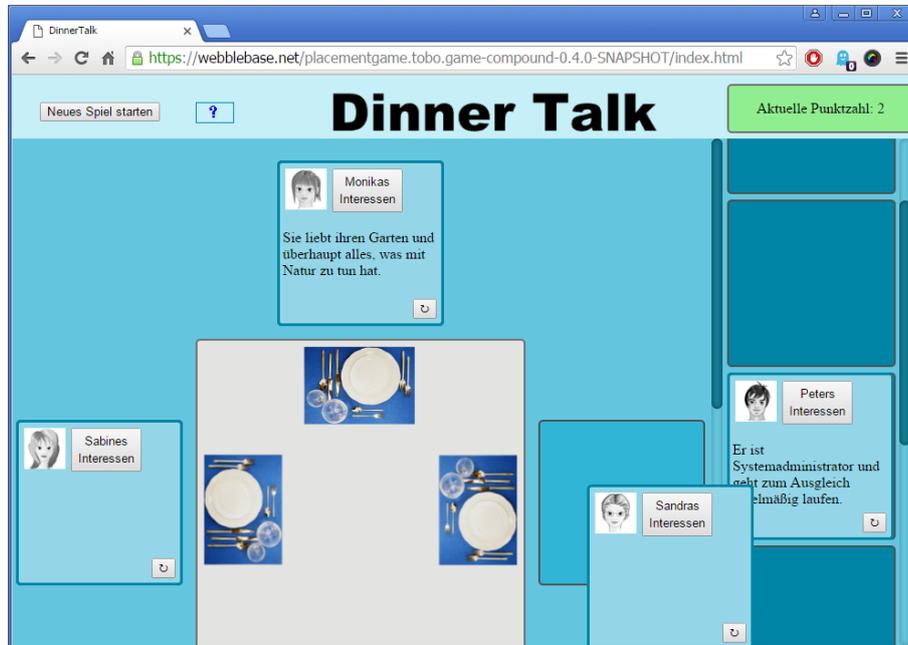


Figure 2. Playing the Core Version of DINNER TALK by moving guests from the repository on the right to their chairs

Players can inspect the relevant texts by clicking to the “Interessen” button of a piece (figure 2 on the right). After reading the texts characterizing different virtual guests, i.e. pieces, players may think about who share interests and, therefore, should be seated next to each other. The necessary skills (for skill development, see section 4 below) are reading and understanding text. This works with any written language.

When a game is set up, it contains a certain number of pieces and, thus, the corresponding number of texts. Expressed in formal terms, there exists some similarity measure over texts which assigns to any two texts some numerical value of similarity¹. When pieces are moved by drag & drop to cells—see figure 2 where a piece is dragged from the repository on the right to the next empty cell—the similarity values for all pairs of neighboring pieces are calculated. This results in a current score shown in the upper right part of the screen.

These effects of interaction are made possible by the deployed technology (see section 3), especially by the technology’s feature of auto-connection, peeling off, and direct execution (see Fujima and Jantke, 2012, and Jantke, 2013).

The similarity measure in use in the core implementation is a finite binary function of texts returning one of the values 0 or 1. This function returns positive values on only finitely many pairs of texts. Therefore, it may be represented by a finite table.

Due to the huge number of potential seating solutions, learners cannot easily guess whether or not the current score is optimal. When they have their doubts about the quality of a current solution, they can easily explore the space of solutions. One can open texts of pieces already placed on the board and look for semantic similarities of different texts. If those are found, it is worth thinking about some re-seating. Just drag a piece from its cell back to the repository and change the current seating. When doing so, watch your current score.

¹ Similarity measures establish an interesting research field the study of which exceeds this contribution. Future research may include the mutual interplay of pedagogical approaches and similarity concepts in use.

2.2 First Steps Towards the Infinite DT Family of Dynamic Placement Games

Obviously, the most simple, but practically very important way of modifying any game of the DT family is to change its textual contents. The very first core implementation comes already with its build-in editor (figure 3).

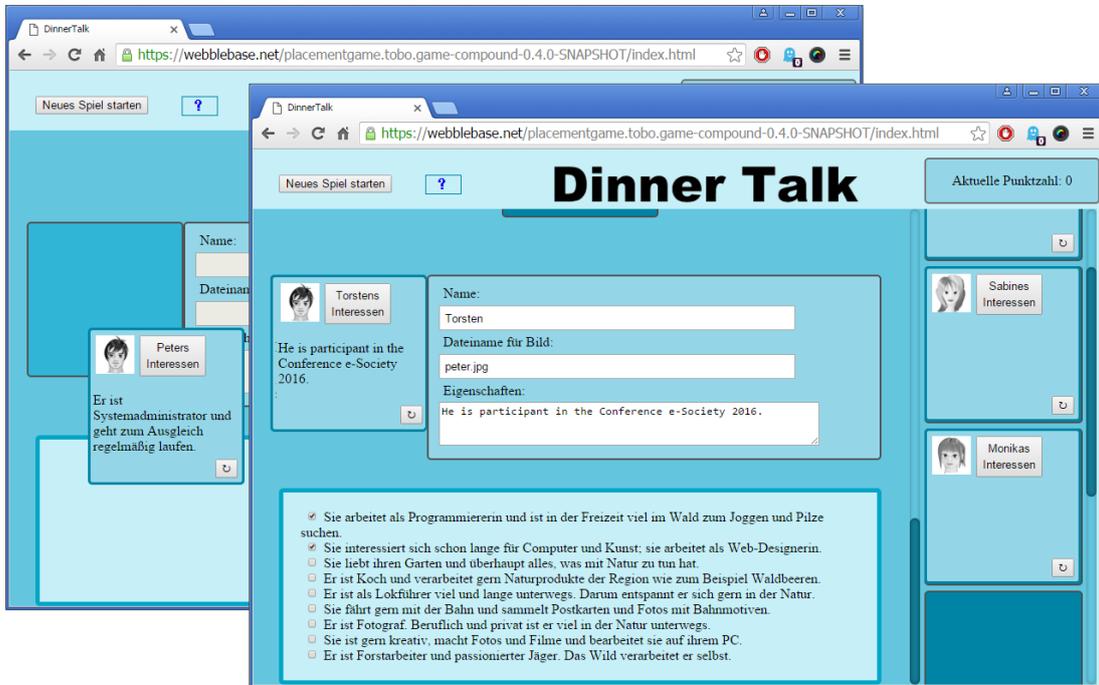


Figure 3. The built-in editor of the DT digital games family – the name, the picture, and the property text may be edited

When starting the game, there is a check box “Editor anzeigen” (figure 1) which turns the editor on and off. When the editor is activated, one can simply drag a piece from the repository on the right and drop it over the editor’s seat (see figure 3, screenshot in the background). The name of the piece, the picture used on the piece, and the text describing the virtual character’s characteristics may be changed as illustrated in figure 3, screenshot on top. When the piece is peeled off the editor and put back in the repository, it is immediately ready for use in the game again.

This allows for an interesting spectrum of pedagogical patterns and learning scenarios (see section 4 below). But it may also cause some problems to the similarity measure in use, an issue which is beyond the limits of this first presentation of the design and implementation.

There are two more elementary extensions made to the true core implementation. They are of a different character and reach as will become clear in a moment.

First, there is a very specific modification which can be seen in every previous screenshot and which might be better turned off again: a little button in the lower right corner of every piece. When the button is pressed, the piece turns 90 degrees clockwise. In this way, one can seat the virtual characters more properly at the virtual table, a feature which is surely of minor importance. The feature has been added in response to an experiment with a so-called interactive learning table. Several people can stay around the table which accepts up to 10 clicks simultaneously. This opens new potentials of dynamic placement games like DINNER TALK.

Second, there is a modification invisible from outside. The authors decided to give up the perfect path. At real tables, you talk also to individuals sitting right opposite you. Thus, the topology of the board has been changed. All cells—except the seats at the front side of tables with more than 5 seats—have three neighboring cells, one to the left, one to the right, and the one opposite. Similarity scores are calculated accordingly.

On this basis, the number of potentially different placements at a table with n seats is the factorial of n divided by 4, because the table has two symmetry axes. The total number of different placements for 8 and 10 seats adds up to 10.080 and 907,200, resp. Therefore, thoughtful exploration is preferable over trial and error.

3. MEME MEDIA TECHNOLOGY FOR EXPLORATORY GAMES

Meme media technology for purposes of the e-society has been recently discussed in (Jantke & Fujima, 2015). Therefore, the authors can confine themselves to a few essentials. First, the basics of meme media technology, in general, and webble technology, in particular, will be briefly surveyed. Second, two features will be sketched which are key to the present design, development and application project DINNER TALK.

Interestingly, the present technology has, so to speak, a philosophical background. Dawkins introduced the term *meme* to denote units of non-biological evolution (Dawkins, 1976) that may be identified in areas as diverse as animal behavior, architecture, technology, and religion (Blackmore, 1999). Tanaka developed the idea to represent memes digitally as *meme media* to allow for computer-supported knowledge evolution (Tanaka, 2003 & 2013). Early implementations were named IntelligentPad (Tanaka and Imataki, 1989), see also (Ito & Tanaka, 2003), (Fujima et al., 2004). Around 2009, the term *webble* has been coined (Kuwahara and Tanaka, 2010) and was used immediately for purposes such as meme media based learning (Jantke & Fujima, 2010). The advantageous technology allows for a paradigmatic shift from direct manipulation (Shneiderman, 1982) to direct execution (see Fujima and Jantke, 2012, and Jantke, 2013).

This paper is based on the present technology which relies on the strategy outlined in (Fujima, 2013) and (Kuwahara and Tanaka, 2014). The new generation of meme media runs in HTML5, JavaScript, and CSS. “Webble” was coined by Kuwahara to abbreviate “Web PEBBLE” where “PEBBLE” is an abbreviation for the already cumbersome expression “Pad Enhanced Building Block Lifelike Entity” in which “Pad” is a reference to Tanaka’s “IntelligentPad” concept (see, e.g., (Tanaka, 2003)).

Webbles are objects—that is what Kuwahara calls a pad—which have a Model-View-Controller (MVC) structure and may be manipulated on a webble desktop. The webbles’ key touch and feel is decisive for usage. Every webble contains data in places that are called slots. Readers may think of the contents of pieces in the games of the DT family as illustrated before. There are slots for names, for URLs of pictures, and for text. Humans may click a webble on the screen and move it to whatever place desired. When one webble is dragged over another one a slot connection is established. Readers may have a look at figure 3 where a piece webble with three slots is dragged and dropped over the seat webble of the editor. The slots² of the piece are connected to the slots of the seat which, in turn, are connected to the text slots on the editor interface.

All this is possible, because the core game implementation consists of webbles plugged into each other. One webble plugged into another one may be peeled off and may be moved to another place to be plugged in.

When webbles are to be plugged together, there are usually different ways of doing so (Fujima et al., 2010). One may determine the slot connections by hand, an approach preferable in a development environment, e.g.

For game play and, in particular, for exploratory game play, it is desirable that webbles plug in automatically, in case they fit. This feature is called *auto-connect*. It makes frequent changes easy and prevents the player from completely unnecessary technicalities at the interface.

The second feature crucial to exploratory interaction, in general, and to exploratory game-based learning, in particular, is *direct execution*. Several composite webbles have a certain functionality. They are computer programs. Their slots are some of the program’s variables. Some may be seen as input variables and others may be seen as output variables. In case it has been set up accordingly, a slot may be input and output at once. Consider for illustration the three visible slots of the editor in figure 3. When a piece is plugged into the seat webble which, in turn, is connected to the editor interface, the data from the piece webble flow through the seat webble into the interface webble. The interface’s slots serve as output slots. As soon as a user writes into the text slot of the interface webble, the data flow back to the piece webble as illustrated by the screenshot.

The contemporary webble technology, as said above, runs in HTML5, JavaScript and CSS (Fujima, 2013). This makes serious games of the Dinner Talk family potentially available in every browser³ on every digital device such as conventional desktop PCs, tablet PCs, smartphones, and special devices such as the interactive learning table.

To sum up, the selection of webble technology for implementation of the DINNER TALK games family is motivated by the suitability to exploration and by the potential to reach the intended audience everywhere.

² In the traditional meme media technology implementations, meme media objects are connected by only one slot. The authors’ contemporary implementation allows for multiple slot connections, another technological issue beyond the limits of the present contribution.

³ As usual, browser development has difficulties of keeping up with the latest advancement of the technology.

4. ADVANCED EDUCATIONAL SCENARIOS AND GAME VARIANTS

When learning about the idea of the DINNER TALK games family, about design and implementation details, many readers will more or less immediately come up with more needs and desires going beyond the limits of the core variant. This section deals with some of those possible extensions. As can be seen in figure 4 below, there are already some further implementations.

The subsequent separation into subsections, naturally, is not disjoint. There are issues which fit under both headlines at once. The different headlines are chosen to express a different emphasis of discussion.

4.1 Extensions Driven by Special Educational Purposes

Many educators would like to see a larger variety of texts in a single game. This is particularly desirable when players tend to select smaller tables, perhaps, due to the size of the screen on which they play the game. However, in the core variant of the games family just one text is relevant (see figure 4).

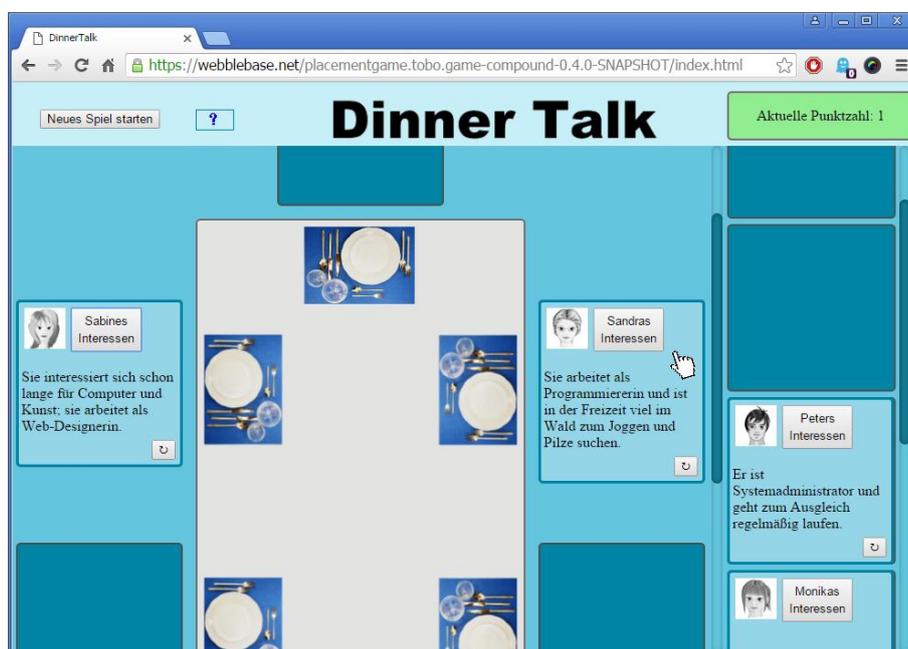


Figure 4. The “Interessen” text slots describe communication preferences for neighbors and for those sitting opposite

A variant has been implemented in which every virtual character is described by three different texts: (i) the own interests, as before, (ii) preferences concerning neighbors on the left and on the right, and (iii) preferences concerning virtual characters sitting directly opposite. This allows for a larger number of text comparisons, even if the virtual table is small.

Figure 4 above illustrates interests of the two virtual characters Sabine on the left and Sandra on the right. Both text slots are opened for inspection. On the Sandra webble, the player just clicked the button for showing Sandra’s preferences. The slot content is saying *that she is a programmer, spends spare time in the woods jogging and searching for mushrooms*. The text about Sabine on the left says that *she has been interested in computers and art for quite some time; she works as a web designer*. According to the common interest in computers, the player scores 1 point for the placement (see upper right corner).

Among the most important requests of educators is the one for feedback. Feedback is carefully separated into gratification feedback and control feedback (Jantke & Gaudl, 2012). To show just points scored so far as on display in figure 4 means gratification feedback. This may be extended towards control feedback, e.g., by informing the player about the maximum score that may be achieved.

4.2 Extensions by Involved Technological Functionalities

Naturally, the amount of ideas, wishes and desires expressed by educators is literally unlimited. They do not care about technological limitations. They are only interested in the needs of learners. This is acceptable.

The second part of section 4 is arranged along educational scenarios. These scenarios describe in more or less detail intended human-computer interactions or, to say it in the digital games science terminology, anticipated game playing behavior.

In classrooms, one can implement a variety of interesting scenarios relying on the communication of learners. Due to the power of human-human communication, these scenarios are frequently light-weight from a technological point of view.

As a first scenario, let us consider the following one. The teacher is asking the class to play DINNER TALK within a certain limited time. After completion, all students should compare their outcomes and find out where the differences come from. The apparent advantage is that learners think in depth about the reasons for scoring points or not. Even more importantly, they have to express and explain their opinion.

In unsupervised learning scenarios, there is no immediate and apparent way of how to get learners engaged in communication about their results. Consequently, educators ask for in-game features to substitute for the missing communication.

A comparably easy approach is to provide continuous feedback to the learners that ingeniously integrates gratification feedback and control feedback. There are varying forms of feedback such as

- current scores compared to scores reached so far (local maxima) during the learning session (see figure 4),
- current scores compared to the optimal solution (which requires a priori calculation),
- some visualization of where the current points scored come from.

The latter item is interesting because of the overwhelmingly large amount of possible implementations. The current implementations illustrated above reflect the user's success of scoring points simply by showing the current high score. As already discussed, the current score may be compared to local maxima achieved before or to the global maximum with respect to the present texts and their overall similarity.

But how to point directly to the origin of the point(s) recently scored? One may show speech bubbles between virtual guests who share some virtual interest due to real text similarities. But what about those speech bubbles over the table? And in case we have more expressive similarity measures that may return different values, not just 0 or 1, do we show speech bubbles of different size? Or do we show speech bubbles with score points inside?

Other scenarios assume that virtual characters are determined by more than interest. Educators like to see virtual in-game characters having age, gender, and possibly familial relationships. This requires specific slots. Whereas slots for age and gender are easily implemented, familial relationships may require some ontology. Do we expect ad hoc ontologies on the server providing the learning service? Or do we aim at the federation of relevant services over the web?

Finally, one of the most ambitious scenarios is as follows. Ask one student or a small group of students to set up an instance of the DT family for their fellow students⁴. After set up, all students of the class play the game. After completion of game play, results are presented and compared. Those who have set up the game need to explain to their fellow students where the scores come from. This requires the explanation of texts and of semantic relations between texts. Teachers may supervise the discussion and intervene, if necessary.

Seen from the technological point of view, this scenario requires (i) the ability to save edited pieces of the game locally, at least, and (ii) to make them available to a certain group of registered learners. There is a need either (iii) to specify the semantic similarities of texts put in or (iv) to compute similarity values of texts put in by hand automatically, perhaps, within a certain context or corpus of words.

Furthermore, one may imagine a way to publish successful game contents. Even further, one may enrich these games by reports about successful deployment in education. This may establish communities of players of the DT family world-wide.

At the very end, one should mention that technological extensions will allow for different experiences of game play. Spoken text output, i.e. reading the texts to the players, will definitely change the game playing experience. All those ideas are appealing, attractive, ... but computationally expensive.

⁴ It is always a highlight of education, if students think about and formulate learning tasks to their co-learners. The buzzword "flipped classroom" is just a simple-minded reflection of this centuries-old insight.

5. SUMMARY & OUTLOOK

The authors' core variant of the games of the DINNER TALK family is available online within the framework of the project which provided the scientific, engineering, and fiscal basis of design and implementation. Currently, the DT core variant serves as a serious game to support learning German as a foreign language.

Subsequent work will concentrate on advanced educational scenarios and related extensions of the core variant towards more attractive, comfortable and mutually different variants of the game. In dependence on practical applications, the extensions will be evaluated and compared to each other.

Part of the second and the fourth author's work has been supported by the German Federal Ministry for Education and Research within the Project Webble TAG, sub-project Webble TaT, contract no. 03WKP41D.



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MANAGING THE EXPERTISE IN A SOCIAL E-LEARNING ENVIRONMENT

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ABSTRACT

In the blended learning paradigm, an aware use of the technologies as well as the introduction of social aspects, allows learners to be more active during their own study and to be more involved in the practices of collaboration and knowledge sharing. In this scenario, the identification of an expert among the learners assumes a key role. An expert has a better overview of the topic and is able to discriminate between relevant and irrelevant information. In addition, an expert plays an active role during the practices of study with the other peers. Quantifying the value of expertise on specific topics is considered a complex task especially with the advent of the “social learning management system” (hereafter “Social LMS”), where the standard methods based on the analysis of textual information are not sufficient to manage the socialization aspect. Our intention is to go beyond these methods by exploiting the social features in order to constrain expertise. In this paper, different roles such as the formal one (e.g., grades), the social one (e.g., social evaluation of peers) and the editorial one (e.g., the skills acquired in the workflow for the creation of informal material) are combined in order to obtain a clear characterization of the concept of expertise within a Social LMS. From this innovative treatment with roles, there is an augmented vision of the spectrum related to the kind of learners according to their actions on the flows of information within a social e-learning platform. For instance, the standard view of expertise ranges from novice (or newbie) to expert while in this case one has to take into account the anti-expert (i.e., troll) whose action degrades the flows of knowledge.

KEYWORDS

Social LMS, Flipped Learning, Expert Role, Social Role, Editorial Role, Informal Material

1. INTRODUCTION

Learning organizations (e.g., schools and academies) should go beyond the teacher-centered approach where content is only provided by the teachers for classroom or online use. An enriched learning process with social features should allow users to have: (1) an active role in the practice of learning material, (2) an immediate access to relevant content, and (3) an access to experts who can impart their wisdom. The actual trend (Dalsgaard C., 2006) is to define a Social LMS in order to build a complete “learning environment” that considers social elements (e.g., collaborating, networking and information sharing capabilities) to support practices of learning. This vision extends the training beyond formal boundaries and provides a social virtual environment for users (i.e., teachers and learners). This allows to work together and share knowledge at any time. In addition, a Social LMS provides interactive elements that enable users to rate learning content and share their experiences. This novel e-learning paradigm is called *Flipped Learning* (FL) (Filiz, O. & Kurt, A., 2015). The FL extends the concept of the flipped classroom method where lectures are watched at home, and then the homework is completed in the classroom. The FL adoption brings some cultural changes related (but not limited) to: (1) blending social learning into formal learning - add *social* class exercises, (2) rethinking learning design - define new appealing procedures to present information for obtaining maximum exposure and comprehension, (3) stimulating the creation of learning communities - learners can document and share their expertise, (4) collaborative learning - learners can improve their own skills on the course/topic by interacting with peers and experts anywhere and anytime, and (5) adoption of new workspaces - learners and teachers can join virtual units on courses, projects, etc.

The FL model shifts the paradigm of instruction from a teacher-centered to a student-centered approach. In this new vision, a student plays an active role in the phases of the learning process; FL enables the so called “active learning” defined as “the process of having students engage in some activity that forces them to reflect upon ideas and how they are using those ideas” (Michael J., 2006). In this respect, the learners have an augmented possibility to build mental models of what has been studied, to deliberately test their validity, and to fix faulty ones.

In this new training vision, the role of expert assumes a key importance in order to identify peers who can support/help students towards the phases of training within a Social LMS (Herling, R. W., 2000). In the context of individual performance, expertise is defined as “the optimal level at which a person is able and/or expected to perform within a specialized realm of human activity” (Swanson R.A., 1994). This descriptive definition of human expertise implies the ability to possess superior skills or knowledge in a particular area of study. Unfortunately, no unique quantitative indicator has ever been provided for this superior skills (Björklund, T. A. & Eloranta, M., 2005).

In this paper, we identify *expert learners* by considering the different roles that they can have in a Social LMS by adopting the FL model. Within a given context, roles are useful resources which help to accomplish goals and they are tools which establish a social structure (Gleave E. et al., 2009). In our definition of expert, we extend the standard view based on the formal role (i.e., grades) including: a social roles, and editorial roles. This study goes beyond the classic identification of an expert; in fact, the level of expertness is enriched from a topic-centered process to a social activity and it is analyzed with the aggregation of several dimensions (e.g., accessibility, reliability, etc.).

2. A NOVEL VISION OF EXPERTISE IN A SOCIAL LMS

During the last decades, studies on the definition of expertise increased widely in several areas of research ranging from Psychology to Computer Science. Despite this, there exists a core of properties associated with the meaning of expertise that is common to the several definitions. Our reference meaning of expertise is provided by (Swanson R.A., 1994) where an expert has recognized skills and knowledge allowing to excel in a particular area of study. In a Social LMS, the concept of expertise has to be extended with new features related to: (1) the ability of a person (hereafter learner) to create a network of collaborators, and to (2) how the flow of information is propagated in the network by analyzing its quality (e.g., an indicator of quality is the pertinence of the informal material with respect to some specific topics by adopting text analysis methods). In this paper, we enrich the definition in (Swanson R.A., 1994) by giving a particular emphasis on the social activity that an expert has to possess, i.e.:

In this paper, human expertise in a Social LMS is defined as the ability to possess superior skills and knowledge in a particular area of study and to be active and collaborative in order to increase the quality and quantity of the knowledge flow of the network.

In the following, the common individual properties associated with the concept of expertise will be taken into account; in addition, it will be addressed what changes when considering the expert within a Social LMS. In detail:

- Set of common individual properties:
 - 1- the quality, quantity and type of knowledge a learner has plus ability to find, collect and organize it. This also implies the creation of new information, and the ability to classify and connect pieces of information according to a priority level system.
 - 2- creative problem solving abilities. This is an indicator of the approach and resolution speed when dealing with new problems.
 - 3- having a general view of the problem, thus being able to quickly grasp what is important in a certain field.

These three points are clearly inter-correlated and essentially define a minimum set which is required for a learner to be considered an expert. It is important to notice that the role of an expert should also be defined according to the impact on the community he/she belongs to. A learner with high individual value which does not share his/her knowledge is of little interest and brings no more added value than a non-expert. The aim of this paper is to focus on the expertise in a Social LMS in a school (or academic) context, with a strong

emphasis on the collaborative element; for this reason, a second set of properties is added here which includes the interaction between the expert and the social network:

- Set of social properties:
 - 4- reliability (do the people of the network trust their peer?)
 - 5- accessibility (is it easy to reach the person? Does the he/she respond promptly when addressed?)
 - 6- collaboration (is team work facilitated by the person? This is a delicate problem also at academic level)
 - 7- ability to transfer knowledge (is the information flow from the expert to the other learners easy?)

Once the total set of expertise properties is defined, the next step consists in describing a series of indicators which reflect them. To this aim, a key factor is assumed by the quality of the material created and published by the learners within a Social LMS. According to this aspect, we define a workflow to validate and certify the informal material created by learners during their academic path (see Section 2.3).

For a consistent result, it is necessary to use both the individual and the social strategies when assessing the expertise level of a learner and that of the material produced. An added value of the network associated with the Social LMS is that it can be used as a self-evaluating system since the action of all the participants to the network allows to control its quality without having to resort to external formal experts. Starting from a core of teachers and peers interacting within the social network, it is possible to classify different roles and strategies for the evaluation of the expertise. In detail, we identify three main groups of roles:

- Formal Role: it considers the grades of a learner;
- Social Roles: they analyze the learner's behavior within the Social LMS with a particular look to the assessment of textual information (e.g., comments and posts within chats and/or forums), being active in the production of new material, and the availability to collaborate with each other. In respect of these considerations, the Social Roles contain two parts: (1) the social judgement, and (2) the social contribution, respectively;
- Editorial Roles: they regard the actions of the learners in the creation of new informal academic material during the process of publication. In the workflow, in fact, a learner can act as: (1) editorial peer, to create new informal material, and (2) editorial leader, who supervises the tasks of the editorial peers.

These roles are explained in detail in the next paragraphs where it is described how it is possible to use them in order to constrain the expertise level. For each of the roles, in Table 1 there is a description of which of the seven expertise properties (previously described) is particularly addressed. Let us notice that the skills of a learner cannot be completely disentangled, however some of them are more prominently observed within certain situations than others.

Table 1. Roles within the Social LMS and expertise properties mainly addressed

	Quantity, quality and organization of the knowledge (1)	Problem solving (creativity) (2)	General view of the subject (3)	Reliability (4)	Accessibility (5)	Collaboration (6)	Knowledge transfer (7)
Formal	✓	✓	✓				
Social judgement			✓		✓		
Social contribution				✓	✓		✓
Editorial peer	✓	✓				✓	✓
Editorial leader			✓		✓	✓	✓

2.1 Formal Role

One of the main duties of a learner within a Social LMS in a school context is to obtain good grades. These grades are assessed by the teachers with oral and written tests. From this point of view, one can define the expertise of a learner as a reflection of the quality of these formal exams. This kind of evaluation can be naturally divided by subject and it evolves during the career of the student. Since there are many concepts which cross the borders of a formal subject it is also possible to blend more than one course in a macro-area of expertise comprising more than one subject (e.g. math and physics or literature and composition).

From Table 1, the individual properties (1, 2 and 3) are particularly suited to be evaluated with indicators related to the formal role since these exams are usually centered on the single learner. For a given

macro-area, the natural indicator which can be used for the expertise is the formal average grade $fg = \bar{g}$ (where g are the grades in a particular subject). The value of fg can be renormalized into the range $[0,1]$.

2.2 Social Roles

The definition of expertise should not omit to consider the social behaviors and activities that a learner possesses when interacts within a Social LMS. As it has been stated at the beginning of this section, the standard definition of expertise should be enriched with a social perspective. In respect of this new vision, we want to keep the evaluations of expertness consistent by creating a synergy between the individual and social competence for both of the materials and the learners within an e-learning environment. Indeed, the social network contains properties more prominently related to global aspects of the learning paradigm than the formal role (which is more centered on the individuals).

In our vision, the social activities are regulated by two pillars that are: (1) social judgment, and (2) social contribution:

- The first pillar (*social judgment*) regards a peer evaluation system, which means that the students can provide assessments about the quality of the material created by the others. In particular, we restrict only to those materials (called *academic informal materials*) obtained as outcome of the workflow (see Section 2.3.1). An academic informal material has a formal and precise grade, “ v ” (see Section 2.3.1), obtained after the evaluations of several actors (i.e., peers, leader, and teacher) during the process of publication. When an academic informal material is published, it can be judged by learners to certify its grade of quality and difficulty. The act of judging can be used to obtain a feedback on the learner who performed it: if the quality of the material v (which is not known by the learner) is strongly correlated with the student’s judgments, then the student can be considered an expert of the subject; otherwise, a mismatch indicates low expertise by the student. The quantification of the social judgement role, “ sj ”, is defined as: $sj = corr(g_i, v_i)$, where g_i is the quality grade assigned by the learner and v_i is the formal grade of the material, and “ i ” is an index running on all the evaluations of the student. The value of sj naturally lies in the $[-1,1]$ range.

From Table 1, the *social judgement*, returns good indications on the 3rd and 5th properties since the learner needs to have an overview on the topics and needs to be active on the network.

- The second pillar (*social contribution role*) refers to the fact that a learner can create material outside of the workflow and make it available for the social network (e.g., textual information within a chat room and/or forum); in this case, the expertise of the learner is associated with how the others grade the material. The rationale behind this choice is to extract the informal quality level of the learner according to the peers. For example, a generally inaccurate social contribution can lower the reliability of a learner even in areas where he/she is really knowledgeable. As an indicator we refer to the *social contribution*, *sc*, as defined in (Avogadro P., et al., 2015). The social contribution value is a linear combination of the appropriateness and quality indicators associated with the informal material. For each indicator, a learner can judge the informal material by linguistic labels that underlie specific numerical points. This means that a learner who posts a great number of texts within a Social LMS can be considered, for the production role, an expert on a specific subject if his/her pieces of information are judged positively by peers.

From Table 1, the social contribution role indicates: how reliable (4th property) and accessible the expert (5th property) is (by including the amount of material offered to the others), and how well the production is perceived by the peers, thus allowing for knowledge transfer (7th property). The social contribution can be negative since the learner can distribute material which is misleading or very inappropriate, for this reason it is reasonable to renormalize it in a $[-1,1]$ range (where a value of -1 refers to the worst possible contributor and 1 to the best).

2.3 Editorial Roles

The concept of expertise within a group of learners in a Social LMS is deeply correlated with the exchange of knowledge among the network. In the FL paradigm this concept is particularly relevant because of the importance of the learning units where learners are divided in groups to solve a specific task assigned by a

teacher. These units, among other properties, are active centers of material creation. In particular, we will focus on the production of the informal academic material. This means that the material is generated by the learners (informal) but it is strictly related with a course (academic). Since it is aimed at an academic environment its quality has to be validated. The control structure should include phases devoted to: 1) the creation of the group, 2) the material creation, 3) an audit phase leading to a 4) publication decision and 5) a social verification (see Figure 1). The next paragraph presents the details of the workflow process related to the certification and publication of the academic informal material with a distinction concerning the roles that a learner can have during the workflow that are *leader* and *peer*. During an academic year, a learner can assume interchangeably these roles in order to validate his/her abilities in coping different responsibility when learning units on specific subjects are created. With respect to the workflow presented in (Valtolina S., et al., 2014), our solution considers a social evaluation of the informal material according to how the material itself is perceived and used by learners during their study, and tries to assign a major awareness of responsibility to the learners during the creation of the informal academic material.



Figure 1. Phases devoted to the process of creation and validation of the informal academic material

2.3.1 Publication Workflow

The workflow here presented is aimed at providing high quality standards involving the participation of individual and social aspects. It also tries to reduce the workload of a teacher by adding structured responsibilities to the learners. At the beginning, a teacher defines a group of learners and a topic. In particular, a group is established by considering different elements ranging from the academic skills to age, gender, cultural backgrounds, etc. (Campo Cobo E.A., et al., 2014). Heterogeneous groups consider issues from a broader perspectives than homogenous groups, and so have a wider spectrum of ideas.

Specific roles are assigned to each learner with the objective to empower the participants. In detail, a teacher can assign two roles: (1) the peer role that is dedicated to the creation of the informal academic material, and (2) the leader role that is assigned to a learner who supervises the work of peers. As previously written, the publication workflow (see Figure 2) is made up of 5 steps as shown in Figure 1:

- Phase 1 – Creation of Groups. A teacher selects the subject (“Choice of the Topic”), the group of learners (“Selection of the Students”), and assigns to each learner a role (“Assignment of Roles”).
- Phase 2 – Creation of Informal Material. The peers produce the informal academic material gathering the information from several sources (such as Web, books, notes, comments, etc.) according to the topic indicated by the teacher.
- Phase 3 – Audit. At this step, all the materials produced – by peers are in state to be approved by the leader (“Request for Approval”).
- Phase 4 – Decision of Publication. The leader’s tasks are to receive the material, control it, evaluate it, and decide whether it requires some modifications before passing to the teacher. If the leader presents some requests (“Writing a Comment”), the peers have to take them into account and act accordingly. If the material is approved by the leader it passes to the teacher. The two steps mechanism (peer and leader) acts as a filter which eases the teacher’s workload but it also grants responsibilities to the peers. Since, at different times, all the learners should cover both the leader and peer editorial roles, this allows them to develop different skills and points of view. The analysis of the material is regulated by a “traffic light” evaluation. A “green state” indicates a positive judgment of the material created, which can proceed to the next step of the workflow. A “yellow state” establishes that further modifications are needed, the material goes back one step either to the peers in case of a first evaluation or to the leader in case of an advanced evaluation. In either case the guidelines for improving the quality of the material are written within comments (“Writing a Comment”). A “red state” indicates that the material is inappropriate, with the consequence that the peers have to create completely new material. In case of a green light from the teacher, the material is (provisionally) published (“Publication”) and becomes available for the social community.

- Phase 5 - Social verification. At this point, there is a time window for social evaluation (“Informal Material accessible in the Social LMS”); the feedback from the community can be either positive or negative (“Social Evaluation by learners”). Every learner has the possibility to provide a grade in the form of traffic lights about the content. If the community provides a positive grading of the material, the workflow is terminated: it has passed three evaluation levels: leader, teacher, and social. If the social evaluation is not positive the material goes back to the teacher who has the possibility to decide if this remark is correct or not. In case of a “yellow state”, the material goes back to the leader (“Writing a Comment”), and then to the peers; otherwise, in case of a “green state” he/she can decide to finish positively the workflow without any other passage. Although not explicitly shown in Figure 2, a teacher has the possibility to remove (“red state”) the material at any time (for example due to obsolescence).

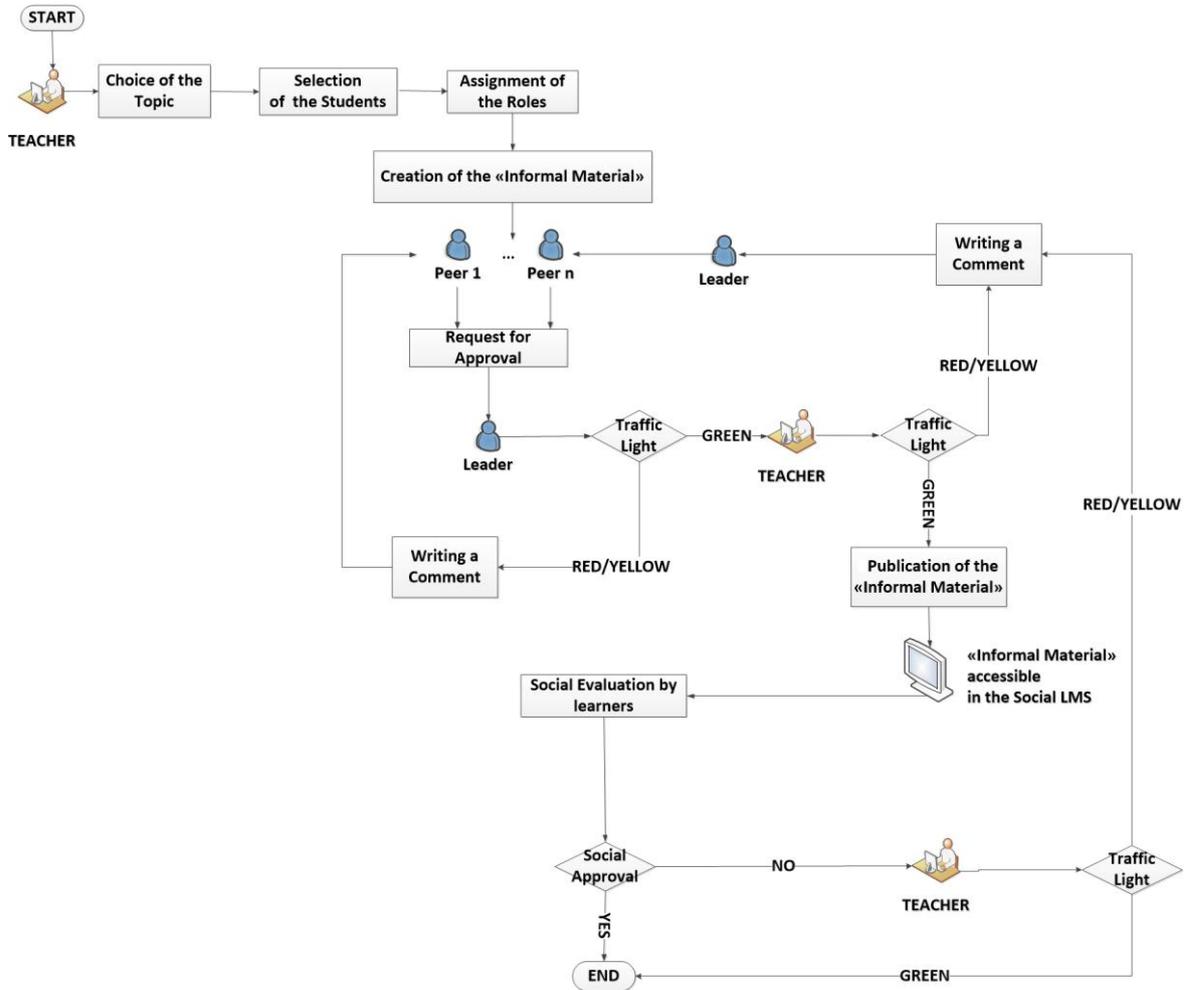


Figure 2. Academic informal material production workflow

A grade can be assigned to the material which reflects the phases of the evaluation process. Each time a leader gives a green light to the material he/she has to also provide a grade “*l*” (1-10), the same happens for the teacher “*t*” (1-10) and for the average social grade “*s*” (1-10) of the peers. The final evaluation, $v = \lambda_t t + \lambda_l l + \lambda_s s$, ($\lambda_t + \lambda_l + \lambda_s = 1$; $\lambda_t, \lambda_l, \lambda_s \geq 0$), is a weighted combination of the three grades. For example, since the teacher is formally an expert, his/her grades weigh 50% of the total while the leader and the social evaluation amount for 25% each.

2.3.2 Quantification of the Editorial Roles

The students can have two editorial roles, one is related with the peer production where a group of learners creates informal academic material (*peer role*), the other is a supervising role (*leader role*) related to a filtering and feedback phase before the teacher's evaluation. These roles are present in the workflow proposed in Section 2.3.1, and can be associated with the same student at different times.

One way to evaluate the expertise of a student during the editorial production phase is to consider the number of steps needed for the final publication of the material. There are many possible rejection phases in the workflow (from the leaders, the teachers and the social evaluation), and as such the path followed by the material can be (and often times is) rather cumbersome. At the end of the workflow, one can expect that the quality level of the material published has passed a minimum quality threshold since it has undergone many evaluation/revision steps. The very reason of the publication workflow is in fact to obtain high standards of informal material, and as such there is a natural flattening of the quality (towards the top). However, there is an important difference if the same material was published directly, receiving only green lights or it had to pass through many revision steps before its publication. The former case is an example of peers who have reached a maturity and quality level higher than the latter. In this respect, the idea proposed is to consider the length of the path in the workflow as an indicator of the expertise of the peers involved.

In order to obtain an indicator which drops with the length of the path, we set the length at the denominator; thus, the editorial production “ p ” for the peer role is defined as: $p = 1/(1 + \mu_t t + \mu_l l + \mu_s s)$, where t is the number of modifications requested by the teacher, l by the leader, s by the social community (which can occur at most only once), and μ_t are the weights associated with the modification by the teacher, μ_l by the leader and μ_s by the social evaluation. As a reasonable example one might consider that $\mu_l, \mu_s = 0.1$ and $\mu_t = 0.2$ in order to assign a greater importance to the evaluation of a teacher than the learners. Let us assume that a material has been requested two modifications by the leader and one by the teacher obtaining a publication score of $p = 1/(1 + 0.2 \cdot 1 + 0.1 \cdot 2 + 0 \cdot 0.1) = 0.7$. During the academic year, for each learner, it is meaningful to consider the average value of “ p ” on all the documents, i.e. “ ep ”. This quantity lies naturally in the $[0,1]$ range.

The *leader* is the second role in the workflow available for the learners. The responsibility of a leader is to review the material produced by peers, evaluate it and eventually request modifications before the teacher evaluation. One expects that a leader is also an expert when the material he/she approved receives a confirmation by the teacher and by the social network. A measure of this skill is the correlation of the green lights. The expertise of the editorial leader “ el ” is defined as $el = corr(gl, gt)$, where gl is the union of the green lights provided by the leader and gt is the one by the teacher on all the materials where a learner has been associated with the editorial role during the academic year. Since it is a correlation also this quantity ranges in the $[-1,1]$ since a leader which gives wrong guidelines can be dangerous for the workflow.

3. DEFINITION OF THE EXPERTISE VALUE

Each of the five roles emphasizes the degree of expertise based on different features. For each role, an indicator quantifies the degree of experience and it can be used independently from other indicators. However, it is desirable to have a single final value associated with the degree of expertise. We propose to consider a linear combination of the indicators where the weights assigned to each indicator can be used to characterize which kind of expertise is more important. The expertise value, “ Xp ”, is thus defined as:

$Xp = \lambda_{fg} \cdot fg + \lambda_{sc} \cdot sc + \lambda_{sj} \cdot sj + \lambda_{ep} \cdot ep + \lambda_{el} \cdot el$, ($\lambda_{fg} + \lambda_{sc} + \lambda_{sj} + \lambda_{ep} + \lambda_{el} = 1$). Where the coefficients are all equal or greater than zero. The indicators related to the formal role and the editorial peer role are limited in a positive range of values, and those values can be renormalized within the range $[0,1]$. The indicators associated with the social judgement, social contribution roles and the editorial leader role are expected to return also negative values. This fact reflects a fundamental reason. A learner within a social network can provide wrong or misleading content, this gives rise to a flow of “bad information” which diminishes the quality of the knowledge of the network. For example, in the case of social judgment, labelling truly good materials as bad brings confusion to those who believe in the judgment, i.e. diminishes the total expertise of

the network. The actions of some learners can have the opposite result in respect to the one of an expert (who has a synergic effect among his/her own peers). It is meaningful to define this behavior as *anti-expert*. In the common language of the social networks a similar role is referred to as a “troll” (Kunegis J., et al., 2009); however, it presupposes a malicious intent by a learner. In our case, we do not quantify whether the anti-expert has a deliberate idea of sabotaging the network and the more neutral term of anti-expert appears more appropriate.

4. CONCLUSION

This paper presents a detailed account of students’ expertise in the context of a Social LMS in academic environment. This requires to review the accepted concept of expertise in the literature and supplement it with further dimensions derived by the specifics of a Social LMS. As a result, we obtain a set of seven core properties accounting also for the social interaction. The scholastic environment that we are considering is within the flipped learning (FL) paradigm which is focused on the students who are active players in the production and sharing of knowledge. For this reason, three kinds of roles are defined within a Social LMS: the formal, the social and the editorial roles. Thanks to this structure, it is possible to define indicators for the quantification of the learners’ expertise. These indicators are based on the interaction mediated by the Social LMS with the other players of the scholastic environment. In particular, we present a workflow which controls the production and publication of informal academic material. The indicators obtained with the different roles clearly show the need of considering both positive and negative contributions to the degree of expertise. The strong emphasis on the dynamics within the Social LMS, in facts, shows that the spectrum should range from an optimal evaluation (expert), to a novice evaluation of the learner (where the knowledge on specific areas is very limited), but it should also include a value considered as an anti-expert (“troll”). This last kind of learner affects negatively the knowledge transfer and degrades the quality of the information and knowledge within a Social LMS. An obvious advantage of the definition and evaluation procedure here described is to be able to control the evolution and quality of the learners within a Social LMS.

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A MODEL OF BLENDED MOOC STUDENT ENGAGEMENT

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ABSTRACT

Massive Open Online Courses (MOOCs) are those that are delivered, usually by leading universities, with a promise to provide free high-quality education to an unlimited number of learners. They offer a new opportunity for blended course design, where instructors can integrate MOOC content within campus course components and activities. This kind of blended learning will help 'face-to-face' instructors use the time for meaningful discussions, identifying and clarifying misconceptions or mentoring students in a group project. This study aims to propose a new measurement that can be used to measure student engagement in the blended-MOOC course design. The well-established National Survey of Student Engagement (NSSE) and Student Engagement Questionnaire (SEQ) were selected as a framework of a model to measure student engagement in a blended-MOOC context. The model has 11 indicators that provide information about distinct aspects of student engagement. The use of this model was confirmed by a panel of 20 expert practitioners. A trial evaluation using the model was conducted as a pilot study of 13 students who had taken a course in the blended MOOC format. The contribution of the study will be to improve the general understanding of the impact of the MOOC systems in higher education and identify benefits specific to learners.

KEYWORDS

MOOC, blended MOOC, Student Engagement, higher education

1. INTRODUCTION

Massive Open Online Courses (MOOCs) are online courses taught usually by elite universities with the promise of providing free, high-quality education to an unlimited number of learners (Johnson, Becker, & Cummins, 2013; UK, 2013; Zhang, 2013). One of the main value propositions that MOOCs can provide is 'education access'; MOOCs allow a massive scale of learners to access courses often delivered by leading faculties and well-qualified instructors (Educause, 2012). This study aims to propose a new model that can be used to measure student engagement in a new context which is so-called blended-MOOC.

The blended-MOOC term has been used to describe the integration of online courses into campus courses in the form of blended learning to make the most of classroom time for hands-on activities and group discussion (Chen, 2013). MOOCs have also made use of social networking tools that stimulate interactions between learners. A body of literature has suggested that blended approaches to learning may offer an optimal environment for augmenting student engagement and success (Picciano, Dziuban, & Graham, 2013).

The term 'student engagement' is defined as 'the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes' (Hu & Kuh, 2002). Student engagement 'can be considered to be among the better predictors of learning and personal development' (Carini et al., 2006). Since 'student engagement comes close to providing necessary and sufficient information about student learning' (Coates, 2005), a body of literature has utilized and identified a number of student engagement measures in different learning settings. Nevertheless, there has been a lack of corresponding research on how to measure student engagement in blended-MOOC course design. A blended-MOOC course design has unique characteristics, so the study aims at filling this gap in the literature. So the study aims to develop a model that can be used to measure student engagement in the context of blended-MOOCs. The findings will provide a series of insights to MOOC designers, educators, and curriculum developers in how to prompt and support the student engagement in this context.

1.1 Massive Open Online Courses

MOOCs, or ‘Massive Open Online Courses’ is a term coined in 2008 by Dave Cormier and Bryan Alexander when they tried to describe an online course (CCK08) taught by George Siemens and Stephen Downes that succeeded a number of earlier successful Open Online Courses (OOCs) (Fini et al., 2009). This course was freely available to everyone worldwide and, at the same time, aimed at a group of 24 fee-paying students. At the end of the course, there were around 2,200 registered participants with various levels of participation and involvement (Downes, 2009; Fini, 2009).

‘Massive’ refers to the number of participants. MOOCs can easily accept hundreds to thousands of learners, simultaneously engaged in the course. ‘Open’ refers to ‘the fact that anyone is free to register... [and that] [t]here are no prerequisites, other than Internet access, and no fees are required’ (Bond, 2013). It may also refer to many concepts: open source; open registration; open curricula; open syllabi; open assessment; and the open learning environment (Rodriguez, 2012). ‘Online’ refers to the use of the Internet and the World Wide Web to deliver course components. ‘Course’ refers to a series of lectures, readings or other course materials with schedules and facilitators, all structured and organized around a particular topic (Billington & Fronmueller, 2013; Bond, 2013).

The most common classification of MOOCs is:

The first, Connectivist MOOCs (cMOOCs), defined by Mcauley, Stewart, Siemens, & Cormier (2010) as ‘an online phenomenon that integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources’. They are based on connected and collaborative learning where learners use a public open platform to explore new pedagogies out of the classroom (Yuan & Powell, 2013). The learners in cMOOCs play a fuller role in shaping their learning experiences than in normal online courses (Milligan, Littlejohn, & Margaryan, 2013).

The second, extension MOOCs (xMOOCs), are online courses conducted in a traditional lecture format (lecture, instruction, quizzes, discussion etc.) and delivered through proprietary Learning Management Systems (LMSs) to a massive number of learners. xMOOCs are associated generally with the four largest platform providers: edX; Udacity; Coursera; and FutureLearn. Those providers have contracted a number of prestigious educational institutions and/or individual academics to provide course content (Haggard, 2013; UK, 2013).

Sandeen (2013) coined the third type of MOOC as ‘hMOOCs’, or hybrid MOOCs, which suggests the use and the integration of MOOCs into traditional academic courses.

1.1.1 Blended (Hybrid) MOOCs

A recent development of MOOCs has been the integration of MOOCs into campus courses in the form of blended learning (Chen, 2013; Houston, 2013; Kolowich, 2013). Blended learning combines several different delivery modalities to harness the strengths of each and promote learning. Blended learning programs can take different forms and models, for example flipped classroom, which reverses the typical cycle of course content acquisitions so students gain their first exposure to the instructional content, often online, outside the classroom and use class time for group projects, discussion and problem-solving. Recently, a number of scholars used the flipped classroom model with some changes: outside class time students participate in a MOOC offered by lecturers at another institution—usually from well-known and prestigious universities—then meet in class with local instructors for meaningful discussion, identifying and clarifying a misconception or mentoring students in a group project. Not only does this form of teaching give students more campus and peer support, but it helps in solving some of the authenticity, certification and assessment issues facing MOOCs as well as enhancing the completion rate of MOOC takers. So blended MOOCs have some face-to-face sessions, but part of the course content and activities are offered via a MOOC platform.

A body of literature suggests that blended approaches to learning may offer an optimal environment to augment student engagement and success (Picciano et al., 2013).

1.2 Understanding Student Engagement

A critical review of the literature on student engagement in higher education makes it clear that this concept means different things to different people (Barkley, 2009). There is a lack of consensus on what exactly student engagement is (Bowen, 2005). For example,

- Ralph Tyler in the 1930s defined engagement as ‘time on task’. Pace (1984) extended Tyler’s concept to conduct the College Student Experiences Questionnaire (CSEQ) to measure ‘quality of effort’. Pace’s research over three decades (1960 to 1990) found that the more effort students invest in using the institutional resources and opportunities provided for their learning, the greater they benefit (Gonyea et al., 2003; Pace, 1984, 1990).
- Astin (1984) augmented the concept of ‘quality of effort’ by his theory of student involvement, which refers to ‘the amount of physical and psychological energy that the student devotes to the academic experience’. Drawing upon his longitudinal studies about the impact of college on students, Astin demonstrated empirically the relationship between involvement, and developmental and attitudinal outcomes. Astin’s theory bears out Pace’s findings: the more the student’s involvement in academic activities, the greater amount of student learning and personal development (Astin, 1993, 1977). Astin was a most significant contributor to the widely cited report, ‘Involvement in Learning’ (National Institute of Education, 1984) that underlined the importance of involvement to student persistence, achievement and other valued outcomes (Astin, 1984).
- In 1987, Chickering and Gamson published ‘The Seven Principles for Good Practice in Undergraduate Education’, which were conceptually linked to CSEQ items. The response of these principles was immediate and overwhelming. These principles are usually used to help improve undergraduate education. Chickering and Gamson found that effective educational practice includes: student-faculty contact; cooperation among students; active learning; prompt feedback; time on task; high expectations; and respect for diverse talents and ways of learning.
- In the spring of 2000, the National Survey of Student Engagement (NSSE) was launched as a lens to examine the quality of the student learning experience (National Survey of Student Engagement, 2007). The NSSE defines student engagement as ‘the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities’ (Kuh, 2003). NSSE is derived from prior research, particularly from the three conceptual studies mentioned earlier (Vaughan, 2010; Zhou, 2010): ‘quality of effort’ concept (Pace, 1984); ‘theory of involvement’ (Astin, 1984); and ‘seven principles of good practice in undergraduate education’ (Chickering & Gamson, 1987). The five NSSE benchmarks are:
 - Active and collaborative learning: Items on this scale are designed to assess the extent to which students interact with other students, and the frequency of student participation in academic activities inside and outside of the classroom.
 - Student interactions with faculty members: This benchmark is designed to evaluate student and faculty interaction. This includes participation with faculty members inside and outside the classroom, and the level of engagement with them in regard to grades, coursework and career plan.
 - Level of academic challenge: Questions in this scale focus on measuring students’ academic effort and the institutional expectations of students.
 - Enriching educational experiences: Items in this dimension are designed to report on the number of complementary learning activities available to students. This can be joining in community service, participating in internships and engaging in curricular and co-curricular activities with students of different backgrounds.
 - Supportive campus environment: Questions in this section deal with the extent to which students perceive the institution is dedicated to student success and cultivates positive relationships among students, faculty, staff and community on campus.

Since that time, the NSSE has been widely used as a tool to study undergraduate student engagement. It has been used by more than 1,500 different colleges and universities in the US and Canada. It permits comparison of institutions against each other and against a benchmark. According to NSSE, the ‘results provide an estimate of how undergraduates spend their time and what they gain from attending college’, and the instrument offers a measure of ‘empirically confirmed good practices in undergraduate education’ (Indiana, 2003).

1.3 Related Works

Various definitions of student engagement have resulted in the development of a number of scales designed to assess students' involvement and engagement in classroom. For example, Smallwood and Oiumet, (2009), Ahlfeldt, Mehta and Sellnow, (2005) and Langley (2006) have adapted selected NSSE items to identify specific measures of classroom engagement, while Handelsman et al. (2005) have developed a model, the Student Course Engagement Questionnaire (SCEQ), to measure four types of engagement:

- *Skill engagement* includes general practices of learning strategies and behaviours that stimulate academic success, such as note-taking.
- *Emotional engagement* includes personal involvement with and internalization of course materials.
- *Participation/interaction engagement* includes individuals' desire to participate in class and interact with others in academic activities.
- *Performance engagement* includes the level of classroom performance such as grades.

Robinson and Hullinger (2008) have also modified the NSSE survey to assess student engagement in online learning environment. They found that 'online students were modestly engaged in selected NSSE dimensions and had a pattern of engagement that differed from on-campus students'.

In blended learning settings, there are a number of scholars who have focused on student engagement in hybrid learning such as Neumann and Hood (2009), who examined the impact of wikis on student engagement in higher education. NSSE items were adapted in their study and wikis were used as part of a blended learning approach to promote collaborative learning among students in a first-year university statistics class.

Also, Coates (2006) has published a number of articles relating to this topic, developing a model, the Student Engagement Questionnaire (SEQ), to study student engagement in blended course design. His model consists of two parts: general engagement and online engagement. General engagement includes nine scales to measure more general forms of campus-based student engagement: constructive teaching (CT); supportive learning environment (SLE); teacher approachability (TA); academic challenge (AC); active learning (AL); student and staff interaction (SSI); complementary activities (CA); collaborative work (CW); and beyond-class collaboration (BCC). Coates (2006) believes that online learning, which is a part of blended learning, requires its own engagement scales: online engagement; online active learning; online academic relevance; online teaching; online collaboration; online social interaction; and online contact with staff.

Delialioglu (2012) used NSSE measures to investigate how a blend of different instructional approaches with technology affects students' engagement. In his study, three benchmarks of NSSE were used: Active and Collaborative Learning; Student-Faculty Interaction; and Level of Academic Challenge. Two dimensions were added to the Survey: Total Time on Task and Course Satisfaction. Another study conducted by Owston, York, & Murtha (2013) used CLASSE items, an adaption of NSSE items, to examine student engagement in a blended course.

Blended MOOCs have characteristics that make them different from other blended learning settings. Up to this time, no model has been designed to assess student engagement in this context.

2. A PROPOSED MODEL OF STUDENT ENGAGEMENT IN A BLENDED MOOC

Upon reviewing a number of student engagement measures such as NSSE, SEQ and SCEQ, the most established and adapted instrument was selected: NSSE. This is a large-scale project administered by the University of Indiana that seeks to 'assess the extent to which students engage in educational practices associated with high levels of learning and development' (Indiana, 2003).

NSSE developed ten engagement indicators within four engagement themes that are adapted from NSSE's former Benchmarks of Effective Educational Practice (Table 1).

Table 1. NSSE engagement indicators

Theme	Engagement indicators
Academic challenge	Higher-order learning reflective & integrative learning Learning strategies Quantitative reasoning
Learning with peers	Collaborative learning Discussions with diverse others
Experiences with faculty	Student-faculty interaction Effective teaching practices
Campus environment	Quality of interactions Supportive environment

The proposed model uses six NSSE engagement indicators to examine student engagement in general course engagement: Higher-order Learning; Reflective and Integrative Learning; Learning Strategies; Collaborative Learning; Course Challenge; and Student-Faculty Interaction. These indicators are most relevant to our study, while the others relate to how students perceive their entire institution, not a single course experience.

In order to explain potential impact of using MOOC, five indicators of student engagement in the MOOC system have been added. These are adapted from the Student Engagement Questionnaire (SEQ). SEQ is a model with 19 scales designed to measure student engagement, both in online LMSs and on campus. It has 'high construct stability, face and content validity, and replicates well in different institutions and fields of study' (Coates, 2007). The proposed model adapts only five that are relevant to the MOOC context. So the full proposed model has 11 indicators to track campus-based students' engagement with MOOC and general aspects of their course. The indicators are presented in Table 2 in detail.

Table 2. Proposed model to measure student engagement in blended MOOC design

Engagement indicators	Definition
1. Reflective and integrative learning:	Reflective and integrative learning: six items designed to study the level of integration and connection of ideas and concepts.
2. High order learning:	Higher order learning: five items capture the extent to which course materials and assessments emphasize challenging mental tasks such as application, analysis, judgment, and synthesis.
3. Course challenge:	Course challenge: three questions in this scale measure the extent to which students being challenged by the course.
4. Learning strategies:	Learning strategies: three items designed to assess the extent in which students performed some of effective learning strategies such as identifying key information from readings, summarizing course materials and reviewing notes after class.

General engagement indicators

MOOC Engagement Indicators	5. Collaborative learning:	Collaborative learning: This indicator includes four questions examine the extent in which two or more students work together in educationally purposeful activities.
	6. Student-staff interaction:	Student/staff interaction: Five items explore the degree of students' contact and interaction with teachers.
	7. MOOC Challenge:	MOOC Challenge: two questions focus on how MOOC materials and quizzes encourage them to work hard.
	8. MOOC Active and Collaborative Learning:	MOOC Active and collaborative learning: four items designed to collect information about the degree to which students actively use MOOC to enhance their learning. The items also measure students' use of MOOC in collaborative work with their others.
	9. MOOC Academic Relevance:	MOOC Academic relevance: three items scale measures the degree to which MOOC materials are relevant to classroom activities.
	10. MOOC Social Interaction:	MOOC Social Interaction: two questions ask about how students use MOOC to experience a range of interactions and communications with others.
	11. Teaching with MOOCs:	Teaching with MOOCs: three scale items capture students' perceptions of whether instructors used MOOC in pedagogically effective ways.

3. RESEARCH METHODOLOGY

3.1 Expert Practitioner Questionnaire Design

The expert survey was designed to capture experts' opinion on each proposed indicator identified from the literature review. Efforts were made to recruit expert practitioners from a wide range of backgrounds. The communication medium for data collection was self-administered online questionnaire using survey software called Survey Gizmo. The questionnaire was divided into three sections. The first was to collect general information about the participants. The second section used 17 5-Likert scale questions, ranging from (Very important =5) to (Not at all important=1). The last section was of two open-ended questions to check whether there was ambiguity in any indicator, and whether any further indicators needed to be incorporated.

3.2 Data Analysis Method

The one-sample t-test was used to analyse the expert practitioner questionnaire in order to confirm the proposed indicators. This kind of test was used to determine if the mean rating for a representative question of each proposed indicator was significantly higher than 3.5. The rationale behind choosing 3.5 is that this number falls between 'neutral' and 'important' on the five-point Likert scale.

Establishing hypotheses:

To test the hypotheses, we set a confidence level with 95%, and the alpha α with 0.05. The null and alternative *hypothesis were as follows:*

H0: the mean value of an indicator is equal to or lower than 3.5.

H1: the mean value of an indicator is higher than 3.5.

In this study, the indicator is accepted when the null hypothesis was rejected ($p < 0.05$).

3.3 Sample

The population of interest will be MOOC educators who are academics with experience in teaching in both settings: traditional face-to-face and MOOCs. Also, MOOC facilitators will be interested, as facilitators are academics and have experience in teaching in conventional setting and helping MOOC educators by providing individual and group support through course discussion, email and regular contact classes. The expert practitioners were asked to participate in the online questionnaire and rate the importance of each indicator.

3.4 Pilot Study

A trial evaluation using the model was conducted as a pilot study of 13 students who had taken a course in the blended MOOC format. The reliability of the pilot study was assessed by considering Cronbach's Alpha. Reliability is considered to be satisfactory when values are greater than 0.70 (Hair et al., 2006), but this is sensitive to the number of items in the scale, so for short scales a lower value is acceptable, and conversely for longer scales.

Table 3 shows that the overall Cronbach's Alpha value is .854 and the Cronbach's Alpha value of all apart from in three scales are equal to or more than 0.7. The three scales are slightly below the acceptable level, yet satisfactory for a short scale consisting of four items or less, thus the constructs were deemed to have adequate reliability.

Table 3. The Cronbach's Alpha value

Indicator	Cronbach's Alpha	N of Items
Integrative & reflective learning	.864	6
Higher order learning	.700	5
Learning strategies	.513	3
Collaborative learning	.816	4
Student-staff interaction	.714	5
Course challenge	.636	3
Active & collaborative learning in MOOCs	.641	4
MOOC relevance	.700	3
MOOC social interaction	.859	2
Teaching with MOOCs	.823	3
Overall	.854	40

4. RESULTS AND FINDINGS

The proposed student engagement determinants were arranged in a questionnaire format to capture an expert perspective of the relative importance of each of student engagement factors. This questionnaire survey was carried out over three months with the involvement of 28 experts who are academics and educators/facilitators in the MOOC systems. As shown in Figure 1, the participants are from different

backgrounds: 32% of the respondents were from UK; 25% from Saudi Arabia; 21% from Malaysia; 7% from each of the United States and Australia and 4% from each of Mexico and Morocco.

As displayed in Figure 2, MOOC educators involved in this survey constituted 61% of the respondents, while 36% of respondents were facilitators and others constituted 3%. We only accepted academics who taught in the MOOC system. The 3% mentioned earlier were respondents who described themselves as both educators and facilitators.

Some 36% of the sample had an experience of more than two years teaching in the MOOC system, and 36% had one to two years' experience and 29% had six months or less (see Figure 3).

In Figure 4 and Table 4, it can be seen that there was agreement on the importance of all indicators. Interestingly, no participants registered an objection to the importance of any of the following student engagement indicators: reflective and Integrative Learning; higher order learning; course challenge; learning strategies; student-staff interaction; and MOOC social interaction. The MOOC challenge indicator was seen as less important than other determinants, as 7.1% of the participants believed it is 'not important', and 17.9% stood in between.

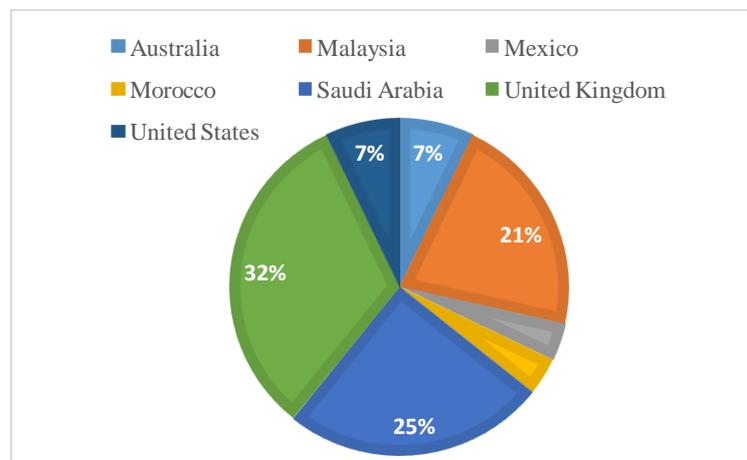


Figure 1. Participants by country

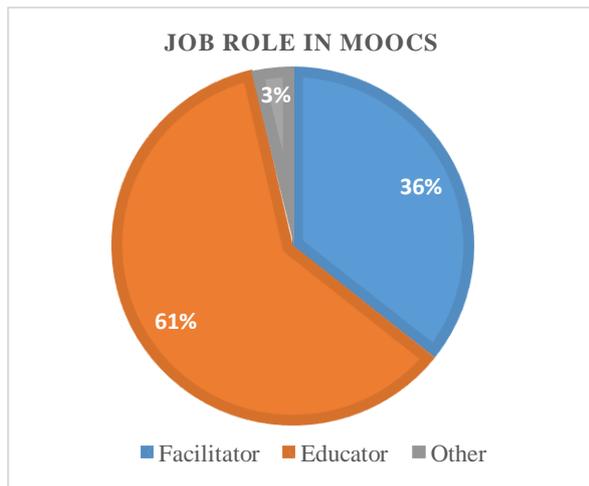


Figure 2. Participants by job role

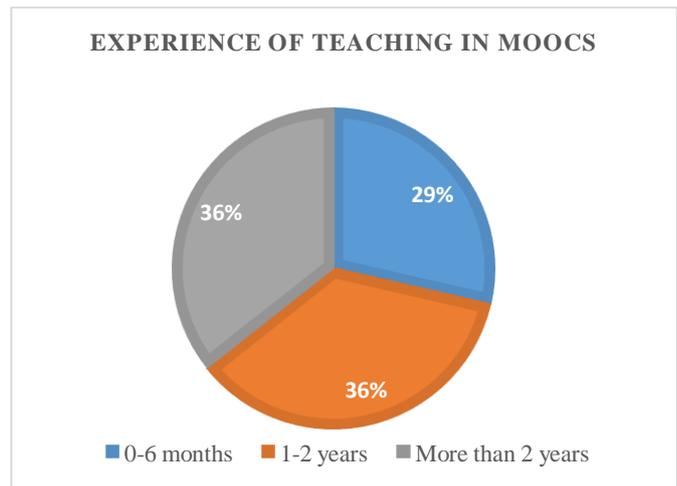


Figure 3. Participants by experience

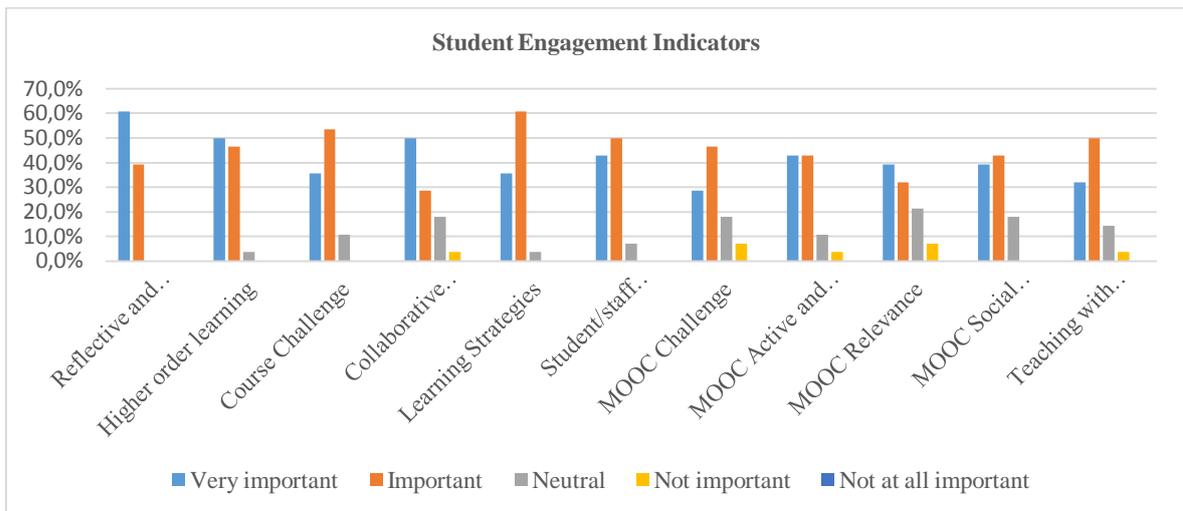


Figure 4. Expert survey result

As shown in Table 4 the analysis of the results indicates that all respondents agreed on the importance of the proposed indicators/factors, as the mean value of each indicator was higher than the test value (3.5). The fact that all answers were significant, as p values for all determinant were less than 0.05, confirms that all proposed indicators and factors were important to the blended MOOC framework.

Table 4. One-sample statistics for all indicators

Student engagement indicator in blended MOOC context	N	Mean	Std. deviation	Std. error mean	Sig. (2-tailed)
Reflective and integrative learning	28	4.61	0.497	0.094	0.000
Higher order learning	28	4.46	0.576	0.109	0.000
Course challenge	28	4.25	0.645	0.122	0.000
Collaborative learning	28	4.25	0.887	0.168	0.000
Learning strategies	28	4.32	0.548	0.104	0.000
Student/staff interaction	28	4.36	0.621	0.117	0.000
MOOC challenge	28	3.96	0.881	0.167	0.010
MOOC active and collaborative learning	28	4.25	0.799	0.151	0.000
MOOC relevance	28	4.04	0.962	0.182	0.007
MOOC social interaction	28	4.21	0.738	0.14	0.000
Teaching with MOOCs	28	4.11	0.786	0.149	0.000

5. DISCUSSION

The proposed eleven-indicator model was confirmed by 20 practitioner experts. In this study, the indicator was accepted if the null hypothesis was rejected. Generally, a p-value is required to be .05 or less in order to reject the null hypothesis. The one-sample t-test (as seen in Table 4) shows that the p-value of all the proposed indicators is less than .05, so the result was found to be statistically significant and the proposed indicators can be used to measure student engagement in the blended-MOOC setting.

Moreover, the results of the questionnaire show that the experts agreed on the importance of all the proposed indicators in the context of blended MOOC.

With regard to the pilot study, the findings look encouraging:

- Questions in the survey seems clear and understandable to most students, and
- The survey is deemed to have an adequate reliability.

6. CONCLUSION

Upon the review of student engagement literature, NSSE and SEQ were selected to use as a theoretical framework to measure student engagement in the context of blended MOOC. There are 11 indicators: reflective and integrative learning; higher-order learning; learning strategies; course challenge; collaborative learning; student-staff interaction; MOOC challenge; teaching with MOOC; MOOC relevance; active and collaborative learning in MOOC; and social interaction in MOOCs.

A confirmatory study was conducted with 20 experts in the field. The result of this study confirms that the proposed indicators can be used to measure the blended-MOOC students' engagement.

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BLENDED LEARNING AND THE MBA: HYGIENE FACTORS, MOTIVATORS AND LIMINAL SPACES

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ABSTRACT

This paper presents an evidence-based approach to blended learning development on an MBA in a research intensive UK university. Although blended learning MBA's represent a small proportion of comparable programmes, there was recognition that current provision did not meet either student needs, or expectations. Results indicate a body of students with high expectations, incorporating their constant connectedness and a desire to learn in liminal spaces with smaller learning objects in a variety of media. At the same time physical facilities and other aspects of learning support can be 'hygiene factors' which can influence student dissatisfaction. This paper reports an important step on a journey towards developing a programme based on a range of learning strategies, emulating best practice and relevant to the travel, work and study habits of our learners. It contributes to understanding contemporary MBA student expectations, matching these to blended learning strategies, and recognition of the potential of 'liminal space' in learning as a space in between other events, where learning is facilitated by problem-based approaches through a variety of media.

KEYWORDS

MBA, Blended learning, Hygiene factors, Liminal spaces

1. INTRODUCTION

This paper explores a range of issues in relation to blended learning on MBA programs. The three specific aims of this paper are: first to design and develop a model for blended learning; second to understand motivation and hygiene aspects of blended learning; and finally to evaluate contemporary MBA student attitudes and preferences in respect of mobile learning and learning in liminal spaces. The context for the research was a medium sized research intensive university in the Midlands region of the UK. The Master of Business Administration has existed for over 20 years but now needs to explore ways of learning that are more relevant to contemporary students, to support both full and part-time learners who are taught together. This paper focuses on development in relation to one 10-credit module, The Management of Human Resources. Hence, this is part of a wider transformation programme with learning leading the way (Salmon 2014). Present evaluation mechanisms have a tendency to focus on what students have experienced (past), rather than what they desire or expect (future). To remedy this we ran an all-student survey broadly linked to the three research aims articulated above. Recognising the semi-permanent state of connectedness experienced by contemporary students, as well as the fast moving working lives of our part-timers, we especially wanted to investigate mobile learning, notably learning in temporary or 'liminal' spaces (Van Genep 1960, Hislop 2013), while resting, waiting or travelling. The aim is to develop an evidence based approach to a revised curriculum that meets or exceeds student expectations.

2. LITERATURE REVIEW

This section of the paper is a literature review which in the first part considers models and examples of blended learning appropriate to MBA programs. Bentley, Selassie & Parkin (2012, p.76) noted typical components of blended learning as including: ‘face-to-face classroom teaching, live e-learning, self-paced e-learning, and structured off-line study including set readings and assignments’. Singh (2003, p.52) added a level of sophistication in suggesting that it: ‘- combines multiple delivery media designed to complement each other and promote learning and application-learned behaviour’. Blanco, Van der Veer, Benvenuti & Kirschner (2011) cited key factors for maximising the value of ‘technology enhanced learning’ as including a safe learning environment, easy to learn and use interfaces, feedback and guidance throughout the whole learning period, thoughtfully designed learning, possibilities for self-assessment, cooperative learning and built in time management facilities. Finally they noted the importance of motivation, avoiding isolation, and building a sense of community (Wenger 1998). Beetham & White (2013) documented student expectations in respect of the use of technology including the incorporation of technology into their teaching and learning in ways that are relevant to their academic success, the capacities to connect their own devices, and high levels of access to institutional networks.

Blended learning is far from new in MBA programs and there are well documented experiences to draw on. Some early studies (Gimson 2007, Chen & Jones 2007) identified the need to achieve a balance in terms of blended learning with the benefits of online but without losing the classroom experience. Gimson noted that blended learning should not be perceived as a cost-cutting exercise, and a need for considerable investment in human resources. In a recent blog comment (see exhibit 1) by AMBA’s Director of Research (Rapacioli 2015) it was suggested that: ‘- since 2012, Distance/ Online programmes actually saw a slight drop of just over 1% and Blended programmes have largely remained static. Blended MBAs account for 4% of all MBAs and Distance for 3%’. Rapacioli also suggested that employers may be unwilling to recruit students from online or blended programmes due to the value placed on face to face skills.

We employed a traditional theoretical perspective, Frederick Herzberg’s two factor theory of motivation and especially his perspective on ‘hygiene factors’ (1959) to help us understand student behaviours and concerns. Briefly, in a workplace context motivators could include recognition, achievement, the work itself, and the ability to take responsibility (Mullins & Christy 2013). Other aspects, even if they are as good as they can be can only at best reach a level of adequacy, and if they are less than satisfactory will have the ability to cause demotivation. In an educational context such considerations can apply to a variety of factors. For example DeShields, Kara & Kaynak (2006) considered the relational aspects of academic advisement as potential hygiene factors, noting that motivation arose through the learning process itself. In our situation, we might anticipate that some elements of the learning mix (motivators) have the facility to engage and enthuse, typically through involvement (Søilen 2007). Hygiene factors may include the presentation of the virtual learning environment (Reed 2015). Because digital natives (Prensky 2001) are perceived as qualitatively different to previous generations of students in terms of their engagement with the digital world (Dahlstrom, Walker & Dziuban 2013, p.4), it is important to understand their expectations. These include a preference for blended learning to wholly online, but also high levels of guidance when they need it. In addition MBA students can be resource intensive and needy, and will communicate disappointments quite readily to their peers, including within and between cohorts (Gimson 2007). Full time students have generally taken a career break, without necessarily a job to go back to, so expectations are high. An additional perspective was presented by Geri & Gefen (2007), where some MBA students chose a very instrumental – transactional approach to their learning (described as ‘satisficing’, p.158) and appreciated the comprehensive presentation of an online learning program without perceiving the need to undertake further research. Far from being needy, such students did just enough to get by.

As more or less constant connectedness is a feature of modern life, so any gap in one’s day-to-day activities becomes punctuated by the use of mobile technology. To understand this, we have utilised the notion of ‘liminal space’ (Van Gennep 1960, Turner 1967) as representing episodes of activity occupying the space between others. In a digitally connected world spaces that were once merely waiting such as for travel or a meeting acquire a new purpose, either for recreational communication or work. For example, Hislop (2013) studied the work-related communication behaviours of car borne business travellers during rest periods in motorway service stations. Given the ability of contemporary students to utilise mobile technology

between (or even during) learning events and at almost any other possible juncture, this begs the question of whether such spaces might present a missed learning opportunity which could be filled by bite-size elements.

The appropriation of liminal spaces that were otherwise personal and recreational for individuals by educators and tutors raises a potentially interesting ethical concern. Is this pressurising students to learn in what was otherwise private space? Lancaster, McQueeney & Amburgh (2011) noted concerns expressed by respondents in their study of pharmacy students that an additional online component to their program increased overall workloads without providing a perceived benefit in terms of learning. The tutors noted that this hybrid model of lecture delivery actually produce better results, but the students expressed concerns about work in terms of both balance and volume. Finally Powell & Robson (2014) discussed podcasts as both academically generated and student generated, while recognising the need to maintain academic rigour.

3. RESEARCH METHODS AND RESULTS

A questionnaire was administered via SurveyMonkey™, to current students with the aim of evaluating their perspectives on blended learning and ideally to anticipate any potential problems prior to actual implementation. The questionnaire was designed to match our research aims namely the appropriateness of the components of the blended learning model, to understand attitudes towards blended learning including the motivation and hygiene aspects, and finally to evaluate the potential for learning in in-between spaces, hence the notion of liminal learning. Students were notified of the survey availability by email, and encouraged to participate through the use of a prize draw. Thirty-nine students responded, a 48.2% response rate. Ages, in five categories were under 25 (13%), 26-29 (31%), 30-33 (21%), 34-37 (23%) and 38 or above (13%). Because students are taught as one cohort, data were not split by full time/part time or pathway.

Responses to questions on the extent of ownership and usage of mobile devices were captured on a four-point scale: I don't own one of these (1), I own one and use it occasionally (2), - quite often (3), - frequently (4). Most students owned laptops ($M=3.32$, $SD=0.76$) and smart phones ($M = 3.63$, $SD = 0.60$), with lower scores for tablets, iPod Touch and e-readers ($M = 1.85$, $SD = 0.79$; $M = 1.50$, $SD = 0.50$; $M = 1.23$; $SD = 0.58$; respectively). Whether these devices were used for learning showed a somewhat similar pattern with laptops ($M = 3.66$, $SD = 0.53$) dominating device use for learning and weaker scores for other devices. The stronger scores were tablets, $M = 2.00$, $SD = 0.95$; smart phone, $M = 2.65$, $SD=0.86$. However, the introduction of more opportunities for blended learning could well 'bootstrap' the use of technology for learning especially given the relatively high levels of device ownership reported.

A question on the pedagogical approaches utilised currently on the MBA aimed to understand the relevance of hygiene factors and motivators in this particular situation. Students were asked to rate their responses on the scale: 'we don't have this on the MBA right now' (1), 'we sometimes have this and that's too much: de-motivational' (2), 'we sometimes have this and could have more: motivational' (3), 'we have quite a lot of this and that's too much: de-motivational' (4). Hence the numerical value relates to satisfaction with frequency of availability from none (1), too little (2), about right (3), too much (4) Students were asked to rate a range of different scenarios including traditional lectures, aspects of the virtual learning environment (VLE) and other online resources. Results suggest students keen to be actively involved with expectations of engaging learning situations. Almost 46% suggested that there was too much use of traditional lecture delivery ($M = .06$, $SD=0.67$), although 86% would be happy to have more lectures which had a high degree of interaction ($M = 2.89$, $SD = 0.46$), with over 71% requesting greater use of the video clips in lectures. There was modest approval for a participative problem-solving approaches particularly lectures or seminars which include group problem-solving activities such as case studies or business simulations (77%). The principal present usage of the VLE, as a repository for reading and other learning materials, elicited a mixed response with almost two thirds actually citing this as a de-motivating factor, potentially a concern about reading traditional academic sources.

The next question sought to ascertain student views on potential future modes of learning, with three potential responses: 'this activity should not be used on the MBA' (1), 'this activity should be used, it's a minimum expectation' (2), and 'this activity should be used, it's an exciting opportunity' (3). In most cases responses indicated that the learning mode was a minimum expectation, suggesting a clear gap between present provision and their expectations. Responses to the first item appeared somewhat contradictory to the 'pod cast' question above, in that over 88% of respondents either approved or strongly approved of 'short

podcasts relevant to the module content which could be used for mobile learning, to be accessed at any time'. ($M = 2.43$, $SD = 0.69$). Pre-recorded lecture content held on the VLE was regarded as a minimum expectation by 34% of students, and an 'exciting opportunity' by 54%. Note this question did not ask about recorded lectures replacing face-to-face contact, which is a separate matter related to external accreditation for the programme. More than 94% of students wanted short videos relevant to the module content, again to be accessed whenever they wished with more than one third of these regarding this as a minimum expectation ($M = 2.54$, $SD = 0.60$). Exactly four-fifths of students believed online group discussions related to module content or case studies (asynchronous) should be used and would be an exciting opportunity, with the 37% believing on line interactive discussions moderated by a tutor were a minimum expectation. Fifty seven per cent of students believed that online business games and simulations should be used, with almost 26% regarding these as a minimum expectation. Finally just over half the respondents thought an individual reflective element was an exciting opportunity. The 'Pebble Pad' online portfolio is being piloted with the current cohort, with almost 26% regarding it as a minimum expectation. There were some negative responses notably for asynchronous online group discussions (20%), tutor moderated discussions (20%), and the Pebble-pad™ portfolio (26%).

The last set of specific questions related to mobile learning and learning in liminal spaces. These were scored on a three-point scale: 'I couldn't ever see myself doing this' (1), 'I might do this occasionally' (2), and 'this is definitely something that I would like to do - highly relevant to my lifestyle' (3). Just over 80% of students noted that they might occasionally 'learn while travelling on a bus or train' ($M = 2.09$, $SD = 0.68$), with 68% indicating that they might 'learn while travelling in a car, for example listening to podcasts' ($M = 1.91$, $SD = 0.75$). Over 76% of respondents noted that they might 'learn while travelling eg. in an airport lounge' with over 68% noting that they would access learning materials while in the air. For the above questions a significant minority (20%- 30%) of respondents couldn't ever see themselves doing that particular learning activity. Over 82% of respondents regularly stayed in hotels and could see themselves accessing learning resources while doing this. One of the weakest scores was that just under 61% of respondents indicated that they were likely to access learning materials during breaks at work with 38% stating they would not ($M = 1.76$, $SD = 0.69$), although 84% indicated that they were likely to access learning materials during non-work hours ($M = 2.44$, $SD = 0.69$). This a clear divide in the minds of a significant minority of students between work time and study time. In line with the popular perception of constant connectedness, over 77% of respondents indicated they would 'learn in between other activities', such as in short intervals or while waiting. The final question on the survey invited students to contribute views of their own. This produced a diverse range of responses. Some were positive contributions: ' - learning from case studies and having real discussion in class help me understand the modules faster and deeper than traditional lectures. Doing group work is a great way for that'. Many comments reinforced the perception that this MBA is 'behind the curve' in learning technology utilisation, including support for moderated comment boards and more 'mobile' camera management in lecture recordings. Other responses focused on hygiene factor aspects including the balance of coursework and examinations, and the physical learning environment including the main lecture and seminar rooms used.

4. DISCUSSION

We were keen to incorporate in our design for learning what is generally understood to be effective learning as well as more contemporary perspectives. Table 1 illustrates the various components of a proposed blended learning model, as well as a reference or best-practice rationale for their incorporation. Table 2 presents a simplified vision of this in operation, as a short 'snapshot' of the start of the programme. Hence, the watchwords for our model are collaboration, problem-solving, the tutor as an empowering coach, flexibility and the enablement of learning on the move, underpinned by regular episodes of reflection. The unique nature of MBA students has presented some further challenges. While as tutors one might desire to be one step ahead of the students, in reality high-calibre individuals often bring significant expertise in niche areas, and the skill in facilitation is in recognising this and applying it to the overall learning process.. MBA students often come from diverse educational, pedagogic and cultural backgrounds, and blended learning offers the opportunity for resources to be connected into the learning processual issues. One concern is that

some results potentially point to an instrumental-transactional approach to learning such as a possible resistance to reading traditional academic sources (Geri & Gefen 2007).

The first research aim was to design, develop and test a model for blended learning on the MBA. In terms of the HRM module content, students are likely to manage devolved aspects of human resources, such as performance management, appraisal, recruitment, staff development, human resources problem-solving while at the same time developing a relationship with the HR function from whatever specialism they may find themselves in. Having recognised that the majority of students possessed the connectivity for the kind of learning experiences we envisaged, we then focused on emphasising learning processes the students identified as motivational, recognising the limitations of those which presented as ‘hygiene factors’, and opportunities for micro-learning and ‘liminal learning’ to reflect busy, mobile lifestyles.

Table 1. Components of the blended learning framework

Blended learning component	Rationale and underpinning theory	Cautions and considerations
Problem based learning that is learner centred, case based and involves a requirement to connect sources of knowledge and respond to changing situation demands	Student motivation and a desire to represent a VUCA (volatile, uncertain, complex and ambiguous) management environment. Situating learning (Lave and Wenger 1991) Problem based learning (Chagas, Faria, Mourato, Periera, Santos 2012)	Tutor support and development including the facility for rapid response and problem-solving Donnelly (2013) How can one <u>create</u> opportunities for authentic and unintentional learning? Synchronous/asynchronous
Collaborative activities which facilitate the free exchange of information between students	Communities of practice (Wenger 1998), MBA students, case studies and interactivity (Søilen 2007)	Encouraging engagement on one hand while potentially moderating behaviour Tutor as ‘empowering coach’
Scholarship and research, individual or collaborative	Discovery learning (Bruner 1967)	Ensuring the use of sources appropriate to Masters level
Opportunities for tutor interaction and support	Scaffolding learning, the zone of proximal development (Vygotsky 1987), tutor as ‘more knowledgeable other’	Balance of hands off and hands-on, encouraging independence, recognising students as experts
Online role-play	Facilitated by module content (recruitment interviews, disciplinary situations, appraisal)	Challenging to design and moderate (Wills, 2011) Students cautious.
Micro-learning	Short podcasts and videos, to facilitate ‘liminal learning’ on the move, the ‘flipped classroom’ (Baker 2000, Kurtz, Tsimmerman, Steiner-Lavi 2014)	See survey outcomes Generally supported by survey outcomes
Social media including self-made video	Personalisation of learning, highly relevant to contemporary students	Generally supported by survey outcomes
Reflection: E-portfolio	Reflective learning (Choi 2013) throughout the module, reflection as an indicator of ‘cognitive presence’ (Redmond, 2014, p.46 et seq.)	Reflection as a natural all pervasive activity not an add-on Cautions from survey outcomes

The second research aim was to understand motivation and hygiene aspects of blended learning on the MBA. Our starting point was a recognition that our traditional modes of part time study based on either regular half day or evening attendance on one hand, or four or five day ‘study blocks’ on the other were both perceived as less than ideal by current students often due to rapidly changing work commitments. Hence, based on data gathered the timetable is likely to be re-engineered to include shorter ‘touch points’ of tutor contact supported by a mix of blended learning, online resources and micro-learning opportunities. Case-based problem solving approaches (Chagas, Faria, Mourato, Periera, & Santos 2012) were clearly recognised as motivators. Having said that the potential for free-riders in the process needs to be anticipated, so a potential consideration may be peer evaluation as well as ‘reflection an indicator of cognitive presence’ (Redmond, 2014, p.46). Hygiene factors were identified as excessive use of didactic face to face lectures. There was a mixed response to video materials on the VLE potentially reflecting concerns about value for money and expectations of lecturer contact, suggesting a need for an appropriate mix (Lancaster, McQueeney & Van Amburgh 2011, Reed 2015). An overall evaluation has been (and as found by Bentley, Selassie &

Parkin, 2012) that the aspects of programme organisation needing care are still the fundamentals of administration, assessment methods, and tutor feedback, all of which could easily become unresolved ‘hygiene factors’ if not done well. We also wanted to encourage the habit of reflecting on learning experiences, and have trialled the ‘Pebble-pad’™ online portfolio. Feedback on this has been mixed, and the task remains to ensure students embrace the value of reflection, while achieving an appropriate balance for this within the programme.

Table 2. Simplified 5-channel model of Blended Learning (Extract)

Mode of Learning				
Group based Face to Face (F2F) Learning	Substantive online content eg. documents, articles, questionnaires on virtual learning environment	Group based ‘mobile’ online activity Games and simulations	Individually based ‘mobile’ online activity (podcasts, short video clips) Individual forum comments	Individually based online reflective activity (PebblePad)
Block 1 Induction and Orientation to the module Introductory content (1 day)	<p><u>Topic 1</u></p> <p>Lecturer input</p> <p>Reading</p> <p>Case study scenario</p>	Introduction to online game	<p>Video clips (case study)</p> <p>Short readings</p>	Reflection on/from induction
Tutor contact by appointment as required face to face or virtually	<p><u>Topic 2</u></p> <p>Video clips: Lecturer input</p> <p>Reading</p> <p>Case study scenario (Video)</p> <p><u>Topic 3</u></p>	Moderated group discussion	<p>Podcasts</p> <p>Short readings</p> <p>Questionnaire or quiz (with feedback)</p>	Ongoing reflective activity

The third research aim was to consider contemporary student attitudes to mobile learning and learning in liminal spaces. Responses were strongly in favour of micro-learning opportunities during business travel (Hislop 2013), or in between other activities potentially including short podcasts (Powell & Robson 2014) and video clips which were favoured by the majority of respondents. Audio media as opposed to visual or textual media open up a range of possibility for mobile learning otherwise restricted such as while driving, recognising the modest support for this as a learning mode by this cohort group. Linking learning media to the ‘hygiene factors’ above, video content on the VLE is a minimum expectation for many students, with more than half regarding lecture recordings held on the VLE in the same light. Most were in favour of the use of on-line asynchronous group discussions with one-third of all respondents regarding these as a minimum expectation. Nonetheless a sizeable minority of students reportedly felt less comfortable with some of the proposals and technology-literacy and confidence levels clearly varied.

5. CONCLUSIONS

Our reflection from the overall exercise is that contemporary learner expectations have moved on considerably beyond traditional modes of delivery reflecting not only a facility with technology but also the fragmented and liminal nature of student’s working lives and everyday experiences. The MBA ‘offer’ should reflect this in terms of patterns of delivery and learner support as well as academic content. The survey has revealed a very substantial ‘to do’ list including the need to rapidly develop academic staff expertise in online

facilitation (Beetham & White 2013), video-based presentation, facilitation of online discussions (Donnelly 2013), and the development of learning materials appropriate for interactive online learning (Søilen 2007). There is significant potential for further research. There are many online and blended MBA's but relatively few from highly ranked Business Schools (as defined by AMBA membership) and their numbers are not growing. Perhaps this question can be flipped – is AMBA membership actually important or is the market demanding more flexibility and creativity than AMBA accredited schools can offer? Finally, there are a number of unresolved challenges some also related to external accreditation, such as how to define contact hours requirements emanating from bodies such as AMBA. For the programme under investigation, the simple fact that we have recognised the value of the student voice has itself brought positive outcomes, while at the same time potentially raising expectations. Nonetheless, while the MBA will always be a 'work in progress', we believe the survey reported here has the potential to move this particular programme significantly further forward, to better match the expectations and experiences of contemporary students.

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INFORMATION SAVING PRACTICES AN INTERNATIONAL SURVEY

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ABSTRACT

The pervasiveness of the Internet and new electronic devices has changed significantly information searching practices. However, little is known about users' further behaviors: methods of storing and using information. The purpose of the study is to examine the actual behavior of users when they intend to use in the future the information retrieved from the Internet. The study was conducted at four universities from four different countries. Although the most popular action taken is to make a copy on a disk or other electronic device, the significant percentage of respondents print interesting content, particularly if printing is easy available and not expensive. On the other hand, some participants do not take any action assuming that they can always find the required content again.

KEYWORDS

Internet, e-society, information quality, internet users behaviors.

1. INTRODUCTION

Over the last decades, the ways to access information have undergone significant transformations. Those changes were triggered by two main factors: the growing popularity of electronic tools (e.g. computers, smartphones, tablets) and widespread internet access.

Before the digital age, the dominant source of information was printed content: books, newspapers, periodicals, leaflets etc. Although, mechanical movable type printing was introduced in Europe in the fifteen century, printed sources became widely spread in industrial societies throughout the eighteen and nineteen centuries (Briggs and Burke, 2009). Printed materials substituted a word of mouth as the primary source of information about the world for the general public (McLuhan, 1962).

The prevalence of printed publications contributed to the increased availability of information in society. However, access to specific information was often very limited from the perspective of an individual user. If information was in user's private resources available on a site where a need for information occurred, then the information availability level was very high. On the other hand, in many cases, finding information required finding the right resources in a library or an archive.

In the era of dominant printed content, the level of information availability was usually very stable. Even in the event of destruction or loss of a printed document, it was usually possible to find its equivalent, for example another copy of a book. Moreover, in order to secure the high availability of information at any time later, a common solution was to make handwritten notes. The widespread adoption of photocopiers significantly contributed to the possibility of maintaining the high level of availability of previously acquired printed information, but it also raised new legal and economic issues (Liebowitz, 1985).

Revolutionary changes took place with the rise of digital information resources accessible to the public online. Over the last decade, searching and storing information processes by individual users have been very highly saturated with information and communication technology. Personal computers, smartphones and tablets are commonly available in highly developed countries. Moreover, the Internet access is often considered as a common public good (Hess and Ostrom, 2003). In 2012, in the European Union (28 countries), 78.4% of households had an access to a home computer, and 76.1% of households had an access to the Internet (OECD, 2014).

The usage of a new information technology is often accompanied by the continuation of existing user behaviors characterizing old processes and practices typical for using traditional methods and technical solutions. It is caused by both inadequate user skills in operating new devices and software applications as well as by deep-rooted habits to continue known modes of action. A role in shaping user's behaviors is also played by their concerns over the lack of confidence in data and operations security when using new devices and new methods of data processing (Hirschheim and Newman, 1988; Strassmann, 1985). As a result, full technical capabilities of devices are not used, and thus lower economic efficiency of new technologies is observed. An example of this phenomenon observed at the level of a whole organization is the collapse of the concept of "paperless office" formed by the rise of personal computers and office work support systems, in the eighties of the twentieth century. In fact, the widespread accessibility, ease and speed of printing caused an increase in paper consumption (Sellen and Harper, 2002). Despite the emergence of new generation systems for offices, the problem of excessive printing remains unresolved in the majority of organizations (Hill, 2015).

Information acquisition from the Internet has favorable economic characteristics. It is inexpensive in terms of direct costs, as well as it is less labor-intensive than accessing paper sources. Internet search engines provide easy and immediate retrieval of searched information. A digital form of information enables instant updating and supplying various multimedia resources leading to the accuracy, richness and completeness of information (Montgomery, 2000; Polak, 2011). On the other hand, the ability to create web content by virtually any Internet user raised the question of information credibility (Knight and Burn, 2005; Leite et al, 2014).

The positive economic characteristics and the reliance on new technologies contribute to the fact that especially young generations, including students, use the web as a primary source of information. Various studies show that students extensively utilize web sites and social networking services, particularly Wikipedia, to obtain information for personal, as well as study related purposes (Biddix et al, 2011; Garrison, 2015; Guy, 2012; Head and Eisenberg, 2011; Kim et al, 2014; Polak, 2011; Shen et al, 2013).

Among various qualities of information acquired from the Internet one of large importance is accessibility (or availability). Accessibility can be defined as possibility to obtain information when it is needed (Miller, 1996). That information quality category is usually discussed within the context of business organizations or public agencies, as one of the pillars of information assurance in relation to information security (Bharosa et al, 2011). Moreover, particularly in case of the Web, it is not a thorough and sufficient characteristic. A web page can be deleted, a Wikipedia article modified, and there can be simply no access to the Internet in a particular place or at a particular moment of time. Therefore, internet sources, in comparison to traditional paper sources, are characterized by the lack of stable availability. Some researchers add additional information quality dimension: system availability (Dedeke, 2000), but often that feature is discussed in relation to formal and well structured data processing systems, for example data warehouses (Jarke and Vassiliou, 1997).

Actually in case of social networking services, the information ephemerality can be considered a major advantage (Shein, 2013). For example, such a feature is the main reason for the market success of a photo and video messaging application called Snapchat (Kosoff, 2015). Using the application, the content (called a "snap") sent by a user can be viewed by recipients for up to 10 seconds after which it is supposed to be deleted from Snapchat's servers.

Despite the unstable availability of information from the Internet, no research was found on how individual users act in order to store information found on the Internet for later use. Previous studies mainly concerned an information retrieval process and not the way of saving documents and ensuring access to the information in the future.

2. RESEARCH METHOD

After finding on the website the required information, which a user intends to use in the future, one can save the content and keep it in private resources or simply can find it again on the internet when it is needed. In the first case, such information may be stored in electronic form by saving interesting content of the page on personal computer or other private device, or may be kept on paper, most often simply by printing it. While in the era of widespread use of electronic devices, printing of a web content seems to be an anachronistic

action, the failure of the concept of "paperless office", as well as the convenience and traditional popularity of printed media are good grounds for the inclusion of this form of storing information in the study. On the other hand, a user can assume that it will be possible to find the information again using a saved link to a web page or using an internet search engine. The purpose of the study was to examine the actual behavior of users when they intend to use the information retrieved from the Internet in the future.

Respondents were asked in a questionnaire, how they act if they plan to use in the future the content of a web page or an article read on the Internet? They had a choice of four behaviors:

- I print interesting content,
- I make a copy on my disk or other electronic device,
- I remember (e.g. in *favorites*) a link to a web page,
- I do not save it in any form. I assume that I can always find it on the Internet, e.g. using a search engine (e.g. Google).

The respondents of the questionnaire were students from universities in the Netherlands, New Zealand, Poland and Turkey. All those countries are well-developed, free-market democracies and they are all members of the OECD (Organization for Economic Co-operation and Development). However, they differ in the degree of economic development, and the level of development of science and higher education. The Netherlands and Poland are members of the European Union. Turkey has the most distinct cultural traditions and historical experiences of the countries concerned. However, it has been applying for membership in the EU (and previously the European Economic Community) since 1959. New Zealand is located in the Antipodes, but its tradition, culture and an educational system are strongly entrenched in European (primarily British) background.

Students constitute a social group which easily assimilates new technologies. Therefore, any contemporary behaviors in using new devices and internet services should be reflected within that group. The respondents from all countries were studying areas related to economics, management, and business administration. Therefore, the survey is not representative for the whole population, it focuses on a specific group of students. On the other hand, the results from different countries and universities are comparable. The research was conducted at four tertiary education institutions:

- Erasmus School of Economics and Rotterdam School of Management, Erasmus University Rotterdam (EUR),
- Victoria Business School (Faculty of Commerce), Victoria University of Wellington (VUW),
- Warsaw School of Economics (WSE),
- Sabancı University (SU) in Istanbul.

The survey was conducted using a group administered questionnaire, so a respond rate was nearly 100%. The high level of external validity was achieved due to distributing questionnaires during compulsory classes. After the rejection of unreliably completed questionnaires, 675 forms were qualified for further analysis.

3. THE MOST POPULAR BEHAVIORS

The results of the survey show that the most popular behavior of students when saving information from the internet for future use is making an electronic copy, 36.7% of respondent chose that answer (see Figure 1). However, nearly equal group (34.8%) usually saves a link to original resource. It is worth noting that 16% of respondents most often print documents. This is astonishing especially in case of students, because it is undoubtedly the least economically justified behavior. The costs of paper and other printing supplies are quite high. In addition, such action may be perceived as extremely not environmentally friendly. It seems that this behavior shows to a certain extent a lack of confidence in electronic media and concerns about the possibility of losing such data. Taking into consideration studies cited in the introduction that showed continued high popularity of paper sources of information (e.g. books, newspapers), the probable cause for printing the content of websites may be the convenience of using a printed content, or a lack of need to have access to a computer or other electronic device for subsequent use of such sources.

Analyzing the results from a different point of view, the survey reveals that majority of students (52.7%) are careful and usually save the content in some form, electronic or printed. Other respondents typically assume that information will be available on the Internet in future. It should be noted that not only not saving

anything, but also remembering only a website address means that no actual information is saved in private resources. Both actions will prove to be reasonable only in the case the content is not removed from the web and the access to the internet is not restricted for other reasons, for example a technical failure. If searched information is important, such behavior can be considered as risky, and even irresponsible. This carelessness can result from a naive belief that the internet is and will be available in every situation, and moreover, that no resources can ever be removed from it.

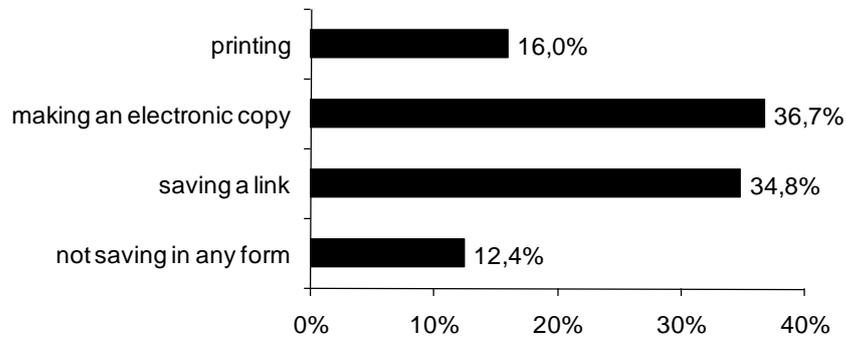


Figure 1. The percentage of respondents' answers to the question about the most popular information saving practice

Only 12.4% of students usually neither save an information nor even write down a link to it. They assume that they will be able to find once again the information if necessary using, for example, an internet search engine. This low value may be caused by earlier experiences of respondents associated with difficulties in finding information.

4. THE RAREST PRACTICES AND EXTREME BEHAVIORS

In addition to the frequency of performing specific actions, respondents were asked to indicate those practices which they never perform (see Figure 2). The study shows that most respondents (32.3%) never take the risk of not saving in any way the content of websites that they intend to use in the future. Whereas, printing is an option never undertaken by one fifth of the respondents. It means that nearly 80% of study participants at least occasionally use information found on the Internet in printed form. The smallest number of indications concern both electronic forms: storing a content (11.9%) and saving a link (5.2%). It confirms that these two forms are the most popular user practices when students intend to use information in the future.

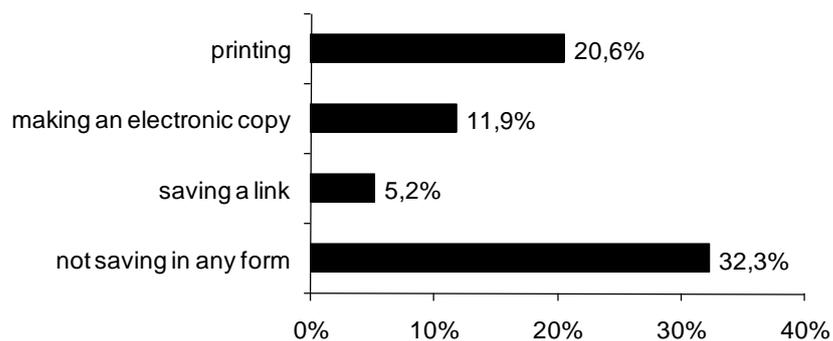


Figure 2. The percentage of respondents never performing particular practices

Interesting results are brought by an analysis of the most extreme behavior patterns. As extreme behaviors are considered those cases where a respondent marked only one type of action performed when intending to make use of the content found on the Internet at a later time.

It turned out that the most extreme behavior was not saving a web content in any form. Nine students who represent 1.3% of all respondents indicated this option. It is a particularly extreme practice if one takes into account that not saving in any form is the least dominant behavior and the one never performed by the largest percentage of respondents. It seems that students who never save content or addresses is a specific group of young, unreliable and not very responsible people.

Saving always only addresses is the second largest extreme practice. That behavior characterizes 8 respondents (1.2% of all participants). Finally, one respondent claimed that he always prints a content for future use.

5. DIFFERENCES BETWEEN RESPONDENTS FROM DIFFERENT COUNTRIES

The surveys were conducted in four different universities from four different countries. Interesting conclusions may provide the comparison of results from those institutions. Although, it should be remembered when analyzing the results that the surveyed students are not a homogeneous group of one nationality with single cultural background. It is a common practice to study abroad. Many students from other EU countries, including Turkey study in other European universities. Also, many students from Eastern Europe and from the countries from the former Soviet Union study at the Warsaw School of Economics and the Sabancı University. Whereas, significant number of students from The Victoria University came to study from various countries particularly from Eastern and Southern Asia.

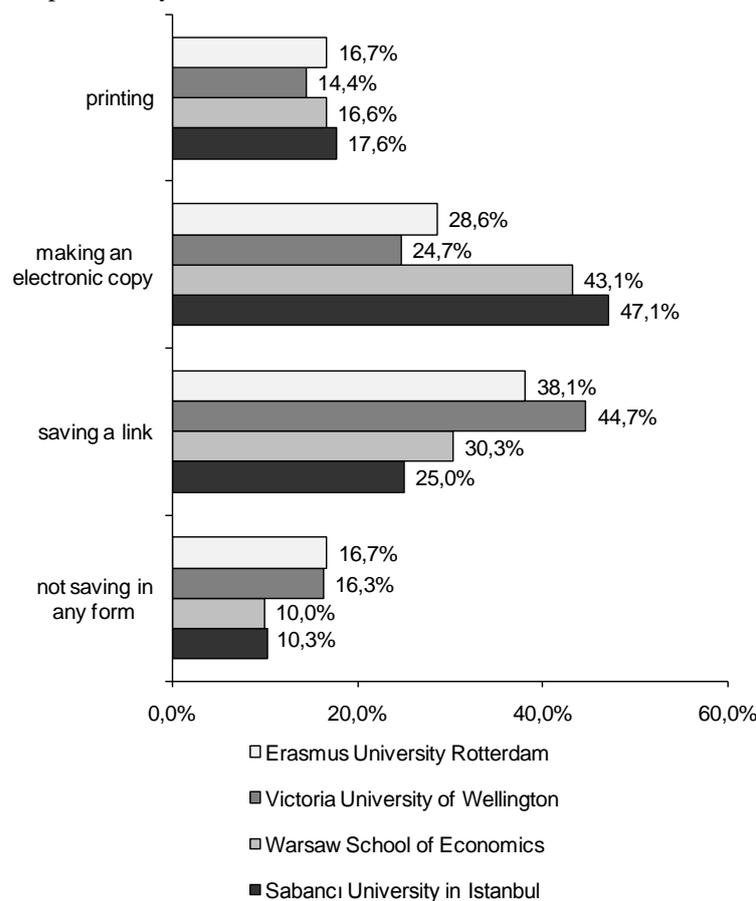


Figure 3. The most popular information saving practice of respondents from different institutions

The survey on the most popular saving behavior clearly shows two pairs of institution with similar results. Significantly less students from the EUR and the VUW most frequently make an electronic copy the students from Warsaw and Istanbul (see Figure 3). Whereas, more participants from Rotterdam and Wellington most often save an internet link and do not practice any form of remembering the source of information. This may be related to the experiences of students in countries with higher quality of access to the Internet. They are more likely to assume that access to the network and internet services is always stable. There are no significant differences between the respondents from different institutions in terms of a number of students most frequently printing an internet content.

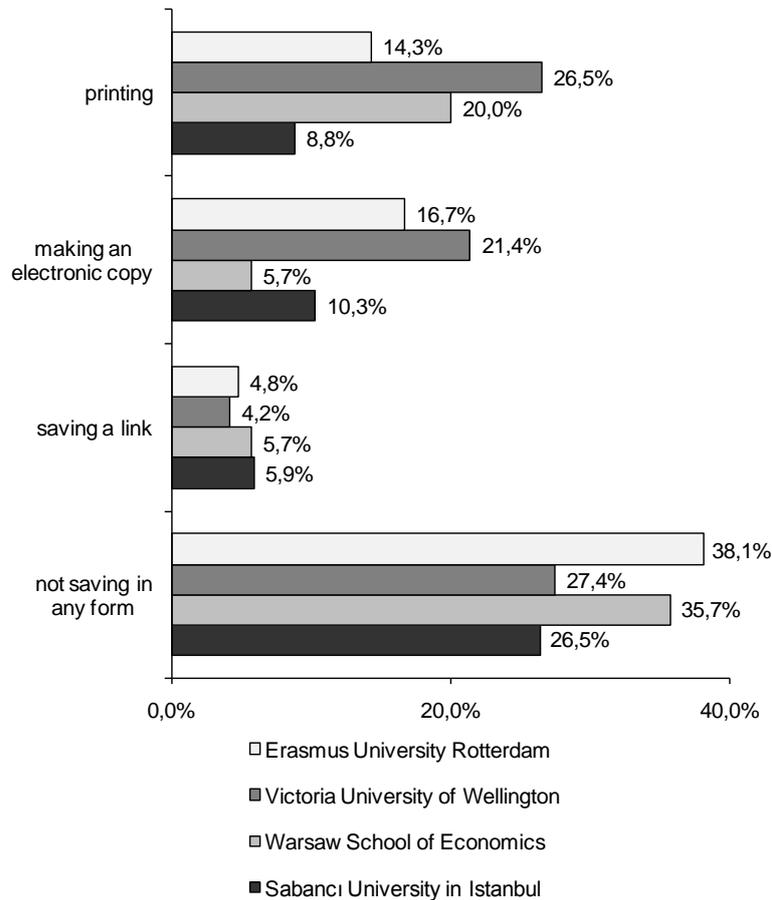


Figure 4. The percentage of respondents from different institutions never performing particular practices

The data on never performed activities do not show such obvious patterns and conclusive findings. Significantly larger percentage of respondents never print any content from the Internet at the Victoria University of Wellington (26.5%) and at the Warsaw School of Economics (20%). That phenomenon could be caused by the availability of printers within a campus. Also, the cost of printing is rather relatively higher for students in Warsaw and in Wellington, in the VUW particularly high for large group of foreign students from South and East Asia. The situation is reversed at the Sabancı University, where students are allowed to print at the convenient facilities at the campus. It can be a reason why only 8.8% of respondents from Istanbul never print a webpage content.

6. CONCLUSION

The behaviors of students declared in the questionnaire are very diverse. There is no single dominant pattern. The most common action taken in order to use a web page or an article content in the future is to make a

copy on a computer or other electronic device. Almost the same number of respondents usually keep only link to such content.

The results show that students' information processing behaviors are not so much digitized as it is expected based on current general opinions about young people, who are supposed to easily and swiftly absorb new technologies and ways to employ them. As many as 16% of respondents most frequently print documents in order to keep information from the internet for future use. Moreover, nearly 80% do it at least occasionally. The frequency of printing is influenced by the cost and availability of printing facilities. It is possible that if students are provided with cheaper or free and convenient printing facilities they will print the content of web pages more often than the survey shows.

The comparison of results from different universities shows two patterns. More students from Dutch and New Zealand institutions most frequently save only a link and do not save a content in any form. Whereas, more students from Poland and Turkey makes an electronic copy. Those differences may be caused by earlier experiences with unsatisfactory network availability.

Constantly observed the rapid development of information technology and the introduction of new electronic devices can change in the future the behaviors that are the subject of this study. Therefore, it seems appropriate to continue the study in subsequent years in order to examine possible changes.

ACKNOWLEDGEMENT

I would like to express my sincere thanks towards all colleagues who helped to conduct the survey, especially Sid Huff, Gordon Hunter, David Johnstone and Janet Toland from the Victoria University of Wellington, Grażyna Aniszewska, Danuta Polak and Jędrzej Wieczorkowski from the Warsaw School of Economics, and Nihat Kasap from the Sabanci University.

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PREFERENCES AND USES OF VIDEO CONTENT AND TECHNOLOGIES AMONG YOUNG PUPILS: A PILOT METHODOLOGICAL STUDY

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ABSTRACT

This paper presents a pilot field research on the user experience of very young students (6-7 years old) with video content accessed via different technological devices. Preferences, uses and practices by the pupils of the first two year classes of the primary school of a comprehensive institute (primary and lower secondary school) in Rome, Italy, have been investigated in the framework of the original methodology KidLab Media Research, an innovative approach for field studies on younger users. Taking into considerations the peculiar characteristics of very young audiences, *ad hoc* tools have been employed in the two classrooms: collective interviews, role playing, simplified questionnaires and yes/no cards. In this way, interaction has taken place with the pupils, their teachers and their parents and with the school psychologist. Both qualitative and quantitative results of this experimental test research on motivations and behaviours of these younger members of the population are shown. Due to the limited size of the considered sample, emphasis is given to the methodology followed, which encompasses the exploration of dynamics of adoption and use, attitudes and cultural patterns, user profiles, purchase intentions, consumptions, psychological and social risks.

KEYWORDS

Children, collective interviews, KidLab Media Research, multimedia content, primary school, qualitative and quantitative analysis, role playing, user behaviour, user experience, user preferences, video technologies, viewing practices.

1. KIDLAB SCHOOL PILOT

The KidLab School Pilot project is a first step towards the direction of researching about young people in schools. Its main objectives are the exploration of dynamics of adoption and use, attitudes and cultural patterns, user profiles, purchase intentions and consumptions, psychological and social risks. KidLab School Pilot involves the comprehensive institute (primary and lower secondary school) "Giorgio Perlasca" in Rome (Italy) through the interaction with teachers and pupils. A set of specific tools was developed for the field research, taking into consideration the peculiar characteristics of younger audiences. results of the first phases of this pilot were presented in a series of papers (Mazzolini et al., 2013; Nicolò et al., 2014; Mazzoni et al., 2015).

2. THE PRESENT STUDY: METHODS AND RESULTS

2.1 Sample and Procedure

In the above mentioned large KidLab School Pilot campaign carried out in 2012, special attention was devoted to the pupils of the first two year classes (IF and IIM) of the primary school, taking into considerations the characteristics of very young audiences and of the school setting. *Ad hoc* tools were therefore employed to investigate the uses and preferences of video content and technologies among these young students (6-7 years old, 34 children, 13 males and 21 females, 9 males and 12 females in the IF class, 4 males and 9 females in IIM), that is simplified tools, both specifically developed and suitably adapted, were used in the classrooms. These first two classes of primary school were investigated by using collective

interviews, role playing, simplified data collection through cards and questionnaires to parents. The corresponding dataset is divided in two sections: qualitative and quantitative data. Qualitative data were collected from the external observations of the collective interviews. The second type was obtained by guided questionnaires in order to evaluate the preferences for technologies and video content. The children were given cards representing different technologies with pictures. During a role playing exercise, participants chose three technologies and three contents from these cards, ranking their preferences.

2.2 Setting and Verbal Introduction

During each two-hour meeting, in both the classrooms there were the following participants: the pupils, a teacher, an interviewer, a recorder, an auxiliary interviewer, the school psychologist. A professor of Psychology was also present in the meeting with the IIM class. At the beginning of the meeting, the interviewer explained to the children the importance of their answers. That is – she said – detailed information on their use of technologies, their preferences about them and the problems encountered when using them allow researchers to design better and more suitable technologies. The interviewer also explained the way of interaction during the meeting: all the pupils can speak freely, no score is assigned, there are no right or wrong answers, the conversation will be recorded. Then, the children wrote their names on small cards and put them on their desks. The auxiliary interviewer gave a silvery envelope to each child.

2.3 Gathering of Quantitative Data

Two tools were used to gather quantitative data: a simplified questionnaire and yes/no cards.

2.3.1 Compilation of a Simplified Questionnaire about Usage

To investigate both children's technology usage and viewing habits about video content, a simplified version of a questionnaire already used for older students was administered to the young pupils. Figure 1 shows the Technology section of the questionnaire, which was handed out to each child by the auxiliary interviewer, who helped the pupils fill in the questionnaire, answer by answer.

	TV	<input type="checkbox"/> I use it		STREAMING VIDEOS	<input type="checkbox"/> I use them
	SATELLITE TV	<input type="checkbox"/> I use it		DOWNLOADED VIDEOS	<input type="checkbox"/> I use them
	VIDEOTAPES	<input type="checkbox"/> I use them		MOBILE TV	<input type="checkbox"/> I use it
	CAMCORDER VIDEOS	<input type="checkbox"/> I use them		PORTABLE DEVICES	<input type="checkbox"/> I use them
	DVDs/BLU-RAYS	<input type="checkbox"/> I use them		VIDEOGAMES	<input type="checkbox"/> I use them
	CINEMA	<input type="checkbox"/> I use it			

Figure 1. Technology section of the questionnaire

After filling out the questionnaire, each child folded up the sheet of paper with the questionnaire and put it in his/her silvery envelope. Figure 2 shows the Content section of the questionnaire which was administered by the auxiliary interviewer following the same procedure described above.

	CARTOONS	<input type="checkbox"/> I watch them		REALITY SHOWS	<input type="checkbox"/> I watch them
	CHILDREN'S TV PROGRAMMES	<input type="checkbox"/> I watch them		MUSICAL VIDEOS	<input type="checkbox"/> I watch them
	FILMS	<input type="checkbox"/> I watch them		NEWS	<input type="checkbox"/> I watch them
	TV SERIES	<input type="checkbox"/> I watch them		VIDEOCLIPS	<input type="checkbox"/> I watch them
	DOCUMENTARIES	<input type="checkbox"/> I watch them		CHILDREN MADE VIDEOS	<input type="checkbox"/> I watch them
	SPORT PROGRAMMES	<input type="checkbox"/> I watch them		COMMERCIALS	<input type="checkbox"/> I watch them

Figure 2. Content section of the questionnaire

2.3.2 Gathering of Yes/No Cards

The interviewer explained the card game. The yes/no cards were distributed and, after their choices, the pupils put them into their silvery envelopes, according to the following topics: Do you watch videos alone? Do you watch videos with your brothers or friends? Do you watch videos with your parents? Do you use a mobile phone? Do you use Facebook? Do you use a computer?

2.4 Role Playing about Preferences

The interviewer explained the role playing game. Each child was asked to choose a secret identity and transform himself/herself into a superhero. The superheroes would take off with a spacecraft in search of a desert island where they would build their secret base. During their journey, each of them would be allowed to bring only three technological devices and to watch only three types of video content.

2.4.1 Preferences about Devices

Figure 3 shows the gamut of the considered devices. Cards with pictures of the technological devices were handed out to each child, who selected his/her three favourite cards while indicating a preference order over the three devices (no. 1, no. 2, no. 3) and put them into the silvery envelopes.



Figure 3. Cards with technological devices

2.4.2 Preferences about Content

Figure 4 shows the gamut of the considered video content. In the same manner as above, the cards with the

representations of the video content were distributed. Each pupil chose his/her three preferred cards, indicated a preference order over them and put them into the envelopes.



Figure 4. Cards with video content

2.5 Collective Interview

The interviewer presented the second part of the role playing experience. The superheroes arrive at a television studio where they are interviewed about their technological preferences by experts who can take part in the television programme by asking questions.

2.5.1 Collective Interview about Television

In order to investigate the aspects relevant to content, the interviewer asks children what they watch on TV, why they do it and what they like most.

Here are some answers by the students of IF.

I watch the news because they are very important / I watch Pokémon because I like when they challenge each other / I watch Pokémon because good guys always win in the end / I watch Batman because I like superheroes / I watch Sidekick because good and bad people fight against each other and punch each other in the face / I watch Spiderman because he is my favourite hero my uncle says I was born with the name Spiderman written on my forehead

Here are some answers by the students of IIM.

I watch cartoons with my brother because we enjoy ourselves / I watch the series of Violetta and sometimes Patito Feo because I like to see what they do they dance and go to school / I watch Ninja cartoons because I like fighting with my elder brother, who always beats me

In order to know the moments of the day and the ways of watching, the interviewer asks children when they watch TV.

Here are some answers by the students of IF.

All day on Saturday and Sunday / From half past four to the evening / In the afternoon and in the evening I can't count how many cartoons I watch / In the evening while I eat alone

Some answers by the students of IIM are reported below.

After coming out of school I do homework, then I watch TV / Sometimes in the morning and in the afternoon before doing homework, then I do homework and after I watch TV again / I don't tell my parents what I watch on TV because they don't ask me about it / At midnight I fall asleep / Not during meals because my father is with us

Moreover, some students refer that they are scolded by their parents since they watch too much TV.

2.5.2 Collective Interview about Computers and the Internet

In order to investigate the activities carried on by the students using the computer, the interviewer asks them what they do with the computer and with whom they use it.

Here are some answers by the students of IF.

I help my mother because she always has a lot of things to do / I see my mother going on the Internet and sometimes she lets me play / I use the computer only to play, but I ask my mother to let me play / I play with the computer, but I don't remember the games I play because I use it very little I study mathematics and I do operations and calculations / I send messages to the people I choose / I send letters to my aunt and my grandparents I make drawings and I send them on the Internet

Here are some answers by the students of IIM.

I go on Paint and I make drawings freely you can choose the colours and then you draw with the mouse / I use my mother's password and I go on Facebook alone but I must always tell her before I do that / My mother goes on YouTube for me and I see the Guinness World Records she remains with me because she prevents me from seeing some things, such as disgusting records / Sometimes I type in the password of my cousin who is seventeen and I write to his friends / I play chess games on the computer and I always win I also play with my father on a real chess-board and I win as well / At my father's home I ask him if I can use his computer if he says yes, I play

In the class IIM two pupils do not use the computer, a boy knows about Twitter, eight students use the computer alone.

Here are the answers by the children of IF about the way of use of Facebook.

I see something but I don't go on it often I use my father's account / I write letters to my cousins / I send messages to everybody my father has opened a profile for me because I'm able to use it

Here are the answers by the children of IIM about the use of Facebook.

I put in my password and I go on Facebook on Facebook I have my photo, my cousin's and my brother's photos and the photo with my friends of kindergarten / It is better to talk with friends on Facebook because they can't scold you and if I write a dirty word, nobody tells it to my father and my mother / I type in unknown names and surnames and I see who they are

2.5.3 Collective Interview about Videogames

The interviewer asks what their preferred videogames are, what kind of games they are and why the children like them.

Here are some answers by the students of IF.

Dinofroz: two dinosaurs fighting weapons / The Smurfs because they teach you to dance but I don't have much time because I always stay at school / I've got a secret password on DS and I play with Mario Bros I like it because I master it / I dance with Wii I must follow the steps of a dancing woman / Need for Speed Nitro on Wii I must win a lot of championships

Fifteen children play with videogames alone.

Here are some answers by the students of IIM.

Super Mario Bros and the videogames in which people dance and you must follow them using the Wii there are already available dances and I don't choose the music / I play with the Wii with horses I feed them, I brush them, I take care of them I also participate in horse races / Even if it is a videogame for boys, I like Assassin's Creed there is an assassin who is a good fellow and he must take all the flags this is a my father's game and he taught me to play / With Ninja you must before fight with the weakest one, then with the strongest one / I play cards because when I'll be older I'd like to be good with cards

In the same class the interviewer asks with whom the children play videogames.

I play Nintendo alone, Wii with my sister / I play chess alone and I always win

Seven children play with their fathers, only one plays with his mother.

Twelve children play videogames alone.

2.6 Quantitative Results

Table 1 shows the technology usage by the students of both classes, IF and IIM (sample: IF: 21 pupils; IIM: 13 pupils; males: 13; females: 21; total: 34 pupils). The results are expressed in percentage.

It can be seen that all the students watch TV. All the children of IF use DVDs and downloaded videos. Considering both the classes in aggregate terms, the most frequent activities are those related to TV (100% of the students), DVDs (94.12%), video downloading (94.12%), videogames (94.12%) and cinema (91.18%). Satellite TV (55.88%) and mobile TV (58.82%) are the least used technologies. Differences of usage between the two classes and between males and females can also be found in the table. As an example, the boys make larger use of videotapes, camcorder videos, DVDs, streaming videos, portable devices and videogames. The girls make more use of satellite TV, downloaded videos and mobile TV and they go more often to the cinema.

Table 2 shows the aggregate results for the two classes in terms of percentage with regards to the technology preferences of the children. According to what said above with reference to role playing, each

student indicated three favourite technological devices together with a preference order over the three preferred devices.

Table 1. Technology usage

	TV	Satellite TV	Videotapes	Camcorder Videos	Dvds Blu-Rays	Cinema	Streaming Videos	Downloaded Videos	Mobile TV	Portable Devices	Videogames
<i>IF</i>	100.0%	52.4%	61.9%	90.5%	100.0%	90.5%	85.7%	100.0%	61.9%	85.7%	95.2%
<i>IIM</i>	100.0%	61.5%	69.2%	84.6%	84.6%	92.3%	76.9%	84.6%	53.9%	76.9%	92.3%
<i>Males</i>	100.0%	53.9%	76.9%	92.3%	100.0%	84.6%	92.3%	92.3%	53.9%	84.6%	100.0%
<i>Females</i>	100.0%	57.1%	57.1%	85.7%	90.5%	95.2%	76.2%	95.2%	61.9%	80.9%	90.5%
TOTAL	100.0%	55.9%	64.7%	88.2%	94.1%	91.2%	82.4%	94.1%	58.8%	82.3%	94.1%

Table 2. Technology preferences

	TV	Satellite TV	Videotapes	Camcorder Videos	Dvds Blu-Rays	Cinema	Streaming Videos	Downloaded Videos	Mobile TV	Portable Devices	Videogames
<i>1st Choice</i>	2.9%	0.0%	2.9%	3.0%	0.0%	24.2%	5.9%	0.0%	0.0%	18.2%	39.4%
<i>2nd Choice</i>	20.6%	0.0%	2.9%	6.1%	0.0%	18.2%	11.8%	2.5%	6.1%	12.1%	15.2%
<i>3rd Choice</i>	17.6%	3.4%	5.9%	12.1%	14.7%	6.2%	8.8%	2.9%	15.2%	0.0%	0.0%
<i>No Choice</i>	58.8%	88.2%	88.2%	78.8%	85.3%	51.5%	73.5%	94.1%	78.8%	69.7%	45.5%

It can be observed that there are scarcely preferred technologies, such as downloaded videos, satellite TV, videotapes, DVDs, mobile TV, camcorder videos and streaming videos. The most favourite technology is videogames (39.4% as first choice). The children also prefer cinema (24.2%) and portable devices (18.2%). Apart from first choice and no choice, table 2 also shows the percentages relevant to the cases of second choice and third choice for each technology. As an example, it can be noted that TV, cinema and videogames are the most favourite items as second choices.

Table 3 shows the content usage by the children of both the classes, the sample being the same. Again, the results are expressed in percentage.

Table 3. Content usage

	Cartoons	Children's TV programmes	Films	TV series	Documentaries	Sport programmes	Reality shows	Musical videos	News	Videoclips	Children made videos	Commercials
<i>IF</i>	100%	80.9%	95.2%	80.9%	100%	85.7%	80.9%	85.7%	85.7%	85.7%	71.4%	100%
<i>IIM</i>	100%	92.3%	92.3%	92.3%	61.5%	92.3%	69.2%	100%	84.6%	76.9%	84.6%	100%
<i>Males</i>	100%	84.6%	92.3%	84.6%	84.6%	92.3%	76.9%	92.3%	76.9%	84.6%	76.9%	100%
<i>Females</i>	100%	85.7%	95.2%	85.7%	85.7%	85.7%	76.2%	90.5%	90.5%	80.9%	76.2%	100%
TOTAL	100%	85.3%	94.1%	85.3%	85.3%	88.2%	76.5%	91.2%	85.3%	82.4%	76.5%	100%

All the students watch cartoons and commercials. All the pupils of IF watch also documentaries and all the pupils of IIM watch musical videos too. In aggregate terms for the two classes, many children also watch films (94.12%). In addition, as a whole they are strongly interested in musical videos (91.18%) and sport programmes (88.24%). Apart from cartoons and commercials (100% for both males and females), males prefer films, sport and musical videos (92.31 for all of them), while females prefer films (95.24%), musical videos (90.48%) and news (90.48%).

Table 4 shows the aggregate results for the two classes with regards to the content preferences of the children. Each student indicated three favourite types of content together with a preference order.

Table 4. Content preferences

	Cartoons	Children's TV programmes	Films	TV series	Documentaries	Sport programmes	Reality shows	Musical videos	News	Videoclips	Children made videos	Commercials
1st Choice	26.5%	8.8%	5.9%	17.6%	20.6%	11.8%	0%	2.9%	0%	5.9%	0%	0%
2nd Choice	29.4%	11.8%	5.9%	20.6%	11.8%	5.9%	0%	2.9%	5.9%	5.9%	0%	0%
3rd Choice	14.7%	61.8%	85.9%	52.9%	61.8%	73.5%	94.1%	82.4%	91.2%	88.2%	94.1%	100%
No Choice	26.5%	8.8%	5.9%	17.6%	20.6%	11.8%	0%	2.9%	0%	5.9%	0%	0%

As first choice, cartoons (26,5%), documentaries (20.6%) and TV series (17,6%) are the most favourite content. Cartoons (29.4%) and TV series (20.6%) are the preferred items also as second choice. It can be seen that commercials have not been chosen at all. It can be also observed that there is a concentration of interest by the children in few types of content.

Table 5 shows the results relevant to watching modalities with regards to the people with whom the children use multimedia technologies and watch their video content. Three cases been considered: alone, with siblings and/or friends, with parents. The results are presented distinguishing between the two classes and between males and females.

Table 5. Social modalities

	1F	2M		Males	Females	TOTAL
Alone	100.0%	92.3%		100.0%	95.2%	97.1%
Siblings/friends	100.0%	100.0%		100.0%	100.0%	100.0%
Parents	95.2%	100.0%		92.3%	100.0%	97.1%

It can be seen that there are strong similarities. All the three cases occur without large differences. All the students of IF use the considered technologies both alone and with siblings and/or friends. All the students of IIM make use of the technologies both with their parents and with siblings and/or friends. All the males of the two classes use the technologies both alone and with siblings and/or friends. All the females make use of them both with their parents and with siblings and/or friends.

Table 6 shows the use of mobile phones, Facebook and personal computers by the pupils, distinguishing again between the two classes and between males and females.

Table 6. Usage of mobile phones, Facebook and personal computers

	1F	2M		Males	Females	TOTAL
Mobile phone	100.0%	92.3%		100.0%	95.2%	97.1%
Facebook	85.7%	76.9%		84.6%	80.9%	82.4%
Personal computer	90.5%	92.3%		92.3%	90.5%	91.2%

All the children of IF and all the males use a mobile phone. A large majority of the children uses Facebook. Almost everyone has a personal computer.

3. CONCLUSIONS

This exploratory study has shown which types of technological platforms and video content are used by the children of two school classes of the primary school (age 6-7 years) in Rome (Italy) in their everyday lives, not only at school, but during all the day.

During the collective guided interviews, almost everyone was eager to say something about himself or herself, showing enthusiasm for being interviewed. These children seem to explore all the new technologies and they show outstanding abilities in using them. They know about social networks and use them with older brothers or sisters, cousins and also with their parents.

The quantitative section of the experimental research relied on simplified questionnaires, purposely built for very young children, so they could easily express their opinions without the presence of their parents as mediators. The children were enthusiastic to answer to the questions and to be an active part in the research. They seem to use almost every technology at their disposal. Anyway, distinguishing between the two classes and between males and females, the outcomes achieved show some differences in both the types of technological devices used and the multimedia content preferred. They watch almost every video content under consideration, embracing a large variety of content. They prefer cartoons most of all, but also TV series, documentaries and children's TV programmes significantly attract their interest. Among the technologies considered, they prefer videogames, cinema and television and they appear not to like downloaded videos.

However, due to the limited size of the sample observed, no emphasis has been given to the specific results obtained. As a matter of fact, the study has been intended to be a preliminary exploration, i.e. a pilot research whose main interest resides in testing the *ad hoc* methodological tools employed. This approach has proven adequately effective and efficient and has found the children's and teachers' satisfaction.

Further studies, based on wider field research campaigns and on the use of other analysis tools, both qualitative and quantitative, could ensure a greater representativeness of the results and allow the investigation of dynamics of adoption and use, attitudes and cultural patterns, user profiles, consumptions and psychological and social risks.

ACKNOWLEDGEMENTS

The authors wish to thank Anton Maria Giorgi, ex-headmaster of the comprehensive institute "Giorgio Perlasca", the teacher and headmaster's assistant Monica Melloni, Dr. Laura Amabrini, all the teachers who have offered their support and Prof. Stefano Livi (Sapienza University of Rome, Faculty of Medicine and Psychology, Department of Social and Developmental Psychology).

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E-GOVERNMENT READINESS, BUSINESS ENVIRONMENT AND ENTREPRENEURSHIP –THE EFFECT DEPENDS ON THE INCOME LEVEL OF THE COUNTRY?

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ABSTRACT

E-government initiatives can help to improve the business environment and the creation of new businesses. The present article has as its main goal to measure the impact of change of the index of e-readiness of e-Government (and its sub-indices) on ease of doing business, in the new business rate and the perception of corruption in countries of high, medium and low income, in order to test whether the effects depend on the income level. The study used a panel data (repeated measures), with four points (years 2008, 2010, 2012 and 2014), with three periods of change (2008/2010, 2010/2012 and 2012/2014), with data the following databases: Doing Business Report of the World Bank, the United Nations Survey on e-Government, Corruption Perception Index of Transparency International and World Bank's Survey on Entrepreneurship. Data were analyzed using mixed linear models procedures with fixed and random effects. The data suggest that different models should be used to understand e-government relationship with other variables, controlling for income level effects, since the effects are diverse and depend on the income level. Indications for future research are presented.

KEYWORDS

Electronic Government; Starting Business; Income level; Impact Evaluation

1. INTRODUCTION

The services provided by a successful implementation of e-Government can be very helpful to the citizens, who can have the convenience of requesting Government services at any time, and most often without the typical delay of traditional services provided by Local, State and Federal Governments (Morgesson & Mithas, 2009). In addition, the services delivered in an electronic format (i.e., e-services) usually are good for business, because they allow a faster process to start a company, to obtain building permits, to hiring people, to import and export goods, and many other key processes for companies. This improvement can be an important incentive for the creation of companies and their preservation, which can improve the rate of business creation in a given country, and other economic indicators relating to the business environment. The underlying idea is that the improvement in the establishment of e-government applications also improves the business environment, as measured by the dimensions of the Doing Business Report (Almeida & Zouain, 2014).

Yet, the level advancement in the implementation of e-government projects is very diverse between countries, and in general, the lower income countries have significantly lower levels of success in the creation of e-government applications, rely on a much more limited infrastructure, have a population less educated and proficient in IT tools, and therefore a significantly weaker participation through e-participation processes.

Hence, it is essential to understand the impact of e-government initiatives in different contexts and their impact on improving the business environment, in the creation of companies and reduce the perception of

corruption in the countries, and is the objective of the present work, organized in six sections. In the following section, we will briefly present a review of the literature on the electronic government, and its impact on the business environment and in reducing corruption, plus a succinct analysis of the advances of the e-government initiatives, with a focus on the great diversity of the level of success of the applications around the world and its implications. The third section discusses the methodologies and methods used, while the fourth section presents data analysis. The fifth section presents the final considerations and conclusions.

2. LITERATURE REVIEW

Research on Electronic Government is growing, but not yet in a mature stage. Although the volume of publications has increased considerably in the last 10 years, the first articles related to the topic just showed up in the 1990's, and did not receive much thought until early 2000 (Almeida et al., 2014). The implementation of e-government platform is an objective of the majority of Governments, as it allows transparency in public acts on information about income and expenses, in addition to providing a greater amount of available services, increasing the efficiency and responsiveness of Government (& Mihai Brunetti, 2003; Mahalik, 2014). Margetts (2006) indicates that a wide adoption of e-government initiatives increases the chance that the e-government projects can bring economic and social benefits for citizens.

Therefore, a series of articles seeking empirical evidence to verify the strength of these effects have been developed. This was the goal of the seminal article of Andersen (2009) which used a study with panel data with 149 countries, with two data points (two years) to compare the improvement in e-Government and their effects on control of corruption (more specifically in the perception of corruption). The deployment of e-government services also contributes to the creation of an electronic State, minimum, transparent, responsive and accountable (Margetts, 2006). However, the degree of success in e-Government implementations has always been different among countries. Therefore, the concept of e-readiness was created to provide a unified framework to evaluate the magnitude of this digital disparity between the countries during the 1990's (Hanafizadeh et al., 2009).

Hanafizadeh et al. (2009) proposed a model of measuring the concept of e-readiness, based on the convergence of various e-readiness assessments (e-government readiness index) consists of the following dimensions: infrastructure and access; access to and use of ICT by households and individuals; e-business; e-education; e-Government and indicators allowing comparisons and measurement of the level of ICT development. In addition, as an initiative to measure the progress of adoption of e-government solutions in different countries, the United Nations (UN) has created an index known as e-government readiness index (e-readiness) consisting of the indices of human capital, infrastructure, online services (formerly Web Measure) and e-participation index (UN 2014).

The human capital index is a composite of the adult literacy rate and the combined gross enrollment rate of primary, secondary and tertiary levels (UN 2014). The infrastructure index consists of five primary indices relating to the ability of a country's infrastructure, especially indicators that relate to the ability to provide e-government services. The Web index Measurements (called online services index in later editions) was based on a five-stage model of Andersen & Henriksen (2006), which in turn was based on previous levels of sophistication of the online presence framework of the United Nations.

The e-participation index aims to measure the transition from a passive to an active role of e-Government. The model includes three components: e-participation (access to information on demand), e-consultancy (people involved in discussions and contributions on public policies and services) and e-decision (empowerment of people for co-design of public policy and services) (UN 2014).

Most developed nations have made greater progress in this area, especially Europe, USA, South Korea and Japan, leaving most of the world behind (World Bank, 2014; Almeida & Zouain, 2014). Heeks (2006) indicates that the implementation of e-government initiatives in developing countries requires a customization often complex between the technology and the specific contexts of these countries, which hinders the adoption of a model of e-Government in these countries.

Additionally, the e-government initiatives depend on the use of a more complex ICT infrastructure (Stanforth, 2006) that is strongly associated with the income level of a country, higher-income countries tend to have a much more developed infrastructure and tend to invest more in e-government applications. As a result, the implementation of e-Government varies around the world, with a substantial investment for the improvement of infrastructures of these countries, as well as the creation of new services for citizens (Ebrahim & Irani, 2005).

In addition, the higher income countries usually have a set of institutional factors that make them easier for doing business than lower income countries, reflected in better indicators in the dimensions of Doing Business (DB). On the other hand, corruption tends to be higher in poorer countries and without stronger public institutions (Transparency International, 2013). For operational and analytical purposes, the main criterion for the classification of economies by income by the World Bank is the gross national product (GNP) per capita. As there are changes in the GNP per capita value over time, the composition of country income groups can change depending on the edition of World development indicators calculation.

For the present study, the classification is based on GNP per capita in the most recent year with data are available (the year of 2013 was used in this study), and the countries remain in the same category for all years. Low-income economies (low income) are those with a per capita GNP of \$ 1035 or less in 2012. The classified as middle-income economies are those with a per capita GNP of more than 1035 dollars, but less than \$ 12,616. Within the range of middle-income countries, the middle-income countries of the lower stratum (lower middle) and the middle-income countries of the upper stratum (upper middle), separated by a difference in the per capita GNP of \$ 4,085. According to the World Bank classification, the high-income economies (high income) are those with a per capita GNP of \$ 12,616 or more (World Bank, 2014).

The Doing Business report provides a quantitative measure of regulations for starting a business, dealing with construction permits, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, fulfillment of contracts and closing a business-how to apply to small and medium-sized national companies (World Bank, 2014). The indicators are usually composed of a combination of the number of procedures time needed to perform some crucial tasks of business how to register a business, closing, export and import, the income tax rate, access to credit, labor costs and many other indicators (World Bank, 2014). Also from the World Bank, the Entrepreneurship Survey measures the entrepreneurial activity in more than 100 countries in the period 2000-2014. The database includes cross-country data, time series on the number of enterprises in total and recently registered, collected directly from the Registrar of companies from all over the world.

Finally, one of the most widely used instrument for measuring corruption in a country is the index of perception of Corruption (Corruption Perception Index -CPI), published since 1995 by Transparency International, ordering the countries of the world according to "the degree to which corruption is perceived to exist among public officials and politicians". The corruption perception index (CPI) measures the level of perception of public sector corruption in 180 countries and territories around the world (Transparency International, 2010). The countries which have highest perception of corruption have a near-zero indicator, while the smallest perception has near index 10.

3. METHODOLOGY

All data were obtained for four non-consecutive years (2008, 2010, 2012 and 2014). The databases employed were: Doing Business Report issued by the World Bank (World Bank, 2014), United Nations research on e-government (UN e-Government Survey) (UN, 2014), Entrepreneurship Survey also from the World Bank, in addition to database corruption perception (Corruption Perception Index) published by Transparency International. The choice of period of analysis was due to the availability of data for selected databases. The data were initially imported and processed in the Microsoft Excel 2010 software.

The study used a data analysis method known as panel data (panel data). A Panel means that a variable for the same subject (subject) is available at different times. Hsiao (2003) indicates that the Panel data have become increasingly popular due to a greater availability of data in this format, and because panel data is more capable to respond to the substantial questions than a set of indicators measured at a single point in time, which is usually found in a cross-section data. Nevertheless, the study also can be classified as a correlational study, since it is conducted to determine the relationship between variables (MARCZYK et al, 2005).

The statistical analyses were performed with the software: SPSS version 22.0, and the significance level for all statistical tests was 0.05. The main research question article is structured as follows:

The improvement of the e-government readiness is associated with improvement of the ranking of a country ranking in Doing Business Dimensions or the creation of new businesses? This relationship depends on the income level of the country?

To test the hypothesis that the impact of e-Government in the dependent variables is not the same among countries with different income levels, countries have been grouped into three categories by using the World Bank classification. The first group, called, contains the low-income countries and lower middle income, the second group called middle income, upper middle income countries contains, while the third group called high income, have exclusively countries classified by the World Bank as high income (World Bank, 2014).

During the regressions, this categorization serves as a dummy variable, by creating interaction terms between the variables by income level. Therefore, instead of having a single slope for all countries, there is a coefficient for each country group, when used as a term of interaction, being thus possible to identify the impact of each variable, by income group, in just an equation or model for the dependent variable. It is important to note that to establish causality between variables in non-experimental designs is not possible, but the approach of search panels dealing with this limitation of the data, using also the quantification of variable change instead of using the actual values. These variables are marked with the symbol Δ (delta) to facilitate understanding.

4. ANALYSIS

After the consolidation of databases, errors and test data consistency and visual inspection, the shape of the distribution of the data was tested by One Sample Kolmogorov-Smirnov test. The null hypothesis of this procedure establishes that the distribution is normal, and values of p greater than 0.05 indicate that the data has an approximately normal distribution, and therefore appropriate to go through tests and procedures that require the normality to provide adequate results (Hair et al., 2010).

The results indicated that no variable tested had a normal distribution (Z statistic varying 0.050 to 0.199-p-values of $p \ 0.00 < p = 0.004$). Although the visual graph analysis for the PP plot indicated that for most variables, the deviation relative to a normal distribution was not large. In the sequence, we tested the distribution of the main variables and compared the countries according to their income level. The results are in table 1:

Table 1. Descriptive Statistics by income level

Variable	Country Income level								
	Low and Lower income			Upper Middle income			High income		
	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
Rank Doing Business	41,00	191,00	138,98	27,00	151,00	84,56	1,00	168,00	32,33
E gov ranking	11,00	187,00	129,69	12,00	181,00	84,16	1,00	170,00	41,92
Egov Index	,09	,60	,31	,27	,73	,48	,23	,95	,70
Human Capital Index	,11	,96	,59	,49	,98	,81	,53	1,00	,90
E Participation Index	,00	,80	,15	,00	,95	,24	,00	1,00	,48
Online service index	,01	,69	,24	,01	,84	,38	,03	1,00	,62
InfraStructure Index	,01	,43	,10	,01	,62	,27	,04	,94	,57
Corruption Perception	1,10	6,50	2,86	1,30	7,10	3,61	1,70	9,46	6,64
TEA- Total Early stage entrepreneurship	7,00	52,10	22,00	4,00	36,00	14,44	2,40	24,30	7,79

The descriptive statistics presented in table 1 allow you to compare different groups with the income group of countries (low income, middle income and high income), and indicate that higher income countries feature better indicators in all the variables studied, except for entrepreneurship, indicating a linear relationship between the income and the remaining indicators.

However, to verify the statistical significance of these differences, a comparison of averages, using the procedure analysis of variance – ANOVA (Analysis of Variance), having as independent variable the variable of belonging to the Group and as dependent variables the other variables of the study. All comparisons were statistically significant, with p-value < 0.001. In addition, the post-hoc procedure of Tukey HSD to compare the differences between the possible pairs for each of the variables and check which of the groups of countries separated by income feature difference in average values. 54 comparisons were carried out (9 variables x 6 possible combinations of the 3 groups, taken 2 to 2). All comparisons showed significant difference with p-value of all comparisons $p < 0.001$. The next step was to perform a regression of variables

against two main dependent variables of the study: entrepreneurship and the ranking of the ease of doing business (Easy of Doing Business ranking-EoDB). From this point the present variables analyses in terms of variation and not absolute values. These variables are preceded by the symbol delta (Δ).

The first model, in order to explain the change in the rate of new businesses, we used as independent variables the changes in indices of e-readiness of e-Government, and its sub-indices and also the change in the perception of corruption (Corruption Perception Index -CPI), for all groups (high income, average income, and low income). The second model had as its aim to explain the variation in the classification of the country the EoDB, using the sub-indices of e-readiness of the Government and change the perception of corruption (CPI) for all groups.

We used a similar procedure to the stepwise, where predictors were included one at a time, the models were compared using the criteria usually employees of Akaike Information Criterion (AIC) to select between the generated models. Lowest AIC indicates models that best fit the data.

To verify the relationship between the change of variables and dimensions-Government and Doing Business, we employ a linear mixed effects model (MIXED) implemented in the SPSS software. For a more comprehensive review of the application of such models, we suggest that readers consult the works of McCulloch and Searle (2000), and Verbeke and Molenberghs (2000).

Briefly, in a linear mixed effects model the responses of a subject (subject) are the sum (linear) of fixed and random effects. If a given effect affects the population average, is a fixed effect, if an effect is associated with a sampling process, for example, is called the subject effect and is considered a random effect. In addition, in a mixed effects model the random effects contribute only to the covariance structure of the data, that is, they do not change the coefficients.

The use of mixed models presents a clear advantage over ANOVA methods on actual data modeling, since when you ignore variations present the random effects can produce estimates of standard error incorrect or get fake positive tests (SPSS, 2013). In this study, we employed SPSS version 22 and the PROC MIXED procedure (SPSS, 2013) to perform an analysis of the relationship between the change in rates of e-Government and the change of the EoDB and TEA using a linear mixed effects model. The fixed effects were changes in sub-indices of e-readiness (infrastructure, e-participation, online services and human capital indices) and income group (high, medium, and low). For random effects, we had the intercepts of the subject (countries), keeping fixed inclinations by factors (or interactions). Visual inspection of the errors did not indicate deviations of linearity or normality.

The first model had as dependent variable Δ Doing Business ranking (Δ EoDB), and the indexes that make up the e-readiness as predictors along with the group variable. The results are available in Table 2:

Table 2. Estimates for Fixed Effects-dependent variable (Model 1)

Δ Ease of Doing Business Ranking Parameter	Estimate	Standard Error	GL	t	SIG. p.	95% confidence interval	
						Lower Limit	Upper Limit
[GROUP = 1.00]	0.449	0.549	282.249	0.818	0.41	-0.631	1.53
[GROUP = 2.00]	1.886	0.656	282.825	2.877	0.00	0.596	3.177
[GROUP = 3.00]	2.918	0.609	247.188	4.792	0.00	1.719	4.117
Δ HumCapInd	-102.797	6.657	389.315	-15.44	0.00	-115.885	-89.708
Δ EPartInd	-21.537	2.049	399.153	-10.51	0.00	-25.564	-17.509
Δ OnServInd	-43.342	2.968	464.434	-14.6	0.00	-49.173	-37.51
Δ InfraInd	-55.378	5.749	439.299	-9.632	0.00	-66.677	-44.078

a. Dependent Variable: Δ Ranking Ease of Doing Business

Group 1-low income GROUP MIDDLE INCOME Group 2 – 3 – HIGH INCOME

The model obtained indicated to be in low income groups does not bring a significant impact on the ranking of EoDB (estimate for Group 1 parameter is statistically equal to 0 ($b = 0.449$, p value = 0.0414), while for the medium and high income countries, the parameters indicate a worse performance in Doing Business dimensions. For example, belong to the Group 3 (high income) meant a loss of almost three positions in the ranking, keeping all other factors constant.

The improvement of the human capital index had the strongest effect on the EoDB ranking variable ($t = -15.441$). For example, according to the model, if a country in Group 1 (low income) had an increase in Human Capital index 0.10 10 positions in the current rankings improve. For comparison, the same country should improve the index and 0.45,-participation in the online index service by roughly 0.25, and infrastructure by 0.20 to achieve the same improvement of 10 positions. All these indices can range from 0 to 1 (UN .2014).

The comparative fit index model was $AIC = 3476.53$. As the variable of belonging to the Group of income had a significant effect, an effect of interaction was tested between the variable of belonging to the Group of income and the predictors in a new model, which obtained a higher setting, with $AIC = 3410.6$. The main advantage of the second model is the calculation of a different regression coefficient for each group and variable, making it possible to verify how the impact is different for every combination of variable and group. The results are in table 3:

Table 3. Estimates for Fixed Effects-dependent variable Δ EoDB Ranking (Model 2)

Parameter	Estimate	Standard Error	GL	t	SIG.	95% confidence interval	
						Bottom Limit	Top Limit
Intercept	1.008	0.392	208.324	2.574	.011	0.236	1.781
[GROUP = 1.00] * Δ HumCapInd	-79.476	6.704	340.742	-11.855	.000	-92.663	-66.290
[GROUP = 2.00] * Δ HumCapInd	-96.014	10.208	267.411	-9.406	.000	-116.113	-75.916
[GROUP = 3.00] * Δ HumCapInd	-119.148	14.531	248.560	-8.200	.000	-147.767	-90.529
[GROUP = 1.00] * Δ EpartInd	-14.605	3.023	249.251	-4.831	.000	-20.560	-8.650
[GROUP = 2.00] * Δ EpartInd	-18.227	3.588	265.252	-5.080	.000	-25.292	-11.162
[GROUP = 3.00] * Δ EpartInd	-12.670	3.039	273.034	-4.170	.000	-18.652	-6.688
[GROUP = 1.00] * Δ OnServInd	-70.525	4.326	320.815	-16.302	.000	-79.036	-62.014
[GROUP = 2.00] * Δ OnServInd	-78.860	5.174	317.444	-15.242	.000	-89.040	-68.681
[GROUP = 3.00] * Δ OnServInd	-32.052	4.472	271.329	-7.168	.000	-40.855	-23.249
[GROUP = 1.00] * Δ InfraInd	-84.766	10.634	233.972	-7.971	.000	-105.718	-63.815
[GROUP = 2.00] * Δ InfraInd	-74.199	8.769	364.623	-8.462	.000	-91.443	-56.955
[GROUP = 3.00] * Δ InfraInd	-60.268	6.601	245.187	-9.131	.000	-73.269	-47.267

a. dependent variable: Δ EoDB Rank.

Group = 1 – Low, 2 = middle income GROUP, GROUP 3 = High Income

The results of the model shown in table 5 indicate differences in all the coefficients between the three groups. All the coefficients were negative, indicating an improvement in any variable represents an improvement in ranking (ranking is a type of variable of type the smaller the better). The effects on the improvement of human capital in EoDB looks bigger in the highest income group. The change of e-participation has had more impact on middle-income countries. In connection with the online services, the improvement was greater in middle-income countries and low income, and, finally, the infrastructure change has had a greater impact on the EoDB for countries with lower income, followed by the middle-income countries and less of an impact for the high-income countries. In the next model the main variable of the study regressed against the total early-stage entrepreneurial activity (TEA), which represents the percentage of the population about to start a business or activity that has companies with up to 3.5 years of Foundation (new business).

The first model proposed included as predictors Δ human capital index, Δ e-participation, Δ online services index, Δ infrastructure index, Δ EoDB Ranking, Δ CPI, and identification of the variable income group. The model results indicate that only variables Δ infrastructure and Δ EoDB Ranking were significant predictors of Ranking EoDB variation of TEA. A series of changes to make the simplest model, and improve the statistics. The final model used only two variables as predictors (the effects of interaction were not significant in this model). The most comprehensive model obtained $AIC = 1026.869$ while the simplest model had $AIC = 1021.310$, indicating that the simpler model is preferable. The parameters of the selected model are displayed in Table 4:

Table 4. Estimates for Fixed Effects-dependent variable TEA

Parameter	Estimate	Standard Error	GL	t	SIG.	95% confidence interval	
						Lower Limit	Upper Limit
Intercept	-0.262	0.314	188.795	-0.834	.405	-.882	.358
Δ InfraInd	8.269	2.949	176.453	2.804	.006	2.448	14.089
Δ eod_rank	0.059	0.018	171.565	3.187	.002	.022	.095

a. Dependent Variable: Δ Total early-stage Entrepreneurial Activity (TEA)

It is interesting to note that the intercept was not statistically different from zero ($p = 0.405$), but was retained in the model, since its removal would mean that, if a country had no change in the ranking of doing business or infrastructure dimensions wouldn't change TEA (so = 0), however, we recognize that other factors can affect the TEA. This model also indicated that the two independent variables were predictors of improvement in TEA. Both have positive coefficients, indicating that the improvement of any variable is associated with an increase in TEA.

5. CONCLUSIONS

The results of this study support the general perception and previous studies about the big difference in the level of sophistication of e-Government in relation to the income of the countries. All variables studied presented significant differences with independent variable belongs to one of the income groups (low, medium and high).

The data indicate that countries with lower income have less availability of online services, less advanced infrastructure, electronic participation reduced, smaller development of human capital and a higher perception of corruption. The only positive indicator for this group of countries was a rate of early-stage entrepreneurship (TEA) higher than the other two groups. The higher income countries present therefore the best indexes on all these indicators, and only present the indicator TEA as the worst of the three groups. While the middle-income countries, are in middle position in all the dependent variables, including TEA.

The analysis also showed that the improvements in the variables of e-readiness of e-Government and its contents have statistical power to explain the change of positions of a particular country in the ranking EoDB and TEA. There were important differences between groups and variables, indicating a very interesting dynamics, which have practical implications. Online services and improvements in human capital were independent variables that had the greatest impact on the EoDB, when considering all countries. According to the model, human capital is the most effective way to improve the business environment of a country, regardless of the income level; the online service was the second best predictor.

However, the article has reached its goal to demonstrate that it is important to consider this relationship taking into account the level of income of the countries. We were able to achieve this when considering the effects of the interactions between the variable group determinant and the other predictors available in model two. For low-income countries, the infrastructure was the predictor with the greatest impact in improving to Doing Business rankings; the improvement in participation had a very limited impact in comparison with the others, and can be related to the lower level of participation in those countries. For middle-income countries, the trend was different.

The most important predictor was the change in the human capital index, followed by the change in the index of online services and the change in the index of infrastructure. Once again, the improvement in the e-participation had the lowest impact. Finally, for the high-income countries, the enhancement of human capital was definitely the most powerful predictor for the improvement of the EoDB rankings, followed by infrastructure index, then the index of online service, while the e-participation had the lowest impact.

In relation to the model ready to explain the changes in the rate of entrepreneurship, not all variables were statistically significant. The representative of the country's income level was a significant predictor, which means that the effects are practically the same in all three groups. The only change in the human capital index and ranking EoDB were significant predictors for changes in total entrepreneurial activity (TEA) stage. As variables are of different magnitudes and natures, the comparison of the effects is more difficult than the

comparison among the indexes, though a statistic t biggest suggests that improving the EoDB ranking has deeper impact on TEA.

The results of this study suggest that the Division of countries by income level to understand the impact of e-Government is relevant. In addition, further research should seek to understand how and by what causes the impact of e-government services differs according to the levels of sophistication of e-government applications and the income levels of countries, and other factors that may explain why the Government implementations have different impacts. In relation to the result on the perception of corruption, future studies should seek to establish relationships between the e-government initiatives and a lower perception of corruption.

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NATIONAL IDENTIFICATION SYSTEMS & IMPLICATIONS IN EGOVERNANCE

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ABSTRACT

The recent turn of events after 9/11 has led to a changing rationale around National Identification systems. Even citizens of those countries such as the US and UK, who had been staunch opponents of identification systems have conceded to great extent on the need of such a system in recent years.

From a sustainability view point, there are large scale Economic and Social impact to the countries that are planning or currently undergoing implementation of such a system. In 2007, there were over 43 countries across the world, either developed or less developed that have implemented such system or are in the process of doing so. Today there are approximately 103 countries that have deployed some kind of government issued identification system. When large scale deployment of such system that incur substantial costs in the range billions of dollars, require a supporting legal policy, social acceptance, and have deep impact on human liberties, the sustainable aspects of such schemes require critical attention.

This paper discusses the National Identification Program in the following aspects:

- A critical analysis from the Technical, Commercial, Organizational and Social (TCOS) model of implementing such system
- Managing stakeholder relationships and its importance in the success of this system
- The resource advantage argument that favors implementation of such a program by nations
- Differences in viewing the problem and the continuation of sustainability debate between the developed and the developing nations

eGovernance has been evolving over the decade. Having acknowledged the presence of web and conveying relevant information to the public i.e the Information stage, the next stage of Interaction has given the citizens the ability to deal with the government saving time and making relationships. In many countries the eGovernance systems have evolved to levels where transactions in their entirety can be completed without having to leave the comfort of one's home or office. However, if the ultimate goal is to save time, simplifying processes and drive up efficiencies, the challenge of dealing with multiple entities and contacts need to be resolved. Societal and democratic processes cannot be built on anonymity or moving targets. A one point of contact saves money and time as well as boosts the satisfaction of customers along with productivity. National Identification Systems or online systems that can meet such requirements can play an important role in the "Transformation" of eGovernance.

KEYWORDS

National identification, eGovernance, social security, citizen engagement, developing nations, sustainability.

1. INTRODUCTION

Implementation of a national identity system has gained significant social exposure, especially in the United States, United Kingdom and Canada. The Indian government recently undertook a massive exercise for compilation and issuance of the largest human identification that made headlines across the world on National ID Cards. Besides these countries which have embarked on this initiative mainly due to security concerns post 9/11, there are many developing nations who have also either piloted such schemes or they are in the process of implementation. The reasons for the developing nations are different. Their motivations are social welfare, ability to manage the growing population and get their inclusion in to the state. In either case, such scheme involves large scale mobilization of state apparatus and significant expenditure to cover the entire population. A report appearing in the Daily Telegraph in Nov 2, 2006 categorized United States under

“extensive surveillance”; Russia, China and United Kingdom as having “endemic surveillance; and Canada under surveillance methods with “significant protection and safeguards” for its citizens. Many European Union nations & Australia were also categorized under leading surveillance societies, however, their systems either have “systematic failure to uphold safeguards” or have “some safeguards but weakened protection” for the citizens. Upholding individual rights, social and security issues are important aspects of such systems.

In the European context, many Scandinavian nations already have some form of a national identification system in place for several years. However, with the formation of the European Union, member countries which did not have any such system in place are seriously considering adopting / implementation of some type of a system.

The changing posture by the United States on national security matters even for its friendly nations such as Canada and UK making Passport / Secure identification soon to be mandatory for crossing borders has also heightened the need for such systems.

In the article ‘Go Slow on National Identification Cards’ – Jurist Forum, Prof. William G. Ross from the University of Notre Dame Law School says that in the past, any such national identification system had been rejected in these countries mainly on the ground of encroaching the civil liberties and privacy concerns. However, after September 11, the situations have changed. The 9/11 commission called on the Federal government to tighten up regulations and the Congress passed the REAL ID Act in 2005. The public opinion in favor of such a scheme has also increased post September 11, with 68 percent favoring a national identity card in the US. This is a significant increase from 39 percent in favor during 1980s and 63 percent in 1990s.

The Bush administration had taken the route of implementing this as a new Driver’s License with a complete switchover to happen by sometime in 2013. Despite the above facts in favor, there is a growing rebellion from the States in implementing such a scheme. Eric Clapton on 5th Feb ’07, reported in New York Times that “Opposition among state officials is turning into an open revolt against a federal law calling for the creation of standardized driver's licenses nationwide.” The 12th Mar’07 online edition of Concord Monitor reported that the Department of Homeland Security had delayed the start of implementation until late 2009.

Following close on the US sentiment, the British Government has also embarked on a sophisticated Biometric based compulsory identification scheme. The British Home Office press release on 3rd Dec’03 had the Home Office Minister, Beverley Hughes, say:

“Through identity cards, the Government is determined to put Britain at the forefront of international developments in the use of biometrics to protect our citizens from identity theft and to prevent abuse of our immigration system...”

2. THE ISSUE

National Identification Systems have been a contentious issue. At one end of the spectrum the proponents of such a system advocate:

- Attaining efficiencies and cutting red tape by harmonizing government agencies and government owned and controlled corporations
- Control of illegal immigration by building a national registry
- Curbing tax evasion and welfare fraud
- E-Governance
- Fighting Terrorism

There is stiff resistance from various interests groups, political parties in opposition, academia, state governments and the citizens themselves.

- Violation of citizen’s intrinsic rights to privacy by exposing and tracking their personal activities
- Functionality creep and the potential to misuse than the original intent runs high
- Discrimination against ethnicities or religion by oppressive regimes
- Lack of data / evidence if ID systems affect crime trends or tax evasion
- No correlation between ID cards and prevention of terrorism in countries where ID systems are present
- Staggering cost of implementation: ID cards and indirect costs of upgrading infrastructure
- Lack of Policies and Legal Acts to prevent misuse
- Social issues of unregistered births, social exclusion in less developed countries

Compiled from a world wide study done by the Senate Economic and Planning Office of the Philippines that re-assessed the viability of pushing for a National Identification system by an executive order issued by the president – Report PI-07-05, Dec’05..

2.1 Statement of the Problem

Many countries are mobilizing their resources to undertake massive nation wide exercise engaging technology, manpower and creating supporting infrastructure that will cost billions of dollars in creating National Identification Systems. For the developing nations, where the population is largely illiterate, state machinery is comparatively weak and unorganized; the rules of implementing such schemes may be entirely different. Therefore, it is important to scrutinize the possible advantages, disadvantages and problems that such a scheme will face and establish a framework that can help grappling with the issue effectively.

3. THEORETICAL FRAMEWORK & ANALYSIS

3.1 Uncertainties and Framework for Evaluating Radical Technology Development

The new identification programs that are being rolled out especially in the UK and USA using today's sophisticated identification technology such as the Biometrics or the REAL ID cards, there has been an unduly large focus on the ID card itself and its technology outweighing some important considerations from organizational and social aspects of such a system besides being quite costly in commercial terms.

When technology overcomes the commercialization and organizational challenges but faces complex and often conflicting / difficult social uncertainties just as the Identification System currently, then Hall and Martin's (2004) framework for evaluating radical technology deployment is very useful. The new sophisticated identification systems meet the definition of 'radical technology' i.e. 'controversial and potentially disruptive to secondary stake holders'. The situation is exactly as outlined in the paper ...'where there are many interacting stakeholders that are not easily identifiable and they may all have contradictory demands, goals and interests.'

Citizens, Individuals, Technology and Social aspects are interlinked in any National Identification Scheme. While there have been significant enhancements in identification mechanisms with modern technology such as biometrics, technology alone cannot drive the success of a national surveillance system which is far more complex task in light of the remaining elements of commercial, organizational and social uncertainties. The four aspects are analyzed in details as follows:

3.1.1 Technology

Currently, Biometrics is considered advanced and most reliable. Biometrics has evolved by combining unique physical characteristics of a person with information technology for accurate recognition. Some of the leading methods are:

- Facial Recognition
- Fingerprint Recognition
- Hand Geometry
- Iris Recognition
- Retina Recognition
- Signature Recognition
- Voice Recognition

However, technology changes rapidly and what is cutting edge today may be obsolete in a few years (Information Technology Doesn't Matter – Nicolas Carr, Harvard Business Review, 2003). The need for secure identification is required for a life time of a person. Investing in such devices costs in the range of billions of dollars and there are risks of obsolescence before realizing substantial benefits.

Establishing the Identity and its reliability meets only a partial need for good governance and security measures. It is the co-relation of identity and transactional information generated by use of such systems that can lead to the much sought after benefits from the system. This implies that such a system cannot be effective in a standalone mode and by simply distributing a highly secure, digital or micro-chip enabled identity card.

In the ‘Alternative blueprint for a national identification system’ – draft version put out for public consultation by the London School of Economics, the authors envision a universal identifier i.e. a unique ID code that is processed fully electronically. The logic of various types of Identity code systems deployed in major countries have the following main features:

- 8 to 15 digit numerical value
- 1 or 2 digits for a check code
- Information revealed ranges from: date of birth, year of birth, gender and place of birth
- Applications range from: medical records, social security, administration, national statistics & planning, tax collection, health services or multi-purpose

The concept of an ID code based system also requires attention to the critical aspects of establishing identity. Conventionally, this is by the use of an Identity Card in possession of the individual. However, it is important to discern between the ID Code and the ID Card. A national identification system implementation depending upon the emphasis of an ID Card or a Code acquires the following two different characteristics as highlighted below:

Table 1. Differentiation between identification code versus identification card based system

Citizens and residents of the Nation	
Individual Identity	
Identification Code based system	Identification Card based system
Individuals allotted a code or number that may optionally be mathematically generated with capability of identifying place, year of birth and sex. ID card is a secondary device / certificate of proof.	Individuals allotted an Identity card with physically secure characteristics and embedding of biometric information that is the person’s identity
Importance of sophisticated transactional database for co-relation of information	Emphasis on securing the Card with advanced features such as Biometrics
ID number can be life-long	ID Cards can become obsolete during the life time of a person
Memorizing ease of ID code can help devising a system that works without sophisticated reading devices and easy to train people and staff	Requires sophisticated reading devices and positive match with the holder. Sophisticated systems may be required to handle the information
Possibility of aiding in crisis/emergency situations are greater even though the network infrastructure may not be available. Support of critical security functions / robust and resilient to malicious attacks.	Unpredictable in crisis and emergencies when people may not possess their cards or device read outs not functioning. Critical security functions may break down if Identity cards are lost.
Low cost – allocation of ID Codes	Very high costs of making secure ID Cards

In a study carried out by the London School of Economics in March 2005 on the Biometric based Identity Project undertaken by the UK government, one of the important conclusion is to find an alternative model for identification that is cost effective, secure and trusted. It also states that the new technology envisioned for the scheme is untested and unreliable and such large scale implementations have not been done anywhere in the world.

3.1.2 Organization

The organizational aspects for such schemes for a government are different than those of business corporations. In fact they are difficult to envision and more complex than market oriented technology exploitation.

The system requires a backbone of computing and network infrastructure. However, the level of computerization in government agencies across the nation especially in developing countries is very low. Where this exists, the systems and software are outdated ranging from no network connectivity to dial-up type of connections. Interfacing and coordination of data amongst these agencies are to a large extent impractical with the current infrastructure unless significant investments are done in upgrading this infrastructure. Sophisticated ID Cards will require equally capable readout devices and technical training for

people who will be using this. This can be challenging even for developed countries where computerization across the government is at high levels, and definitely impractical in many cases for less developed countries.

3.1.3 Commercial

The cost of implementing a national identification scheme in the US tagged along with the Driver's License is at a direct cost estimated to be \$23 billion. The Identity Card Bill introduced in the House of Commons in UK by Regulatory Impact Assessment estimated 5.84 billion pounds over 10 years and, 93 pounds per person. The typical business corporation type of profit and return on investment analysis have not been adequately studied or represented in these proposals in front of the governments. Often these are hard to estimate due to the complexity of the value estimation methods in areas of social welfare and attaining administrative efficiencies.

Edwin Morley-Fletcher studies the issue of how governments can enhance the welfare system within the constraints of not increasing taxation/social contribution or containing costs through rationing that may drop quantity or quality of service (The Re-Monetarization of Welfare Benefits, *Annals of Public and Cooperative Economics* 67:3, 1996). Edwin conjectures with the idea of a single universally distributed 'citizen card' that becomes central to health care, transfer of benefits, payment of public services, national and local taxes, utilities etc. The author cites the absence of any direct link between those who finance the welfare benefits and those who receive them as the main difference from the system of the market transactions. The impetus for re-monetarization in the welfare services can introduce the market-oriented reforms key to improving the efficiency of the system. Acknowledging the concept to be at early stages and under large confusion, the trends of an 'Information society' evolving by modern technology to bring about a radical change in relations between state and citizen, the author predicts a transaction cost revolution in the welfare market where planning of 'needs' and rationing of supply replace the demand expressed through consumer choices and purchasing power in the traditional market.

Edwin considers a 'universal' welfare card born out of natural government monopolies in similar ways as the bank notes with possible involvement of national banking system to deliver multifarious benefits across state and private functions besides being instrument for lowering the transaction costs.

3.1.4 Social

Adrian Beck and Kate Broadhurst conducted a two phase study. The initial phase reviewed powers made available to police, the legislative and operational frameworks in place in 15 EU countries. Second part was field study of 3 countries having a voluntary, compulsory and in-between system in operation. The overriding conclusion from this study (Public Administration: Vol 76, Winter 1998) was that 'the degree of compulsion with a national identity card is less important than the nature of accompanying legislation concerning the circumstances when a citizen is required to prove their identity.' When legislation is insufficiently rigorous and has wide latitude interpretation then it risks 'functional creep', becoming institutionalized, arouse false suspicion from police for not having an ID and cause more harm in day to day lives of the public. It recommends introduction of an Identity act which has wide range of legal checks and balances to protect the privacy of the individual along with implementation of such schemes.

In practical implementation when the I-card itself is made base of the management, then taking away the I-card is an easy way to settle old scores, to prevent people from voting, to torture them, to take bribe, etc . ***"Manipur gunmen seize I-cards from voters,"*** *The Times of India, Mumbai: 21 June, 1994, Page 15.*

Besides, huge expenditures required in training, values education and capacity building of the governing systems – police and welfare agencies. This does not discount coaching the citizens on their rights and proper usage of the ID mechanisms.

3.2 Importance of Stakeholder Management in Implementing such Systems

Stakeholder management is crucial in the success of such a system implementation. The concept recognizes the importance of accommodating the concerns of secondary stakeholders also such as local communities, minority groups etc. Skills acquired by firms to successfully engage in such matters can be a distinct competitive advantage and can preempt many concerns that the firm may never imagine working alone. Placing a few countries on how they have primarily dealt with stakeholder so far using the dragon metaphor where you deny its existence, go on to slay or feed it gives the following picture:

Table 2. Categorization of stakeholder issues of countries using the dragon metaphor as an example

Deny	Slay	Feed
<i>Ignore, assume, irrelevance</i>	<i>Undermine, destroy credibility</i>	<i>Recognize, legitimize</i>
China	USA	Canada
India	Malaysia	United Kingdom
Philippines		

The LSE Identity Project Interim Report, March 2005 published by the London School of Economics, states “The success of a national identity system depends on a sensitive, cautious and cooperative approach involving all key stakeholder groups including an independent and rolling risk assessment and regular review of management practices...” Without such elements contributing to the development and implementation of identification system, the report concludes that a contrary approach can be “a potential danger to the public interest and to the legal rights of individuals.”

The stakeholders who need to be involved for any national identification system should include at least the following groups in confidence:

Citizens	Politicians	Department of Homeland Security
Police	Election Commission	Ministry of Health and Wellness
Home Ministry	Judiciary	NGOs
Financial Institutions		

3.3 Stake Holder Ambiguity

Popper recommends a ‘piecemeal engineering approach’ for situations where there are high degrees of complexity and stakeholder ambiguity (Hall and Martin, 2003). For the governments that seek to impose a ‘utopian good or optimum’ solution, this kind of approach is more pragmatic and the *muddling through* (Lindblom 1959) and *mutual partisan adjustment* (Lindblom 1965) as quoted by Hall and Martin (2004), can be an effective technique to come out successfully with a socially acceptable, non-intrusive yet effective surveillance and welfare system. However, the key to the situation is to involve a broader range of stakeholders along the process. The evidence based study carried out by a group of over 25 researchers at the London School of Economics concluded in their report (The LSE Identity Project Interim Report: March 2005) that ‘the success of a national identity system depends on a sensitive, cautious and cooperative approach involving all key stakeholder groups’ and put the risk of failing to do so as potentially dangerous to public interest and legal rights on individuals.

Real versus Ambiguous Reasons

The various stakeholder groups hold different positions behind some real issues. However, there are several ambiguous issues that add to the complexity of addressing them effectively.

At the very start, the issue of what segment of the population should be targeted by an identification system, the motivations and the purposes that it will be used for remains unclear and sometimes changes with the political party in power or other geopolitical situations prevalent. Further, should ID cards be compulsory or voluntary has been another issue. If 9/11 changed the citizen’s rationale for surveillance system, the support has been dropping over the years to an extent that there is a growing rebellion (NO2ID in UK). A list of real and ambiguous issues compiled from various sources can be as follows:

Real issues:

- Staggering costs
- Mandatory or Voluntary
- Include Biometric Information such as finger printing or eye scans
- Creation of government mega-databases to hold information on the cards

Ambiguous Issues:

- Changing justification over the years
- Are the national security based motivations truly justified
- Americans are suspicious on any National Identification System – Concord Monitor
- Can the government be trusted with the information it collects

- Relying on cutting edge technology
- Contributing towards identity theft
- Balance between security and privacy
- Value in crisis situations when all technology networks break down. Earthquake, wars, families separated, flood
- Limited functionality for a limited number of the population and may not work in Attributing success / substantiation of claims. Norway, Sweden, Denmark – Better social programs and low cost administration. Israel has been successful in strengthening security and population management
- Identification for children or illiterate

3.4 Problem of Social Exclusion

In the less developed countries, many children born go unregistered and many do not possess any birth certificate. The estimates run anywhere from 10% and above which translates to millions in populated countries who go unaccounted in the social system. There are serious implications of any ID Project which may not reach these people and they may get further marginalized. Regardless of any type of identification system, this has been a pre-existing problem that challenges and constrains the administrative machinery. Technologically complex ID systems may drive this problem further and may be impractical with illiterate and uninformed masses of these nations. Careful planning and due consideration to the ground realities of the various societies that comprise a nation needs attention in national identification schemes.

3.5 A Resource based View on the Resurrection of such a System

Resource based view says that fundamentally a firm's competitiveness is a result of valuable resources that the firm can deploy to create an advantage. These resources can be tangible or intangible assets and even organization capabilities that can be a complex combination of assets, people and processes.

Governments that are implementing the National Identification System can be synonymous to firms in this view. A list of some prominent countries and their motivations in implementing such a system is as below:

Although, UK has been accused of the changing justifications for the scheme, the government has viewed this as (*source Perri, University of Birmingham, Political Studies: 2005 Vol. 53*):

2002: Combat problems of illegal working and identity fraud

2003: Emphasis on use of cards to fight organized crime

2004: A device to combat terrorism

USA: Mainly a response to 9/11 Commission for tightening regulations, establish uniformity and implement safeguards against fraud stemming from driver's license fraud for identity.

Philippines – Past and current Presidential decrees seeking

(*Source: Policy Insights, Senate Economic Planning Office, Dec' 2005*)

National security and transactional convenience with government / agencies

Reduction of government red tape through integrated and reliable identification cards

India

Border protection, Voters ID for election commission, reduce overload from administration

China

Ministry of public security, prevent fake ID used in criminal activities defrauding the state.

<http://josieliu.blogspot.com/2007/02/china-set-up-citizen-identification.html>

http://news.xinhuanet.com/politics/2007-02/08/content_5715838.htm

Malaysia

Cradle-to-grave smart card identification for multi-purpose system for national welfare and security. (*Source: Considerations for a Malaysian Cradle-to-grave Identification Proposal, Malaysian Journal of Computer Science, Vol. 10 No.2, Dec 1997*)

Evaluating the conditions of an invaluable resource as depicted below, a socially acceptable, reliably functioning national identification system can become an invaluable resource to the nation. It can become a back bone to multifarious governmental agencies and deliver higher efficiencies in government programs. The elements of making such a scheme invaluable are present for both developed and developing nations as described below:

Table 3. A resource based view of national identification system for developed and developing nations

	Developed Nations	Developing Nations
Scarcity	Existing methods of identification are inadequate and unreliable	No system in place
Demand	Motivated by security concerns and safety of borders. Government driven but also having a pull from the citizens.	Motivated by need to deliver social programs and inclusion of population. Mainly government driven.
Capacity	Population at large: mainly adults, people possessing drivers license	Population at large and may include children.
Specificity	Identification card and national security	Identification and social program efficiencies

4. CONCLUSION

At a conceptual level, national identification system does find support in the studies reviewed by this paper but not without some pre-conditions such as:

- London School of Economics: Supports the concept, current proposal (Biometric based) are not feasible
- State Economic Planning Office of the Philippines: Advantageous if implemented in tandem with tenets of good governance: transparency, predictability, participation and accountability in a cost effective / realistic budget and technology sophistication
- Perri, Political Studies (2005, Vol 53): A justification can be defined which may also permit government to introduce compulsion. However, ‘the scheme must be one that supports privacy and also be worthwhile and proportionate to the risk.’
- Public Administration Journal: Need for accompanying Identity act with legal checks and balances guaranteeing individual privacy.

This highlights the highly complex nature of the issue even though seemingly acceptable. Amongst the various options laid out by the radical technology deployment framework to manage such situations, the following recommendations are also applicable to National Identification Systems:

1. The technological aspect of designing a fool proof Identity card has been given a very large emphasis in many of the countries. However, all the four facets of the TCOS model important for the success of such a system implementation.
2. Need to encompass broader range of stakeholders. Considering the population at large as the key stakeholder in Social programs whether it is national security or availing government benefits, establishing Identity is only one aspect of the program. However, it is the ‘co-relation’ of information and ‘coordination’ of agencies, public trust and confidence to deliver a synergistic value.
3. Utilization of ‘Piecemeal Social Engineering’ approach due to high stakeholder ambiguity. Instead of a massive deployment and unilateral decree, a pilot project based approach to reveal the complexities and the opportunities to solve the problem in smaller scale will be advantageous.
4. Importance of recognizing and addressing the concerns of the stakeholders to complement in the process of value-chain of deploying surveillance systems. The National Identity Schemes have mainly focused on Social aspects. The main motivations for countries implementing this have been either national security, electoral system, checking migrants or to manage government sponsored benefit programs. However, there can be significant economic opportunities such as reduced transaction costs which can only be realized when all stakeholders complement one-another’s position.

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- University of Birmingham, Political studies, vol. 53 no. 2, pp. 243-261, Jun 2005; ISSN 0032-3217 *Should we be compelled to have identity cards? Justifications for the legal enforcement of obligations*

Short Papers

EXPANSION OF HIGHER-EDUCATION ENROLLMENT RATIO USING AND E-LEARNING PLATFORM WITH OPEN-SOURCE SOFTWARE: MÉXICO

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ABSTRACT

In Mexico, the percentage of higher-education enrollment is approximately 35% of the population. Consequently, the Mexican Government, within the context of National Development Plan 2006-2012, proposed the creation of the Open and Distance-Learning University in order to increase the higher-education enrollment ratio in the country.

Thus, the Secretary of Public Education of Mexico requested the Center for Research and Advanced Studies of the National Polytechnic Institute (CINVESTAV-IPN) to develop a technological platform with the following features: scalability, reliability, portability, built on a layer-based model, interoperability, high-availability ($n + 1$), with an average response time of three seconds, high capacity, based on an Open-Source platform (Open Source LMS-Model), with a Service Oriented Architecture (SOA), and a student-centered service model.

This article presents a model of technological pedagogical, and administrative collaboration between academics and Cinvestav, a project-development road map, the architecture of the technological platform, the layer model, the Service Oriented Architecture, the workplace environments, and the high-availability technological infrastructure that allowed the creation of an educational offer of 12 bachelor degrees and one Higher Technician Certificate, as well as the School Management System, with more than 220 success cases. It also presents the national and international distribution of Mexican students.

This project placed Mexico within the countries that actively use communication and Information Technologies in education. The technological platform developed to meet the required service levels evolved from a cluster-based solution to a platform of repeatable virtual classrooms that ensures a suitable response time. From 2009 to 2013, this platform was used by approximately 200,000 Mexican students living in Mexico and 86 different countries, and was even capable of supporting 76,000 students enrolled with a 50% attendance.

KEYWORDS

Open Source, e-Learning, higher-education

1. INTRODUCTION

The Secretariat of Public Education started the Program for Open and Distance Higher Education (ESAD, by its acronym in Spanish), with the purpose of offering higher education to the general population, regardless of age, location, social status or working status, who cannot attend to a traditional on-site educational system.

The educational offer of ESAD consists of 12 Bachelor's Degrees with the option of having a terminal degree as "Técnico Superior Universitario (TSU)" (Superior Technical University Graduate). It also has the degree as TSU in Medical Emergencies. The careers it offers are: Logistic and Transportation Engineering, Environmental Technologies, Biotechnology, Telematics and Renewable Energy as well as Bachelor's Degrees in Public Security, Community Development, Mathematics, Management and Administration of Small and Medium-Sized Companies, International Marketing and Touring Company Management.

The educational model of ESAD is flexible and all careers are taught through the internet, with the support of a technological learning platform, an online school management system and using all information tools and technologies and communications available.

Some of the most relevant characteristics of the Educational Model are:

- Flexible syllabus; students can learn by themselves and they are responsible for their own learning.
- Self-study, counseling and tutoring are the main axes of their learning process.
- During their learning process, the students have access to facilitators, tutors and other academic figures for aid and orientation; they also have academic supervisors for the aid and follow-up provided by both facilitators and tutors.
- The students organize their own leaning process and work at their own pace, which allows their studies to become compatible with work and other activities.
- There are University Centers of Support and Access (CAAU, by its acronym in Spanish) where the students can use computers, receive counseling, communicate with their teachers and classmates and carry out activities or evaluations on-site.
- Lab classes and workshops are carried out in associated higher education institutions, in companies and in the government sector, with the aid of interactive and multimedia material.

The model is inclusive, since it has support, resources and material designed for people who have any visual, auditory or motor disability.

2. TECHNOLOGICAL CONCEPT MODEL FOR THE ESAD PROGRAM SERVICES

The Department of Public Education requested the Center for Research and Advanced Studies (CINVESTAV, by its acronym in Spanish) to develop a service model focused on Students where the technological platforms would be to provide educational support by means of Web 2.0 tools (Forums, Wikis, virtual classrooms, contents), LMS, CRM, GRP and BPM to facilitate the participation, communication, cooperation and integration of the students. In this model, learning is focused on the student, whose activity is supported in the technological tools described above.

2.1 General Services Model

The General Services Model is composed of a series of layers that start from the access portal inside which the users can access the e-learning and administrative systems. The next layer is the intermediate layer for the integration of the various portals and support systems. The next layer is the process layer and the last layer is the infrastructure, which is composed of a cluster, a high availability system, the telecommunications system and the Data Center, which offers the necessary security for operating.

2.2 SOA Architecture

Since the ESAD technological administration model is very complex and it requires several automated processes that are constantly interacting with each other so as to offer an adequate functionality, an SOA-based architecture is used.

2.3 Rendered Services Model

CINVESTAV managed and offered ESAD the services of supervision, monitoring, operation and technical support and maintenance of:

- I. The Data Center, where the computer and processing equipment and platforms for processing, telecommunications and Internet, applications, storage and databases, security, robots and backups are located.
- II. Software platforms such as: operational systems (Solaris, Linux), MySQL, PHP, APACHE databases, portal (CMS-Joomla), SOAP protocols, the learning management system (LMS-Moodle virtual classrooms), Integral School Management System (SIGE, by its acronym in Spanish), backup and recovery management software, JAVA, JEE, Glass-Fish languages, interoperability OPENBUS; OPENSSO Single Sign-On; SVN sub-version; installed software in all four environments (tests, development, pre-production and production) needed to operate applications such as the portal and the virtual classrooms of ESAD.

- III. Computer and processing platforms composed of the necessary servers and resources to store and handle ESAD data.
- IV. The telecommunications platform (LAN/WAN) and reliable logical security, specifically designed for the project integrated by routers, switches and firewalls, accelerators, balancers and domain management systems (DNS) in order to provide the necessary telecommunications to have incoming and outgoing internet availability with a 155Mbps bandwidth.
- V. Databases for the information storage infrastructures of up to 20 Terabytes and their management.
- VI. The information infrastructure that supports all four UNADM environments: a development environment, a test environment, a pre-production environment and a production environment.
- VII. Operational systems, application and language servers and providing preventive and corrective actions support.
- VIII. The platform of the Integral School Management System (SIGE, by its acronym in Spanish.)
- IX. The Service Oriented Architecture (SOA), which includes the operational system, the GlassFish application server, the inter-operability bus, the Sing-On Single, the lightweight directory access protocol (LDAP) and the connection technology for the various systems.
- X. Application and environment production protocols such as Learning Management Systems (LMS) and the portal for the content management system (CMS) as well as participation and communication tools such as forums, messaging and blogs.
- XI. Email platforms such as: Postfix based on Linux-Debian to send and receive bulk and institutional emails.

2.4 Technological Platform

CINVESTAV provides a technological infrastructure capable of supporting a 24-hour, 365-day high availability environment for students, candidates, supervisors, facilitators, administrators and tutors of the ESAD program. The technological platform developed is based on open software and allows access to courses and support management systems so tutors, candidates/students and managers can follow-up on courses, carry out procedures, supervise progress, send homework, work on collaborative projects, participate in forums and carry out their academic and school activities. In the case of the ESAD Portal there are around 700 monthly visitors and in the case of the virtual classrooms there is an average of 40 thousand daily visits.

The telecommunications, computer and processing platform with which the Program for Open and Distance Higher Education (ESAD) is supported is one of the most advanced platforms in Mexico and was integrated by: an internet connection of 155 Mbps which guarantees a data entry and exit wide enough to meet the ESAD connection needs. It also has load balancers and content accelerators that enable incoming data compression of up to 30%, which enables the web content servers to better manage incoming requests. It is also important to mention that these accelerators, along with firewalls, allow not only withstanding a DNS (Deny of Service) type attack, but also providing a better security for the platform itself. The computer power is provided by the 88 + servers, including the T5120 servers with the Solaris operational system that supports the web and application portion of the platform, in which the Open Source-based portal (Joomla), the Moodle LMS (Learning Management System) virtual classrooms and the Integral School Management System (SIGE) and the MySQL Databases are located. The databases are located in M3000 Servers and X4150 Servers. All of the above composes the production environment. Likewise, there are pre-production, development and test environments with T5220 servers and a cluster of 32 Mac-Linux servers, all of which are interconnected by Gateways and Switch's 4950 of 48 ports each, and their traffic is directed to a TCPIP port, distributed by an out port towards the Database and it also handles incoming requests. In a third port, the communication between servers accelerates the communication in the local network. In the storage portion, there are 2 server groups that share the same data repository using Quick File System (QFS) technology within a drive array of 20 TB ST6140, to which the servers are connected using two fiber optic Brocades Switches that enable high speed connections at 10 Gbps, to enable quick data writing and thus avoid bottle necks.

ESAD has a high availability computer architecture model, which includes servers, drives, drivers, switches, routers, balancers and hub accelerators needed and exclusively dedicated to process and correctly operating hosted applications such as: the portal platform, the virtual classroom platform, the integral school management system and the email server. The infrastructure is able to support 57,000 students in a maximum

amount of 18 virtual classrooms, with access for students, facilitators, visitors, tutors, supervisors and users in general who access these applications.

There is a strict control over the servers, since the data center has air conditioning monitoring systems, fire suppression systems and 3 UPSs, one 80KVA and two 20KVA, exclusively dedicated to the ESAD servers. The health of the servers is also maintained by means of monitoring systems that show the server's memory usage, the CPU use and the amount of incoming and outgoing traffic. These tools are supervised by operators 24 hrs. a day, all year round.

2.5 Management and Operation Services

The management and operation services are provided for:

- I. Virtual classroom platforms, where students and teachers engage in the teaching-learning processes for the various four-month periods that are active, and programming the evaluation model and its components, activities and evidence that integrate it. Including the copies of their preproduction and production environments.
- II. Virtual classrooms for evaluations, as well as handling questions, environment preparation, production and digital programming of the test items, integration of the tests and migration of the tests to productive environments.
- III. Virtual classrooms to further develop content created by the universities, as well as the technical review of the compliance of the standards used by the content delivered by ESAD that were created by various institutions and that are migrated to preproduction and production virtual classrooms.
- IV. Virtual classrooms for teachers, in which they have their own communications and tutor classrooms where they have contact with their students.
- V. Integral School Management System (SIGE) and maintaining and managing users (students, teachers, academics, managers and candidates.)
- VI. LDAP, BUS, SIGE and SSO applications. Incidence and requirement management. Detection of new cases of SIGE use, documentation and analysis, as well as its implementation in approved cases.
- VII. Logistic support during announcement processes and ordinary four-month periods such as: registering candidates and students in subjects, preparing environments for each classroom opened, adjustments to content and activity programming, forums and communication tools, re-adjustments to the evaluation model, registrations, de-registrations and content changes, assignment of students to each group, monitoring, platform closure, grade migration, bulk emails.
- VIII. Availability of previous classrooms or courses that were not published in production environments for consultation of auditing.

The technological architecture vision set out by the CINVESTAV is aligned with the general objectives of the university, which is reflected by the projects, where the processes and systems contribute to the online teaching process along with the University's roadmap, thus reaching its goals. The technological platform supports managing and controlling management personnel, informs and provides services to students, facilitators, supervisor and coordinators.

2.6 Results (2009-2012)

In the first announcement, more than 31,000 candidates were registered country-wide, the greatest concentration of candidates is given in Mexico City, there are students with ages ranging 24-60, from the candidates with disabilities, the ones with visual disabilities are the majority, from the demand that was handled in the 2009-2012 period, in July 2012, there were a total of 75,000 students registered.

3. CONCLUSIONS

The ESAD project started as a program in 2009. In the first announcement, roughly 12 thousand students were registered (11 thousand, 709), in the second announcement there were 27 thousand students, in the third announcement there were 32 thousand and this year, in May, approximately 49 thousand active students were

registered. Hence, this is the largest non-school-based institution with the greatest amount of students in Mexico, well above its peers.

Having access to university studies is only one "click" away by means of the programs offered online by the Open and Distance University of Mexico (UnADM, by its acronym in Spanish.)

Education authorities expect that the distance education institutions will help widen the higher education coverage, which is currently of 33%. With the formal inauguration of the Open and Distance University of Mexico (UnADM), the range of opportunities is broadened so that more young people can continue with their higher education studies.

The link between CINVESTAV and the Open and Distance Higher Education Program, ESAD, started on April 15, 2009, when the Sub-secretariat of Higher Education requested CINVESTAV to develop, implement and start the operations of a technological platform for ESAD, since it has the specialized human resources capabilities to integrate the technological infrastructure needed to operate the ESAD program, which started operating on July, 2009 with the launch of the Portal and the first Announcement for tutors and facilitators that were interested in participating in ESAD.

The UnADM infrastructure includes 140 Access Centers for University Support (CAAU, by its acronym in Spanish) distributed across the country that has been developed with the help of universities and technological institutes, particularly, the Research Centers of Advanced Studies (Cinvestav) of the National Polytechnic Institute (IPN).

From 2009 to 2012 some of the following instruments have been created with the purpose catering to three main areas to operate ESAD:

1. The Data center and the technological architecture.
2. Technical support and infrastructure maintenance.
3. Application management of content and users (School System Management and Virtual Classrooms.).

The operation of these three critical areas of ESAD has enabled providing technological services for a total of 12,723 teachers, and 164,631 candidates of which 80,304 became students and of which 1,343 are international students in 71 countries. In regards of digital content, CINVESTAV created 2,750 hours of digital materials for training courses for teachers, four-month periods and the propaedeutic course for candidates, as well as the core curriculum subjects for the first four-month period and eight subjects for the Second four-month period of the Bachelor's degrees offered by ESAD.

Undoubtedly, UnADM is destined to be the largest vanguard University of our country in the XXI century, in which the intensive use of Information Technologies and Communications come together to offer a new educational service to cater to the ever-growing demand of the Bachelor's degree education for the benefit of all Mexicans, wherever they may be.

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USING NARBS FOR ANALYSIS OF HEALTH CARE ISSUES

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ABSTRACT

There is an increasing availability of unstructured textual data in the depositories of big databases that are constantly produced and updated. Such unstructured data, such as tweets from journalists and their followers play the role of narrative bits – narbs – in creating specific stories about an individual, group or institution. A selection of narbs emanating from a set of followers of the tweets of prominent journalists in India are analyzed using the theoretical foundation of the narrative paradigm to demonstrate how analytic protocols adapted from Latent Semantic Analysis and Natural Language Programming can be used to political outcomes.

KEYWORDS

narb; big data; discourse; narrative; analysis, politics, vote, prediction.

1. NARRATIVE ANALYSIS

The construct of looking at culture, communication and human behavior and beliefs through the lens of a narrative was suggested by the work of Walter Fisher who in turn based his work on earlier scholars who identified the importance of story-telling and narratives in the process of making meaning of everyday life as people operate within the cultural and social spaces that they occupy (see, e.g., Andrews, 1982; Gadamer, 1982; MacIntyre, 1981; Ricouer, 1977, 1983, 1984; White, 1984). In setting forth the notion that human beings operate not only as a rational and rhetorical being, Fisher suggested, people can also operate as a narrative being where the act of creating and articulating a coherent and rational narrative becomes a part of being human. In doing this, the narrative paradigm offers a different way of analyzing and understanding communication, and the way in which people act.

There are many aspects of the narrative paradigm that merit examination in the early Twenty-first Century of Big Data, particularly when the analysis of large data sets seeks to provide an account of how persons come to believe and behave (see, e.g., Kosinski, et. al. 2013). The narrative paradigm suggests that it is possible to examine a story to seek internal coherence and fidelity of a story. Coherence refers to the internal logic of the story to see if indeed all the elements connect in a coherent fashion and fidelity refers to the believability of the story in terms of its truth value. Stories that demonstrate high coherence and fidelity could become the components that supplement the structural part of any big dataset by providing insights into the story and its author.

Consequently, using the paradigm, it is possible to understand how people believe and behave by systematically analyzing the stories that are being told. In the case of social media systems these stories appear as collection of narbs that are made up of the different ways people express themselves – from simple status updates to the elaborate process of offering visual information that makes up the elements of the narrative.

2. NARBS AND BIG DATA

As discussed elsewhere, a narb is a narrative bit of information that an individual produces every time an individual places information in a digital space (Mitra, 2014a, 2014b, 2013, 2012a, 2012b, 2011, 2010). The

term can refer to an update on social media systems, a micro-blog, and segments of blogs or other personal digital discourse that is available in the virtual space. It is these narbs that make up much of the narrative component of Big Data, and are amenable to narrative analysis. The term has commonly been utilized in discussions of the analysis of large data sets within the realm of computer science as in the case of the work of Weiss and Indurkha (1998) in the discussion of mining large data sets, just as the term was discussed within the context of macroeconomic measurement and forecasting (Diebold, 2000, 2003, 2012; Lohr, 2013). The key to the idea of Big Data is the fact that this is personalized data that is coming from people who are actively and voluntarily contributing to the compilation of these data sets (see, e.g., Mayor-Schoeberger and Cukier, 2013). Much of the attention on Big Data has focused on the two key components – 1) gathering the large amounts of data and 2) quantitatively analyzing the data to obtain both personal-individualized information as well as information about different groups of people. Generally, the structured data refers to quantifiable elements of the data, which for an individual are things like, gender, age, education, income and other stable and easily measured and quantified attributes. Such data is amenable to numeric analysis, which is the forte of computers, to produce specific statistics about an individual or cluster of people. It is the “unstructured” data that becomes more challenging to analyze and interpret. There are only exploratory and proprietary numerical tools that can extract meaningful statistics from thousands of messages sent, for instance, via Tweeter, or the millions of lines of status updates that are produced by the nearly one billion users of Facebook. All these messages become narrative bits (narbs) of information, and as demonstrated earlier, it is possible to categorize narbs to begin a more careful analysis of Big Data. Narbs serve as the repository of personal and communal narratives that need to be extracted from the data to offer a better understanding of the person and group represented by Big Data. The premise here is not necessarily new; indeed it has been argued that analysis of the material available on the Internet is indeed a process of discursive analysis (see, e.g., Mitra, 1999; Mitra and Cohen, 1998). The combination of the theory of narbs and the availability of narbs in Big Data offers the opportunity of developing the analytic protocol discussed in this essay.

3. THE ANALYSIS

The availability of Big Data has posed a significant challenge to the traditional mode of text analysis since that analytical process required the use of human coders who needed to be trained to code the texts while maintaining a high level of inter-coder reliability. The volume of texts available by mining the depository of Big Data is simply too large for effective human coding of the texts to discover the narratives contained in the text. This challenge has been answered by automated processing of texts. This processing has gone through many different developmental stages which began with simple enumeration of the words in a body of texts. This process resulted in large sets of tables which reported the frequency of occurrence of a specific string. Such listings, however, did little to uncover the overall meaning of a series of texts or to point towards the stories that were narrated by the texts. The next development in the realm of automated text analysis led to stages such as Latent Semantic Analysis (LSA) which used complex mathematical processes based in linear algebra and matrix manipulations to begin to discover the relationship between words in a text to not only show the words contained in the text but also how they came together to create specific meanings that could tell specific stories. The LSA process has also been developed into the Latent Dirichlet Allocation/Analysis (LDA) which too applies computational processes to the text to discover specific topics contained in the text. Such tools allow for a quicker and more reliable analysis of large volumes of data that become available from the domain of Big Data. However, the automated analysis systems draw upon such dictionaries, and the process of LSA/LDA, to produce results that show what specific opinions are expressed in a text. The opinion analysis thus produces a more detailed analysis of the stories contained in the narbs of Big Data. In most such cases the analyst has little control on contextualizing the analysis and relies on the dictionaries for the automation. However, texts do not operate in a vacuum. As has been pointed out in years of research on text analysis, it is known that texts are often connected with other texts – thus the notions of inter-textuality. Similarly texts have multiple meanings – thus the notion of polysemy. Texts are also sensitive to the culture within which it is produced. Yet, much of the automated analysis miss these nuances of texts that are fundamental to the way in which texts are able to tell stories and illuminate specific attributes of the author as suggested in the narrative paradigm. In the analysis offered here, the automation is coupled

with contextualizing of the dictionary and offering an intermediary step that mimics the traditional coding process of earlier textual analysis allowing for the recognition and incorporation of the context under which the unstructured big data has been produced. This is the process that was used on the narbs extracted for this case study.

4. POLITICALCONTEXT

The specific instance used in this essay uses narbs of a set of people in India who follow the tweets of several prominent journalists in India. As is the case of journalists across the World, Indian journalists also tweet their opinions and the tweeting became particularly frequent prior to the national elections in India in 2014. This election was particularly contentious since the incumbent Congress Party was under significant threat from the opposing Bharatiya Janata Party (BJP) which had proposed to name a controversial politician as the new Prime Minister of India, if the BJP would win the elections. Within this scenario in the most populous democracy in the World, journalists and their followers were tweeting their opinions. In this study, the tweets were analyzed as narbs to understand the political climate and predict the outcome of the election. Nearly a year’s worth of tweets were collected and analyzed.

5. FINDINGS AND PREDICTIONS

The analysis results in the production if narrative maps that offer visualization of the narratives by showing the connection between the key categories in the narrative. In these maps, the size of the circle, or node, representing the narrative category indicates the frequency with which that category appears in the narbs, and the thickness of the line between the nodes indicates the strength of the relationship. In this essay only some such preliminary connections are reported.

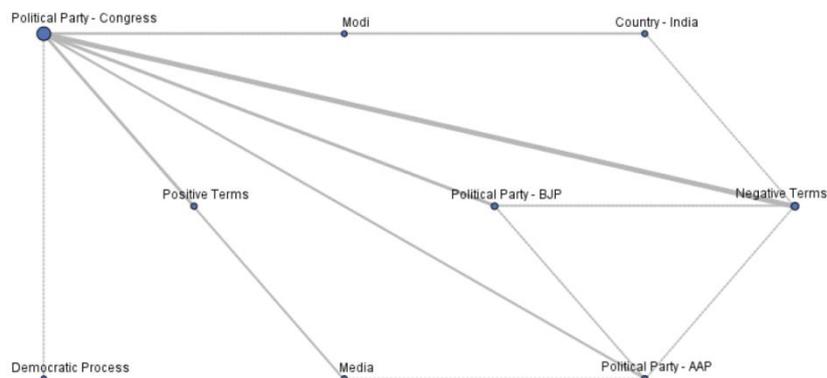


Figure 1. Narrative map of political parties

In the first of the maps, Figure 1, there was evidence to support that the narrative emerging from the tweets is strongly negatively tilted with respect to the Congress Party with a strong connection between the use of “negative terms” and the “Congress Party.” Indeed, nearly 3.2% of all the narbs that used negative terms also mentioned the Congress Party. On the other hand, as the map shows, there are far fewer narbs that use negative terms when discussing the BJP. Indeed only 0.5% of the narbs that use negative terms also mentioned congress. In other words, it is six times more likely that narbs with negative terms will include a mention of the Congress Party as compared to the mention of the BJP Party. This leads to the sense that in the elections, the Congress Party might not fare too well and the BJP has a greater chance of winning.

This analysis was supplemented with the analysis of the connection between a set of other terms that showed that the people who were tweeting were using more negative terms than positive terms when talking about different issues. As seen in the table below there is ambivalence about issues, which is expected, but there are some interesting trends in the story as well. This ambivalence created an uncertain political climate

with people being more positive towards the Congress Party but at the same time being positive towards Modi as a politician with little to say about Rahul who was the erstwhile leader of the Congress Party. Based on such data, it was possible to predict that Modi would be the Prime Minister of India if his BJP party were to gain a majority of seats in the Parliament of India. Indeed, this is precisely what happened in India.

Table 1. Connection between concepts and opinions

Topic	Percent Using Negative terms	Percent Using Positive Terms
Country - India	10.35%	7.98%
Media	5.58%	4.55%
Democratic Process	4.53%	3.22%
Modi	3.48%	2.22%
Political Party - Congress	3.64%	2.11%
Political Party - AAP	2.51%	2.00%
Political Party - BJP	3.07%	1.33%
Rahul	0.81%	0.78%

6. DISCUSSION

There is little doubt that Big Data would increasingly play an important role in many different kinds of decision making processes ranging from political campaigns to identifying points of threats to national securities. This analysis demonstrates that information from narbs can have predictive value when considering specific questions such as election outcomes. When this analytic process can be scaled up to large data sets, it is likely that the predictive value will improve as well. Furthermore, the analysis can be done repeatedly at different moments in time to understand how specific trends shift with time. Here, the data was collected over a period of time and continuing analysis demonstrates that opinions changed over time, eventually leading to the overwhelming victory of BJP at the polls.

7. CONCLUSION

Even with the best of automated content and semantic analysis tools, the human researcher plays an important role in providing the context of the analysis. Here the researcher must be the one who is asking the questions and the machine is doing the analysis to help answer the questions using the narrative maps. Sometimes, even in the days of complete automation, a human being must ask the relevant questions to seek the answers from the Big Data that surrounds us.

ACKNOWLEDGEMENT

The authors would like to thank the Humanities Institute of Wake Forest University for providing support for this research project.

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A CASE STUDY OF TECHNOLOGY LEADERSHIP BY SCHOOL PRINCIPALS IN THE USA; IMPLICATIONS FOR PREPARATION AND TRAINING

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ABSTRACT

The purpose of this study was to investigate the frequency and extent to which principals' implement educational technology leadership in three school districts in the largest Midwestern metropolitan area of the USA. The study also identified and explained the factors that influence these perspectives. A mixed method sequential explanatory research model was utilized to collect quantitative and qualitative data. Technology leadership was measured based a modified version of the Principals' Technology Leadership Assessment (PTLA). Data from the quantitative phase of the study were analyzed using descriptive statistics. Data from three focus group interviews were analyzed to identify codes and themes. These data were then triangulated to inform findings and recommendations for practice.

KEYWORDS

Educational technology leadership, technology standards

1. INTRODUCTION

In contemporary elementary and secondary schools in the USA, technology is an increasingly important role for principals in their efforts to achieve a host of educational outcomes. It is imperative that principals provide the leadership to ensure that technology is appropriately integrated into all aspects of school operations (Klimczak, 2015; Anthony, 2012; Hauser & Koutouzos, 2009; Anderson & Dexter, 2005; Stuart, Mills, & Remus, 2009; Williams, 2008). Mehlinger and Powers (2002) contend, "It is no longer possible for school administrators to be both naïve about technology and be good school leaders" (p. 218). Whereas, the administrator's leadership ability has been identified as critical to the successful planning, implementation, and evaluation of technology in elementary and secondary schools in the USA, many principals are ill-prepared for this this role (Klimczak, 2015; Hauser & Koutouzos, 2009; Anderson & Dexter, 2005; Hayes, 2006).

The purpose of this study was to investigate the frequency and extent to which principals' implement educational technology leadership in three school districts in the largest Midwestern metropolitan area of the USA. For the purposes of this study, technology leadership was defined according to the NETS-A. The NETS-A are comprised of five domains of educational technology leadership, with performance indicators that provide specific, measurable outcomes that describe what administrators should know and be able to do to lead effectively and improve learning for all students in an increasingly digital world (ISTE, 2009). The study also identified and explained the factors that influence these perspectives. This study was guided by the following three research questions: 1. What is the extent school principals implement the NETS-A?, 2. What is the frequency school principals implement the NETS-A? and, 3. What are the factors that influence these perspectives?

1.1 Research Methods

A mixed method sequential explanatory research model was employed (Creswell & Plano-Clark, 2011; Tashakkori & Teddlie, 2003). In the first phase of the study, a modified version of the Principals' Technology Leadership Assessment (PTLA) survey was used to assess principals' technology leadership inclinations and activities over the course of the last school year. The PTLA was developed and psychometrically validated by the American Institutes for Research (AIR) as part of a grant from the United States Department of Education Fund for the Improvement of Postsecondary Education. The PTLA and implied consent statement was sent, via an email link to the survey in Qualtrics, to 24 principals in the three selected school districts. Responses from the three districts were combined for data analysis. The overall response rate was 79% (N=19). As part of the survey, principals were asked seven open ended questions to determine (a) participant information, (b) overall perceptions of their confidence in implementing educational technology, (c) their perceptions on how well their administrative program prepared them for leading educational technology, and (d) how often they attended educational technology leadership professional development. The PTLA survey data were collected in April of 2015. The PTLA survey included an item that offered the principals the opportunity to participate in focus group sessions. Subsequently, six principals completed an informed consent form and participated in taped and transcribed focus group sessions. Focus group sessions were conducted in June and July of 2015.

1.2 Data Analysis

The data were analyzed utilizing a three-step explanatory design (Creswell & Plano-Clark (2011)). During the first step, initial quantitative survey data were analyzed using Qualtrics to produce descriptive statistics including minimum and maximum values, variance, the mean, and standard deviation for each survey item. These analyses were used to inform focus group questions. The second step consisted of collecting, transcribing and coding focus group sessions to identify themes in the data using NVivo. During the third step of the analysis, data were triangulated to identify themes to inform conclusions, implications for practice and, recommendations for further research.

1.3 Findings

For the purposes of this paper, the findings related to the research questions have been combined to avoid unnecessary redundancy. The research data from the study strongly suggests that the principals who participated in the study lack the knowledge and skills to lead educational technology. The data indicated that principals do not think of themselves as educational technology leaders, were unfamiliar with the NETS-A standards, and were ill-prepared to lead educational technology. Overall, the extent to which principals implement the NETS-A standards was (A=3.45), or somewhat, and the frequency with which they implement the NETS-A standards was (A=2.54), or somewhat often.

In considering the data results across the five standards that comprise the NETS-A standards, Standard 1, Visionary Leadership was the weakest domain. Respondents recorded the lowest overall average mean score (A=3.12), or somewhat for extent, and (A=2.13), or somewhat often for frequency, for this standard. Not surprisingly, in the focus groups principals revealed little evidence of their ability to exercise visionary educational technology leadership in practice. Principals also indicated that they were overwhelmed with implementing state and district mandates, and therefore, technology implementation and integration were not a priority at this time. With regard to Item 4, comparing and aligning school technology plans with other strategic district and school improvement plans, the mean score was (M=2.56), or minimally for extent, and (M=1.89), or not often for frequency. Principals' responses to this item strongly suggest that technology is not integrated with other district or school strategic plans.

The data within the domain of Standard 2 - Digital Age Learning Culture, received the highest average mean score (A=3.88), for extent, and (A=2.88) for frequency. Principals indicated that technology integration and implementation was not a priority for everyone and that it is not something that is monitored, evaluated, or communicated to staff.

Overall, the response to Standard 3-Excellence in Professional Practice, was (A=3.62), or somewhat for extent, and (A=2.85), or the somewhat often for frequency. The highest scoring items are within this

domain, and address the area of the principals' personal use of technology to complete daily tasks. Principals indicated that they minimally to somewhat provide release time for teachers to learn about technology, allocate funding for staff to plan for technology, and evaluate the effectiveness of educational technology professional development. Principals were asked during the focus group interviews, "How did you acquire your technology skills?" and "What experiences are you provided with as an administrator that help you gain additional technology leadership skills?" The following subthemes emerged: (a) learning from the internet, (b) coaching and modeling, (c) learning from teachers and peers, (d) leveled professional development, (e) reliance on others, (f) train the trainer models, and (g) technology workshops. While principals discussed various models for professional development, the focus was typically on acquiring technology skills for professional practice. Principals did not indicate that they attended educational technology leadership professional development focused on the NETS-A.

The highest scoring items within Standard 4-Systemic Improvement, addressed promoting staff use of technology to access student information, use electronic grade books, manage the curriculum, and to interpret and analyze assessment data. Items related to data-driven decision making were within the often to fully range. Principals indicated that they not at all to minimally pursue funding for technology, allocate district discretionary funds to technology efforts, and ensure hardware and software replacements and upgrades are in school technology plans. The overall average for this domain was (A=3.30), or somewhat for extent, and (A=2.43), or somewhat often for frequency. The study also found that principals use technology to analyze student assessment data and that they support staff use of data to make instructional decisions. Principals also indicated that funding, planning for technology, and upgrading current technology systems were district level functions.

With regard to Standard 5-Digital Citizenship, the overall average score was (A=3.34), or somewhat for extent, and (A=2.43), or somewhat often for frequency. Ensuring equitable access to technology received the highest response within this domain. During the focus group interviews, the principals expressed concern regarding equitable access to educational technology for students in the classroom and at home. They shared that they felt access to educational technology was important to the future success of their students. They expressed that their students should have the same access, and opportunities for learning with technology, as students from more affluent families.

With regard to the third research question, three factors were identified that influence the frequency and extent of principals' technology leadership. The three main factors are (a) principals are ill-prepared to lead and implement educational technology, (b) they lack visionary leadership as defined by the NETS-A, and (c) they place a low priority on educational technology efforts. With few exceptions, principals indicated that they were ill-prepared to lead and implement educational technology. While they indicated that they use technology for professional purposes, they did not feel that they were educational technology leaders and were unaware of the NETS-A educational technology leadership standards. In particular, principals indicated that their principal preparation program did not prepare them to lead educational technology, and scarcely taught them how to use technology for professional purposes. The data indicated that principals often gain technology skills training from other principals and staff. Typically, principals only learn what they need to know for the purposes of completing administrative tasks such as email, creating documents and spreadsheets, using student information systems, and file management. Principals also indicated that they do not often engage in professional development to increase their knowledge or improve their educational technology leadership in relation to the NETS-A. The data revealed that principals did not create or align school educational technology plans with other strategic district or school improvement plans. Collaboration with stakeholders was also not identified by principals as a means of creating a vision for educational technology implementation. Principals indicated that their primary focus is on implementing curriculum standards and the teacher evaluation system. Therefore, technology implementation and integration were not priorities. Principals most often expressed the view that the responsibility for leading and implementing educational technology was the responsibility of district level administration.

2. CONCLUSION AND IMPLICATIONS FOR PRACTICE

There are many factors that impact a principals' ability to lead and implement technology in their schools. Factors gleaned from this study indicate that principals are ill-prepared, unaware of the NETS-A, and educational technology is not a priority. This study also revealed that principals depend on district leadership

to provide the vision for educational technology. Nonetheless, the data from this study strongly suggests that administrative preparation programs and ongoing professional development are needed to provide principals with the educational technology leadership skills required to lead and implement technology in their school. This finding supports a recent study that found that 92% administrative preparation programs did not require educational technology coursework (Schrum, Galzio, & Ledesma, 2011). In fact, only two states, Michigan, and New Mexico require administrators to demonstrate knowledge of technology integration and/or use technology to earn their initial license. The shortcomings of principal preparation programs related to technology leadership is important in the context of local schools; it is even more profound an issue given the fact that school district superintendents are typically drawn from the pool of school principals. School district superintendents often have no more technology leadership training than principals. Therefore, the lack of technology leadership training is not just a problem at the school level, but it is often a district-wide problem. There is a critical need for principal preparation programs in the USA to incorporate the NETS-A standards into the curriculum, internships, and field-based experiences. These same standards should be similarly applied in preparation programs for school district superintendents. It is not enough to simply know the standards, but to also be able to meaningfully apply them to authentic school site and district based contexts. Since principal preparation programs are aligned with state standards, they include course content that will prepare candidates for state principal certification examinations. It is essential therefore, that state certification examinations for school principals be changed to include the NETS-A. Changes in state certification requirements will stimulate the required changes in principal preparation program curricula. These two changes offer the best hope for improving the preparation of principals for technology leadership in American schools.

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TRACKING AND MONITORING PATIENTS AND ASSETS IN SAUDI ARABIA' HEALTHCARE ENVIRONMENT

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ABSTRACT

The Saudi healthcare system still faces a number of challenges despite numerous initiatives that have been taken by the Ministry of Health and relevant healthcare authorities. Most of these challenges relate to the underutilisation of electronic health (e-Health) strategies, and the development of a national system for health information. This paper looks into current issues and barriers in Saudi Arabia healthcare environment. The paper describes the collections and analysis of quantifiable data to support tracking and monitoring of patients and assets in Saudi Arabia's healthcare environment. The paper also compares current practises with a proposed system for an e-Health framework using Radio Frequency Identification (RFID) and ZigBee technologies. A survey was conducted on respondents from Saudi Arabia to ascertain the need of tracking and monitoring in a hospital environment. The survey results indicated that implementing tracking system will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures.

KEYWORDS

RFID, ZigBee, tracking, monitoring, Saudi Arabia

1. INTRODUCTION

Developing countries, such as Saudi Arabia, have experienced many challenges in e-Health systems, services and applications implementation. Over the past few years, efforts have shown that there is a clear need for an approach and methodology which hold the most promise for success (Healy & Jc, 2008). In recent years, e-Health systems have been started in some hospitals and other health institutions across Saudi Arabia. However, the underutilization of e-Health systems has raised much concern. A lack of proper health informatics systems and applications has been ranked among the major challenges facing the health sector in Saudi Arabia as indicated by the Saudi government Health Reform Committee. One of the prominent issues in the Saudi Arabian healthcare sector is patient misidentification. A recent study shows that in a Saudi tertiary care hospital, 3.1% reported patient incidents were related to patient misidentification (Aljadhey et al., 2014). Another issue is the long waiting time to be seen by a doctor. The average patient waiting time in outpatients' clinics in UK and USA is 24 minutes (Press Ganey Associates, 2009), while research shows average patient waiting time in outpatients clinics in the Middle East Region is 161 minutes (Mohebbifar et al., 2014). Poor patient flow raises healthcare costs by failing to make the best use of skilled staff time and also increases the possibility of harm to patients as the medical staff spend most of their time looking for required medical devices to conduct required medical treatment (De Silva, 2013). Another challenge is the late arrival of physicians. In a Saudi tertiary care hospital, more than 20% of the physicians arrived more than 60 minutes late (Clinic Management Department, 2014). According to several surveys, one of the most common complaints patients have, is that they have to wait too long in the waiting area before being attended to, by the doctor. Patient-centred medical practices seek to make patients feel better, both physically and emotionally (Press Ganey Associates, 2009). Medical equipment is another challenge in the Saudi Arabian Healthcare environment as keeping track and managing costly mobile equipment is challenging and labour-intensive. A significant portion of asset inventories are lost, stolen or misplaced, affecting productivity every day in a busy environment like hospitals. Medical staff waste significant amounts of time searching for devices. For example, studies find that, a majority of the healthcare practitioners (85%) spend up to 60

minutes per shift searching for supplies including wheelchairs and infusion pumps (Dare, 2009). These challenges lead to significantly increased costs stemming from several issues such as low efficiency, poor risk management, high inventory etc. This paper explores potential needs for tracking and monitoring patients, staff and medical assets in Saudi Arabian hospital using non invention emerging technologies such as RFID and/or ZigBee. A survey was conducted on respondents from Saudi Arabia to ascertain the need of tracking and monitoring in a hospital environment. The survey results indicated that implementing tracking systems will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. The research revealed that implementing a tracking and locating system for patients, staff and assets will increase performance and efficiency for healthcare decision support in healthcare institutions in Saudi Arabia.

This paper proposes a tracking and monitoring system for patients, staff and medical assets, for healthcare decision support in Saudi Arabia. Attention is given to use of RFID and ZigBee technologies. This system will be at a strategic-level, and will be developed by using knowledge management concepts in relation to visualisation; to identify an appropriate managerial decision support framework in order to identify patients, medical staff, and medical equipment locations; to improve efficiency, and decision support systems to meet the needs of Saudi Arabia's healthcare sector.

2. RESEARCH ANALYSIS

2.1 Methodology

The population of this study comprises individuals who regularly visit or work in hospitals. The data for this research were obtained from a sample of the population of Saudi Arabia. A self-administered questionnaire (written in English and Arabic versions) was completed by the respondents and the data was gathered via the web. The survey was distributed to the target population through appropriate multiple social networks channels including Twitter, emails and WhatsApp etc. A questionnaire was designed specifically for this research based on the reviewed literature to obtain the necessary data. The respondents were asked to indicate their agreement level with a specific set of statements on a single 5-point Likert scale. A pilot survey was sent to ten individuals to review the preliminary questionnaire. Based on the feedback from the pilot survey responses, amendments to questions were made. The survey was divided into three parts. The first part included questions related to demographic information, such as age, gender, computer skills and educational level. The second and third parts involved the main questions on the needs for tracking and monitoring patients, staff and medical assets in Saudi Arabia. To ensure consistency and accuracy of meaning, all items were prepared in English language and then translated into Arabic language, and back-translated into English by trilingual translator. The 3rd version questionnaires were stored on Google document application (English and Arabic). To check the reliability of the question items, Cronbach's alphas were used and found to range from 0.57 to 0.81, and were thus acceptable.

2.2 Survey Results

Systematic analysis of the survey results produced comprehensive quantitative information which provides the basis for the conclusions developed in this paper.

2.2.1 Respondents' Profile

The online survey produced a total of 360 responses; however, only 220 responses were used, because some of the questionnaires were not fully completed. In terms of gender, the majority were male 85% and 15% were female as shown in Figure 1. The structure of the sample by age, showed 39.1% of respondents were aged from 18-30; 44.5% from 31-40, 13.2% from 41-50; 2.7% from 51-60 and 0.5% above 60 years of age respectively (Figure 2). In terms of computer skills, the majority have medium computer skills 68.2% (Figure 3). Regarding the education level, 75 % of the respondents are graduated people with bachelor degree or higher certificate while the rest of respondents have either diploma, high school or other qualifications (Figure 4). The respondents' jobs are various as follow: 58% are visitors, 19% are administrative staff,

medics/healthcare providers about 15% while the remaining respondents either ancillary staff or IT specialists equally (Figure 5).

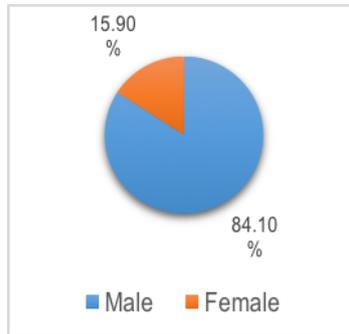


Figure 1. Gender

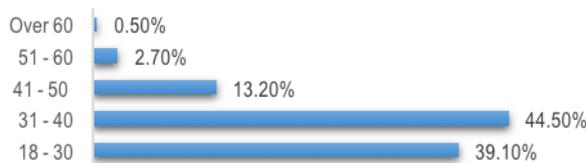


Figure 2. Age Group

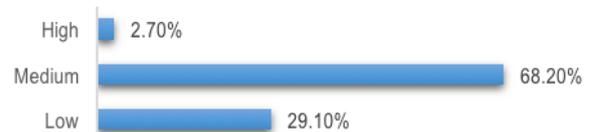


Figure 3. Computer Skills Level

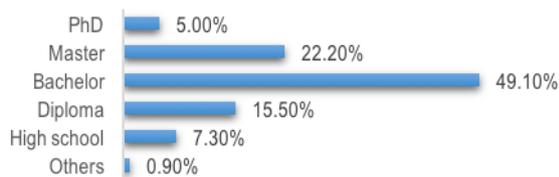


Figure 4. Education Level



Figure 5. Respondent Profile

2.2.2 Current Issues and Challenges in Locating and Monitoring Patients, Staff Members and Assets

The survey analysis shows in Figure 6a to 6c clearly the size of the issue in locating and monitoring patients, staff members and assets. More than 75% of the healthcare workers answered No when asked this question, ‘currently, can you track and locate patients and assets in your hospital when needed?’ (Figure 6a). Also, more than the half of them (51%) admitted that they often found it difficult to find medical assets and mobile equipment’s in their hospitals when they need them (Figure 6b). In addition, more than 88% of the respondents confirmed that there is no system in place to measure productivity and determine the attendance for the doctors, nurses and other staff members (Figure 6c).

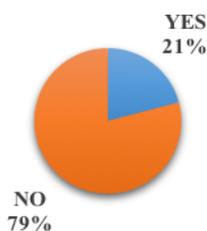


Figure 6a. Currently, can you track and locate patients and assets in your hospital when needed



Figure 6b. Do you find it difficult to find a medical device and mobile equipment’s in your hospitals when needed.

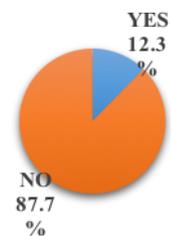


Figure 6c. Is there any system in place to measure productivity and determine the attendance for the doctors, nurses and other staff members?

2.2.3 Patients Waiting Time

In USA and UK, the average patient waiting time in outpatient clinics is 24 minutes (Press Ganey Associates, 2009). However, as shown in Figure 7, the results show that over 70% of the patients have to wait 30 minutes or more to be seen by a doctor, this is due to number of reasons. Firstly, the shortage of healthcare professionals, such as physicians, nurses, pharmacists, etc. According to the Ministry of Health (MOH) in Saudi Arabia the total healthcare practitioner numbers, are about 248,000. The rates of physicians and nurses in Saudi Arabia are 16 and 36 per 10,000 population respectively. This is lower than other countries such as Japan (12 and 95 per 10,000), France (37 and 81 per 10,000) and the United States of America (27 and 98 per 10,000) (Almalki et al., 2012). Secondly, there are no systems or tools to remind the healthcare providers about those waiting patients. Thirdly, reports show that in some hospitals more than 20% of the physicians arrived more than 60 minutes late (Clinic Management Department, 2014).

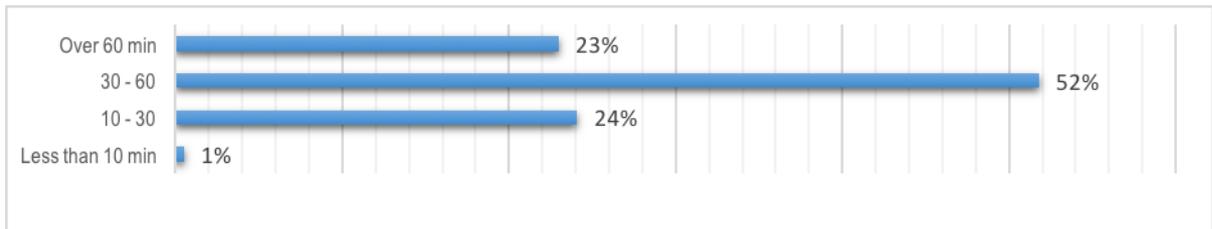


Figure 7. How long patients have to wait until seen by a doctor?

2.2.4 Short Supply or No-Supply of Necessary Medical Equipment

As shown in Figure 8, when healthcare providers have been asked about how often clinics and /or emergency rooms are in short supply or no-supply of required medical equipment, the results show that more than 60% have answered either always, very often or sometimes. These results are due to the lack of assets control and this lead to consuming a considerable amount of time in searching for supplies and this could affect patients' safety.

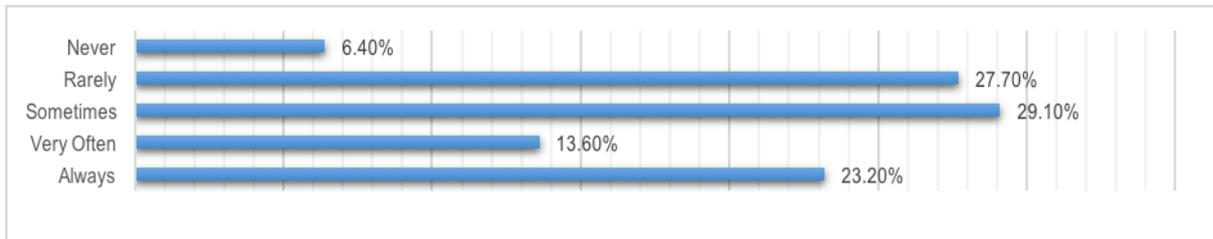


Figure 8. How often are clinics and /or emergency rooms in short supply or no-supply of needed medical equipment?

2.2.5 Tracking and Monitoring System Needs

As shown in Figure 9, the respondents strongly agree (68.2%) that implementing a tracking system; will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. Also as shown below in Figure 10, they strongly agreed (77.3%) that implementing a tracking and locating system for patients, staff and assets will increase performance and efficiency for healthcare decision support in healthcare institutions in Saudi Arabia. The proposed solution as shown in Figure 11 is a smart e-Health framework for tracking and monitoring patients and assets, for healthcare decision support in Saudi Arabia. Attention is given to use of RFID and ZigBee technologies. This framework will be at a strategic-level, and will be developed by using knowledge management concepts in relation to visualisation; to identify an appropriate managerial decision support framework in order to identify patients, medical staff, and medical equipment locations; to improve efficiency, and decision support systems to meet the needs of Saudi Arabia's healthcare sector.

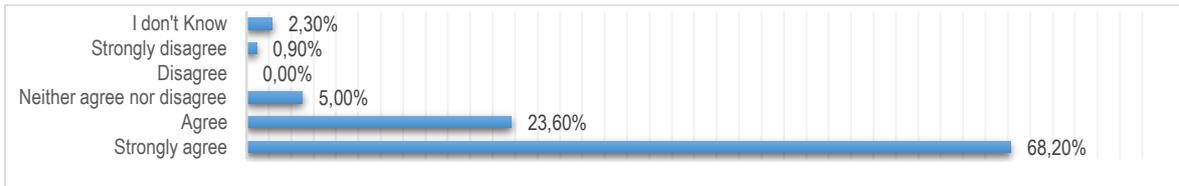


Figure 9. Implementing a tracking system, will help in tracking patients as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures.

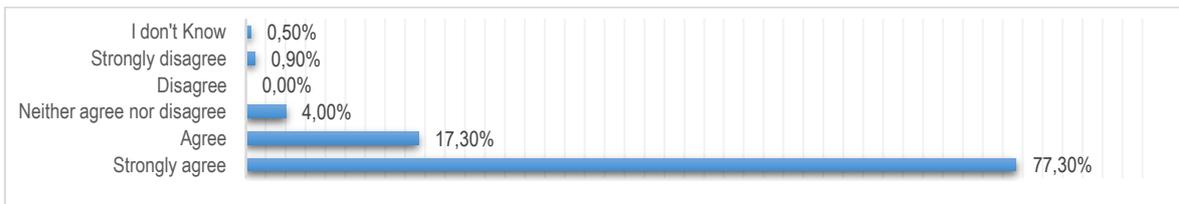


Figure 10. A tracking and location of patients, staff and assets system in Healthcare institutions in Saudi Arabia will increase performance and efficiency.



Figure 11. Current practice and the proposed system.

3. CONCLUSION

This proposed solution has many advantages as it can help in preventing and eliminating human and medical errors such as patient misidentification. Secondly, it will measure productivity of the doctors, nurses, administrative staff and their attendance which will result in improving efficiency. Thirdly, patients can be tracked as they move about the facility, enabling them to be quickly located for scheduled treatments or procedures. Fourthly, a tracking system will enable better protection of vulnerable patients by sounding an alarm when patients leave designated areas. Finally, locating life-saving and critical care equipment quickly, will improve patient care and staff productivity. One possible application is increasing the safety and accuracy of verifying the individual's status regarding access to sensitive areas such as maternity to prevent switching of new born babies. This system can also update responsible staff when beds, wheelchairs and other equipment are unavailable or misplaced. In conclusion, the proposed systems will help in improving efficiency and decision support systems to meet the needs of Saudi Arabia healthcare sector.

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THREE SYSTEMS FOR PERFORMING REMOTE-ECHOGRAPHY THROUGH AN INTERNET CONNECTION ON GEOGRAPHICALLY ISOLATED PATIENTS

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ABSTRACT

Objective: To evaluate the performance of tele-echography for routine use in isolated medical centers. **Methods:** Three tele-echography systems were used for deep (abdomen, pelvis, fetus organs) and peripheral organs (carotid arteries, leg vasculature, muscle): (a) a robotic arm holding an echographic probe, (b) an echograph with motorized probe, both controlled from the expert center, (c) remote guidance where the operator at the patient site hold and orientate the probe assisted by an expert via videoconference. **Results:** These methods were tested in the same medical center 60km away from the University hospital. A total of 340 remote echographic examinations were performed (41% teleoperated, 59% by remote guidance). The average examination time (15 to 25min) depended on the method used, anatomy, and echogenicity of the patient. The motorized probe and the robotic arm allowed the full control of the probe orientation necessary for obtaining correct deep organ views and provided diagnoses in 97% of cases. Similarly, the motorized probe was also used for superficial organ examinations. The use of remote guidance was sufficient for superficial vessel examinations and provided diagnoses in 98% of cases but was not adequate for deep organ examinations. **Discussion:** Both teleoperated systems provided control of the probe orientation for obtaining appropriate views of deep organs but the motorized probe (430g; 400cm³) was much more ergonomic than the robotic arm (3.5kg; 40x35x40cm³). Remote guidance was appropriate for superficial blood vessels; however, the motorized superficial probe was better for the assessment of small structures. The ability to control the echograph functions and settings made the remote echography quicker and more accurate.

KEYWORDS

Tele-medicine; Tele-echography; Teleoperated probe; Remote guidance

1. INTRODUCTION

Previous studies have confirm the strong need to provide access to remote echography to isolated person because echography is the first imaging modality which can be setup without huge and costly installation. Moreover it's the only imaging method that can identify very quickly emergency situation to be treated immediately and other that can be treated on place. Access to remote echography will facilitate and make safer the medical diagnosis, which may result in a better medical assessment and a quicker decision making. Several method were designed and validated for providing remote ultrasound examination to isolated subjects and patient. These methods were based on tele-operated systems (Arbeille et al., 2005, 2015; Georgescu et al., 2015; Vieyres et al., 2003), remote analysis or remote guidance through videoconferencing (Awadallah et al., 2006; Hamilton et al., 2011; Otta et al., 2012; Randolph et al., 1999) or volume capture with 3D reconstruction (Arbeille et al., 2014; Kratochwil et al., 2000; Masuda et al., 2001).

It was hypothesized that not a single method could answer all the medical and ergonomic issues related to tele echography practice. We had the opportunity to use in the same medical center on the same population of patient 3 different methods and try to determine the method the most appropriate for each organ/pathology.

2. METHODS

2.1 Study Procedures and Population

Three methods were used to perform remote echographic examinations. The method used was dependent on the organs to be investigate. For deep organs (abdomen, pelvis, fetus organs) the movement (orientation) of the probe was controlled from the expert center (a) using a robotic arm holding an echographic probe (Arbeille et al., 2005; Georgescu et al., 2015) (Figure 1) or (b), an echograph with a motorized probe (Arbeille et al., 2015) (Figure 2). The motorized probe was also used for peripheral vascular targets (carotid artery, leg arteries and veins) with additional examinations being conducted using (c) remote guidance where the operator at the side of the patient held a 2D probe and oriented it manually according to verbal direction provided by an expert sonographer (Hamilton et al., 2011; Otto et al., 2012).

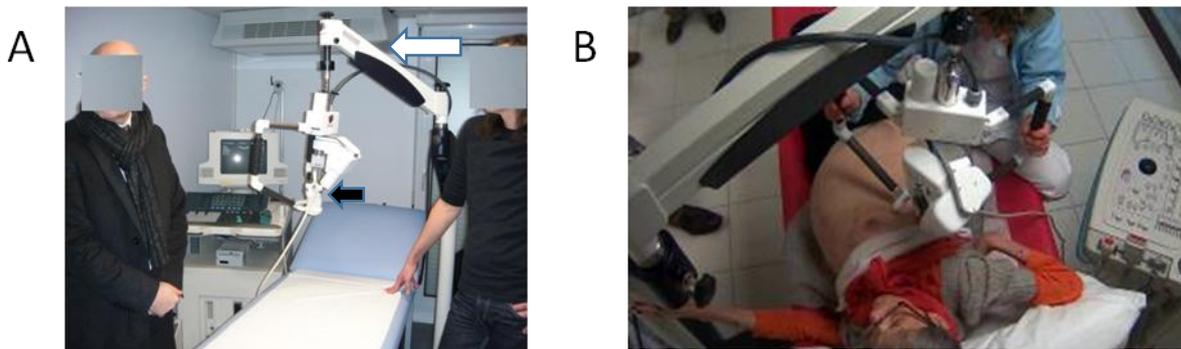


Figure 1. Robotic arm (black arrow) used for teleoperated echographic examinations pictured (A) hung to the ground support (white arrow) and (B) over the patient for the examination



Figure 2. Examination set up for teleoperated echography showing (A) the patient site with the non-sonographer operator holding the motorized probe on the patient and (B) the expert site where the expert sonographer used the dummy probe, ambient video from the patient site, and echographic video to perform the examination

The three methods were used for performing remote echographic examinations on isolated patients in a single medical center. Similar patient populations were used for all the examinations which allowed the methods to be compared to determine the most appropriate for each organ of interest and pathology.

2.2 Tele-echography Assessments

The three methods of tele-echography were used to conduct standard echographic examinations. Images were acquired in B mode for morphological evaluations of diseases (ex. lithiasis, cists, gall bladder wall thickness, tumor, hematoma, and renal cavity dilation), organ or lesion size, thrombus imaging, and collapsing veins.

Color and PW Doppler were used to assess things such as blood flow velocity, atheromatous disease, the degree of stenosis, vascular resistance, vein reflux, and parenchyma arterial color cartography.

3. RESULTS

During the first run of the study (2014), 160 patients were investigated by tele-echography using the robotic arm (n=47) or by remote guidance (linear probe 7MHz; n= 113) (Figure 1, 3). During the second run of the study (2015), 180 patients were investigated by tele-echography using the echograph with the motorized probe (n=92) or by remote guidance (linear probe 17MHz; n=88) (Figure 2, 4)

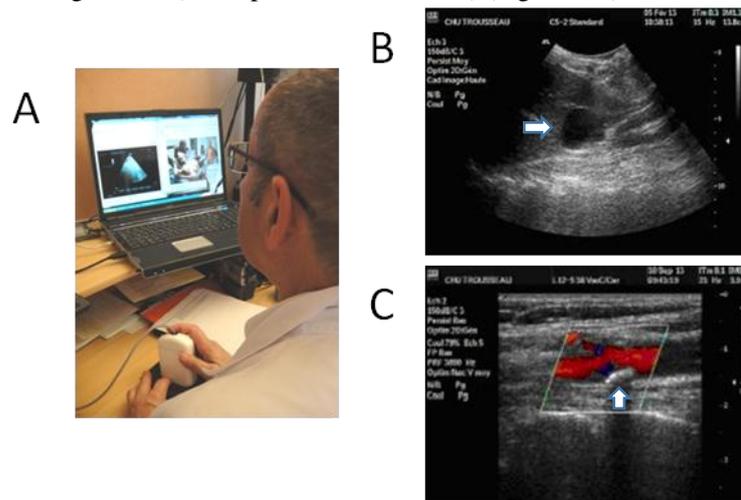


Figure 3: Results of the first phase of the study showing (A) the expert performing the examination, (B) an image of a renal cyst visualized using the robotic arm, and (C) an image of the carotid bifurcation with atheromatous plaque obtained using remote guidance

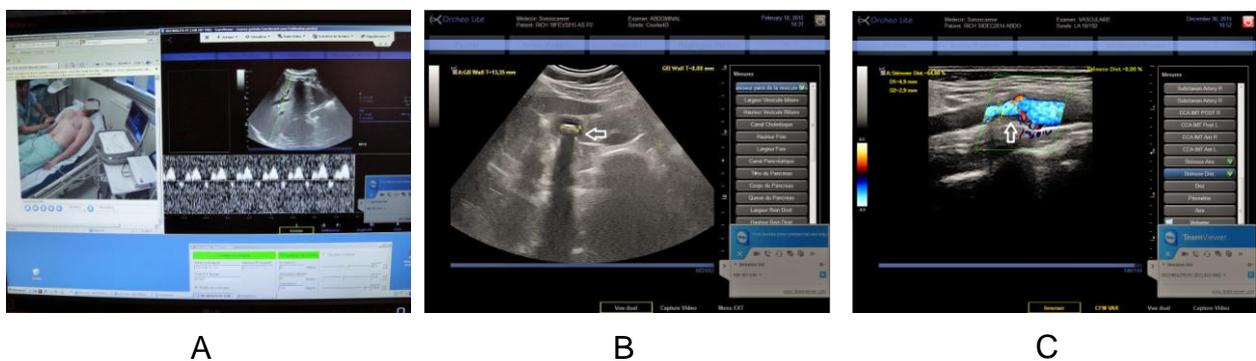


Figure 4. Results from the second phase of the study showing (A) the expert center computer screen during an examination with the motorized probe showing the patient video (left), hepatic vein Doppler (right), and the probe interface (bottom), (B) view of lithiasis (arrow) in a Gall Bladder obtained with the motorized probe, and (C) an image of carotid atheromatous plaque (arrow) with the blood stream in color Doppler obtained using remote guidance

Both the robotic arm and the echograph with motorized probe provided enough views to deliver a diagnosis for deep organs in 97% of the cases. The full control of the orientation of the probe via teleoperation was necessary for getting correct views of the deep organs as the operator at the patient site was not a sonographer. For the superficial targets the tele-operated motorized probe (for superficial organ) or the remote guidance (for superficial vessels) provided the right view of the organ necessary for the diagnosis in 98% of the cases.

4. DISCUSSION

For the deep organs investigation the robotic arm or the echograph with motorized probe, provided similar diagnostic performance. However, the motorized probe (430gr; 400cm³) was found much more ergonomic, and easy to move along the abdomen or the lateral side of the patient than the robotic arm (3,5kg; 40x40x35cm³) which made the tele-echography quicker and of better quality.

For the assessment of superficial blood vessels, remote guidance using a high frequency 2D probe was the best method, while the superficial motorized probe was more appropriate for assessing smaller structures (ex. thyroid or muscle). For superficial organs, the robotic arm was found to be too difficult to locate accurately on the organ acoustic window and to maintain motionless during the examination due to the size and weight.

The remote guidance method with a conventional 2D high frequency probe provided vessel echographic images of better resolution and contrast than the motorized probe of lower frequency. Thus it was agreed that for superficial vessels (carotid artery, leg artery, and veins) the priority should be put on the echographic performance of the probe (high frequency) rather than teleoperation control. Despite the fact that the operator at the patient site was not a sonographer, the operator was able to consistently obtain a transverse view of the vessel and get the long axis view of the vessel simply by turning the probe 90° while keeping the image of the vessel in the field. Conversely for non-vascular superficial structures (muscle, thyroid) the teleoperated superficial motorized probe was preferred as it allowed the expert to fully investigate the organ by teleoperating the transducer orientation or to entirely scan the structure and reconstruct it in 3D for later analysis. As the visualization was done by the expert sonographer, the motorized probe allowed for a faster and more accurate examination of these structures.

The tele-echography performed in this study utilized a standard Internet connection. The results confirm that that 1Mbit/s bandwidth with 10/s frame rate was sufficient for getting echographic images and Doppler data of good quality for diagnosis with a transmission delay of less than 2s. The use of the tele-echography methods in this study required minimal training of the non-sonographer operator at the patient site as the probe movements and echograph functions (motorized probe method) were teleoperated by the expert sonographer. The remote guidance method required the most training as the operator was required to properly locate and move the ultrasound probe in addition to activating echograph functions. However, with several weeks of training, the operator had acquired a sufficient level of skill to perform superficial vessel examinations using remote guidance.

5. CONCLUSION

Presently, the medical reliability and usefulness of tele-echography for isolated patients has been demonstrated. However, results indicate that a single method of tele-echography is not appropriate for all examinations routinely used in clinical practice. The control of the echograph setting and functions with the use of the motorized probe improved both the time required for the examination and the quality of the echographic and Doppler data. The motorized probe and teleoperated echograph also provides a method of tele-echography that can quickly generate diagnoses and requires minimal training of the operator at the patient site. Future work is required to refine this system to provide a method of tele-echography that can generate the same quality of echographic images and with the same ease as traditional echographic examinations.

ACKNOWLEDGEMENT

The authors thanks Mme M Porcher (Sonographer) and Mr Joel Blouin (Engineer) for their active contribution to the tele-echography examination. The present work was supported by CNES (French Space Agency) R & T grant TOURS-2:131512-2014.

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THE RELEVANCE OF INTEGRATION IN A REGIONAL HEALTH CARE SERVICE: A SURVEY

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ABSTRACT

IT advances are changing how health care services are accessed and delivery, contributing significantly to enhance quality of patient care. Existing models for maintaining information need to shift to systems in which the patient's clinical information is integrated, complete, stored electronically, and available to the patient and authorized persons anywhere, anytime. Most health care organizations are still using insufficient and ineffective information systems. This paper presents the results from a survey conducted to 16 health entities from the regional health care service of the Azores, which has the propose of acquire knowledge about the existing information. Because the Azores is an archipelago geographically dispersed having a multiplicity of existing systems that do not cover the information needs. Improving integration should be a challenge to overcome quickly, facilitating delivery of high-quality and cost-effective services on administrative and clinical information. The results given by our survey show us the need for a stronger and more efficient intra-organizational and inter-organizational integration in several levels, namely informational, application and procedural.

KEYWORDS

eHealth; eHealth Policy and Practice; Health information systems; Organizational integration.

1. INTRODUCTION

In the health sector, the activity of its professionals is complex due to the ambiguity of concepts, the frequent changes in clinical status of patients, the variability in the structure and organizational processes, the existence of a large number of professionals with different backgrounds and skills, as well as the different organizational cultures (Chu 2005). In some sense, the quality of care services provided to the citizens depends on the knowledge available at the point of care (Haux 2006). And, then, the knowledge management plays an important role in the therapeutic process and it has a strong impact, not only on health outcomes, but also in the financial performance of health services (Lenz & Reichert 2005; Uslu & Stausberg 2008).

The health information systems require that the health care services be focused on citizens, where the medical records support continuous treatment and allow the involvement of several professionals and organizations. A high level of interoperability, within organizations and among organizations, ensures us the original meaning of the information exchanged (Maldonado *et al.*, 2003). We must move towards interoperability assuring that the health professionals have access to the information in the care points on time, regardless of their location, in order to provide better documentation, communication, and coordination among them (Bergmann *et al.* 2007).

The regional government of the Azores, a Portuguese archipelago, is responsible and fully fund the public health care system, spends annually substantial amounts to support the forwarding of patients between islands as a result of differentiation in the provision of health care services to citizens. In the best of our knowledge, we cannot know, through official sources, estimates the amounts to quantify these values. However, we can assume that these values are excessively high with lack of enforcement of management measures for rationalization and optimization of the financial expenses.

In order to understand what the roots of the problem and what can be suggested to improve the quality of health information provided by the systems, we intend to study the perception of top regional health care system managers on the role and the importance of health information systems integration in regional health care system, having in mind its archipelagic condition.

After the introduction session, where we introduce the importance of health care information systems for health care practice, focused in the patient, the second section gives the methodology used for the survey and, then, the results are discussed, as well as some conclusions are taken.

2. THE REGIONAL HEALTH SYSTEM

We introduce the regional health care system through some aspects of its geography and demography, as well as how it is organized to provide health care assistant to local inhabitants.

The archipelago of the Azores is a region of Portugal, which has political and administrative autonomy, including the provision of health care services. It is composed by nine islands in the Atlantic North, which according to the census of 2011, has a population of 246.772 inhabitants. There are significant differences in the distribution of the number of inhabitants in the islands: the island of Corvo, the smallest of the archipelago, live about 500 inhabitants; on the island of São Miguel, the largest, live more than 120.000 inhabitants. The geographic dispersion of the islands and the uneven distribution of the population influence the quantity and quality of the provision of health services.

The regional health care system (RHCS), that is fully funded by the regional government, is composed by 16 articulated health care organizations: 9 island health units (IHU), one per island; 3 E.P.E hospitals; the Azores Oncology Centre (specialized service); Regional Health Council (advisory body); Saudaçor public enterprise; Regional Health Inspection (Regional Legislative Decree no. 28/99/A of July 31 from Regional Government of Azores, 1989). Each IHU organization is responsible for planning, coordinate and supply of local integrated health care subunits, designated health centres (HC). An IHU has a board of directors whose responsibility is to manage the entire HC network, mainly the clinical components and nursing of its HC. The hospitals are responsible for provide differentiated health care services for citizens coming from other health care organizations, even from other hospitals in other islands, or from their own initiative. Annually, the RHCS generate about 400.000 medical appointments: 39% in HC; 61% in hospitals.

3. THE METHODOLOGY

The method used to conduct the investigation was a questionnaire in the universe of the directors of all RHCS units. It was possible to interview 80% of the 20 units: 14 local health care organizations and 2 hospitals; between January 2014 and April 2014. Each of these units was represented by its maximum charge or by someone appoint by he or she.

We assumed that the universe of inquiries does not have an advanced level of technical knowledge about current integration technology solutions because the decision makers, mostly financial staff, usually know what they want, in order to achieve high levels of efficiency and effectiveness in the delivery of health care services. So, we provide a generic, abstract and hierarchical model for systems integration concept, taking common sense ideas.

We bowered from (Martins 2006) an approach for integration in general information systems. So, in the layer of informational integration, the bottom layer, we assume that every form of storage, exchange and management of information is subject to constant updates that can lead to different integration needs. Its scope encompasses the functionalities that enable the access to correct and updated information, either through synchronisation between multiple sources of information, either by centralizing access to a single source of information. In the next layer, the layer of application integration, we assume that it focuses on solutions that enable interconnect, or incorporate, applications sharing information and functionalities. And, in the top layer, the integration of business processes corresponds to the mode of organizations operation, and defines how information is handled and conveyed. And, finally, we consider that each of these layers may be integrated within the organization or with other organizations, as an afford to integrate information, applications and procedural layers.

The questionnaire was composed by both open and closed questions grouped into 6 groups. Table 1 presents the hypotheses formulated for the research questions that will be later discussed and evaluated in Section 3. Questionnaires were answered individually, in person or by video call. Each group of questions was preceded by a short explanation of its purpose and structure.

Table 1. Research questions and hypotheses

Question	Hypothesis
Q1 - Do the organizations have a degree of computerization suitable to an implementation of a fully electronic IS?	H1.1 - Most of the entities' services are computerized. H1.2 - Entities do use a significant number of software applications supporting IS.
Q2 - How do the boards of directors characterize the importance of IS?	H2.1 - IS is important for the entities.
Q3 - Do the organizations have intra-organizational IS integration?	H3.1 - There is intra-organizational procedural IS integration. H3.2 - There is intra-organizational application integration. H3.3 - There is intra-organizational information integration.
Q4 - Do the organizations have inter-organizational IS integration?	H4.1 - There is inter-organizational procedural IS integration. H4.2 - There is inter-organizational application integration. H4.3 - There is inter-organizational information integration.
Q5 - Do the organizations use the WHO's international information standards?	H5.1 - Entities do use the WHO's international information standards.

The first group of questions contributes to get answers to Q1 through two questions, which allow acquiring knowledge about what services (support, technical, administrative, information management) that are already computerized. The second group questions the opinion of interviewer about the importance of IS, concerning the three organizational levels (operational, tactical, strategic). Third and fourth groups aim to answer Q3 and Q4 respectively. They have a similar structure composed by three questions by each integration perspective (procedural, application, informational). Asking these questions, we want to know in what services exists integration and quantify their use, by assigning a Likert scale with three values (low, medium, high). The fifth group has two questions to answer Q4: checking the use of the WHO Family of International Classifications and classifying each use by assigning the Likert scale previously mentioned. The last question complements the answer to Q1 by identifying what are the IS software applications that are currently in use.

4. RESULTS

This section presents and discusses the results obtained from the statistical analysis of information gathered to answer the research questions in Table 1. In the period mentioned in previous section, it was possible to collect information on 16 of the 20 health care entities (14 HC and 2 hospitals). The data collection covered islands of the three groups, corresponding to a response rate of 80% and 77.77% of medical appointments. A descriptive statistical analysis was performed using Microsoft Excel 2013 software.

Table 2 presents the results obtained for the research questions in Table 1. Concerning the hypotheses formulated for Q1, the results obtained allow us to confirm H1.1, demonstrating that globally approximately 95.07% of services (supportive, technical, administrative, information management) are already computerized. It can be inferred that hospitals are prepared to implement a fully electronic IS, while health centres still require some upfront investment on the computerization of support services, clinical services, and information management services. Results also enabled H1.2, revealing a significant quantity of varying applications in use on a daily basis in the health entities, which can constitute an indicator of the necessity of integration and the effort to be made.

The result obtained for the hypothesis H2.1 tells us that the respondents consider IS very important and essential for decision-making and show us the receptivity in the implementation and use full information system. At strategic level, they highlighted the complex decisions that require information quit varied regarding to the intra-organization/surroundings relations. Respondents also refer that hospitals have some autonomy to define their own strategies, while Sudaçor takes strategic decisions for RHCS. At tactical level, they agree on the needed of information due to their responsibility for frequently interpreting detailed information obtained from different internal sources. These interpretations are useful to support the activities to enable the implementing strategic plans. At operational level, in spite of the availability of most information, the use of information systems is still weak, partially caused by the dispersion of information by various internal systems that are not integrated.

Table 2. Results for research questions

Question	Hypothesis	Results
Q1	H1.1	In HC, administrative services are fully computerized, 95% of a support services, 93% of clinical services, and 97% information management services are also computerized. In hospitals, all services are computerized.
	H1.2	On average, HC have 11 applications in production (with a standard deviation of 3.01) and hospitals use 10.5 applications (with standard deviation of 0.5). Applications in HC and hospitals: FileMaker, Microsoft Access, Microsoft Excel, Spring, SGC Edoclink. Applications only in HC: BAS, BMC Service Desk Express, CGA, Consultorius, EasyLnq, E-Deialab Slice, Intranet, Kodak, Maxdata, MedicineOne, RCI, Refunds IGIF, RNU, Rocra, SGR, SIAGRHARA, Siemens SIENET Sky, SISA, SPA, SR. Applications only in hospitals: AIRC, Connexall, Glintt, Iametrics, InnuxTime, Magic Lab, PACS, SClinico, SGP, DREAM. Applications in all HC: MedicineOne, Microsoft Excel, Spring, SIAGRHARA. Applications in all hospitals: FileMaker, Glintt, Microsoft Access, Microsoft Excel, Spring, SGC Edoclink.
Q3	H3.1	Intra-organizational procedural IS integration is present in all entities. Hospitals qualification: medium (100%). HC qualification: low (7%), medium (79%), high (14%).
	H3.2	Intra-organizational application integration is present in all entities. Hospitals qualification: medium (100%). HC qualification: low (43%), medium (57%).
	H3.3	Intra-organizational informational integration is present in 81% of entities, corresponding to all hospitals and 78% of HC. Hospitals qualification: low (50%), medium (50%). HC qualification: low (18%), medium (57%).
Q4	H4.1	Inter-organizational procedural IS integration is present in 44% of entities, corresponding to 50% of hospitals and 43% of HC. Hospitals qualification: low HC qualification: low (17%), medium (83%)
	H4.2	Inter-organizational application integration is present in all entities. Hospitals qualification: low (50%), medium (50%). HC qualification: low (14%), medium (86%).
	H4.3	Inter-organizational information integration is present in 94% of entities, corresponding to 50% of hospitals and 93% of HC. Hospitals qualification: low. HC qualification: low (7%), medium (86%).
Q5	H5.1	ICNP/CIPE, ATC-DDD, ISO9999, ICP-2, and ICHI are used by HC. More concretely, ICNP/CIPE by all HC, ISO9999 and ICNP-CIPE by 57%, ATC-DDD and ICHI by 36%. HC qualification: ICP-2 was medium (7%) and high (93%); ICHI was low; ISO9999 and ATC-DDD was medium; ICNP/CIPE was low (12%), medium (63%), and high (25%). ICD is only used by hospitals with high qualification. The entities do not use ICF.

In what concerns to the intra-organizational integration, additionally, given the table above, for hypotheses H3.1, in question Q3, the hospitals considered has medium level while, in general, 6% respondent low and 81% and 13% respondent medium and high, respectively. For H3.2, 37% respond low, while the remaining 63% respond medium, and, in general, 23% responds low and 77% responds medium. For inter-organizational integration, 13% responds low and 87% responds medium for procedural integration, and 19% responds low and 81% responds medium for application integration and, finally, 13% responds low and 87% responds medium for informational integration. The results obtained for question Q5 confirm the usage of some of the WHO Family of International Classifications by all organizations.

5. CONCLUSIONS

Interviewing 80% of health care organizations of the Azores, we conclude that approximately 95.07% of services (supportive, technical, administrative, information management) are already computerized. It can be inferred that hospitals are prepared to implement a fully information systems, while the other health organizations still require some upfront investment on the computerization of support services, clinical services, and information management services. However, the survey reveals a significant quantity of varying applications in use on a daily basis. All the interviewed considered that information systems are very important for the integration organizational levels and it also essential for decision-making, as well as for the receptivity in the implementation and use of an integral information systems. All entities have intra-organizational and inter-organizational procedural and application integration, mostly in a low or medium degree. Although intra-organization procedural integration exists in all entities, it does not occur with procedural integration. So, these results lead us to conclude the need for a stronger and more efficient intra-organizational and inter-organizational integration.

ACKNOWLEDGEMENT

We want to thank to all Health Unit's CEO and CIO for their survey interview.

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ITALIAN DIGITAL GOVERNMENT: INSTITUTION, NOT TECHNOLOGY

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ABSTRACT

The subject matter of digital government, and of digital services in general that are linked to it, represent the object of a continuous monitoring in order to evaluate their evolution over the time. In particular, the digital infrastructure gap can be assessed according to the circumstances in broadband connectivity services that are either totally absent or insufficient in several respects. In this paper it is suggested that, in order to make Internet become a real social and market institution, a Digital Government should, therefore, put forward a technological architecture model, as well as a model for public services and market exchanges.

KEYWORDS

Digital government, sharing economy, eService models

1. INTERNET: FROM INFRASTRUCTURE TO INSTITUTION

The topic of digital government and of the digital services behind it in general, are under the attention of the European Union as far as its Digital Agenda is concerned [2], and are the subject matter of a continuous monitoring effort to evaluate their evolution over the time. A survey conducted in 2012 on a wide sample of citizens from 32 European countries (over 600,000 residents) who are Internet users (72% of the total population between 16 and 74 years of age) [14] revealed what follows:

- ✓ 46% of the users of public services used electronic methods;
- ✓ 50% of the sample gave his/her preference to the use of eGovernment tools for future interactions with Public Administration;
- ✓ The most widespread services are related to tax payment (73%), of residence changes (57%), and enrolments for further education purposes (56%);
- ✓ 24% of the sample doesn't know how to use eGovernment services (mostly elderly and young people experiencing usage difficulties);
- ✓ As regards eGovernment services, the satisfaction level dropped by 1.3% between 2007 and 2012, and it is significantly lower than other online services (e.g. eBanking).
- ✓ The main reasons leading to the usage of digital services offered by Public Administrations are time saving (80%), greater flexibility (76%), and savings in term of costs (62%).

Taking into consideration as comparison parameters the percentage of automated services, their level of integration as well as user satisfaction, Italy as appears to be below the European average level in each of them, but maintaining, however, a good ratio between services available and investments made (% of GDP for ICT services). During 2012, in Italy [6] 64% of the citizens interviewed used the traditional office as major method of contacts with PAs. Only 15% opted for ICT services (Internet/email), and 4% used certified email (PEC). By analyzing the data collected on age and level of education, it appears that the use of Internet-email is more widespread among young people, especially those with a high level of education. Such a tool was used by 35% of young people aged <30 years (compared to 5% of people who are over 65), and by 37% of people with a university degree (against 1% of people without any educational qualifications, or having just a primary school qualification). No important differences emerged concerning the geographical location of people that were interviewed. Technical difficulties and the lack of tools represent the main obstacles to Internet use or to its possible greater usage, 32% and 31% respectively of people interviewed.

A first dimension of the innovation that needs to be considered, even before the more specific topic of PA digitalization, is the one related to technology and the general infrastructure within a given country. This is a necessary condition – even if it's not the only one – in order to enable change in individual behaviours and collective processes (as well as administrative ones). Especially in the ICT field, it precedes the demand factors and the social-institutional context elements, and suffers from clear technology opportunities (as a reflex of the “hard law” of physics and chemistry) which are external to socio-economic factors. In this sense, the evolution of technology opportunities in data transmission and reception and, consequently, the private and public investment dynamics in broad band networks and platforms represent the first step to be considered in order to appreciate that the entity of Italy's and Italian PAs' digital gap (both in terms of infrastructures and behaviours) may be due to a shortage in the offer of digital connectivity.

In fact, some recent evidences [10] seem to demonstrate how the diffusion and usage rate of eServices – both public and private ones – need higher rates of broad band diffusion to start with (in particular, as regards its geographical coverage). Starting from such an infrastructural basis, it is then possible to further activate such network effects that result in downstream development of eServices. However, some reputable literature has been showing since the '80s, how the materialization of the indirect effects between infrastructures and services is neither rapid nor predictable, since it can also be hindered by several problems and inactivity issues, in particular, in relation to dynamic settings like “chickenegg” ones. Among them we'd like to mention the asymmetry information characterizing the technological environments that are more dynamic, the frequent discrepancy between stakeholders' expectations and incentives, the external macroeconomic shocks (think about the current impact of the state deficit over PAs' available resources) and, last but not least, also the policy failure. in addition to the problems which are typical of the market.

In particular, the infrastructural digital gap can be evaluated, according to the circumstances, on the basis of broadband connectivity services that are completely absent, or that, if existing at all, are nevertheless insufficient in relation to several requirements. In fact, it should be kept in mind that the global digital gap has a multi-faceted nature, and needs multidimensional metrics. Moreover, in order to assess such a gap, any comparisons with average situations – or even with a digital champion – may be very misleading. Regarding the extent of the development of mass eServices, using a metaphor, we could say that it isn't so important if there is a minority of citizens and companies that runs as fast as a Ferrari when most of them rides rusty bicycles, or even go on foot.

If the aim is Digital Government, we should then discuss not only the Internet of rights, where everyone calls for an unlikely individual total autonomy, but few people seem willing to accept a collective commitment in order to enjoy a kind of freedom that is protected by the law. The argument should be extended to the Internet of duties, beyond the web of entertainment, opportunism and illegality, in order to move forward towards a technological infrastructure becoming a social and market institution.

As concerns Digital Government, there is no need to wait for a 100mb/sec on fiber-optic network to be available in every households. Just a few megabits for mobile connectivity are enough, for everything and everyone. Therefore, a proper use of terrestrial radiofrequencies should have the priority over the requirements of home entertainment services, in favour of the productivity of the country's national economy, as it was clearly highlighted in the relatively ambitious Lamy Report of the European Commission. [8] Amongst major architectural factors such as: Speed; Latency and quality; Ubiquity and geographical coverage; Always on / signal stability; Safety, seen as more protection against cyber attacks; the most important ones in terms of economic productivity are the last four and not the first one. [3] The critical mix of architectural factors changes from time to time for the real “customers” of broad band applications, since they are the economic processes of public and private organizations. Therefore, a country needs a good band more than a large one, a universal band, conceived as a right, but also as a duty; and a secure and protected band (not a feast of illegality, anonymous whistleblowing, piracy and hacking). The high speed access can and must be available with time, but it doesn't constitute the main priority for growth and development and it should not be achieved at the expense of the geographical coverage and safety.

2. APPLYING A SUCCESSFUL MODEL: THE ANALOGIC/DIGITAL “SWITCH-OFF”

Internet implementation for traditional companies and public institutions has been, with very few exceptions, the cause of additional, not replacement, costs, and a source of replacement, not additional, revenues.

As regards costs, for instance, for 15 years companies have invested on institutional websites or on ecommerce platforms, but they couldn't stop supporting the costs of traditional distribution. The public administration spends lots of public money for first generation e-government, and so do the banks keep on spending for information and transaction-based e-banking services. In both cases, such services are wrongly considered additional channels for traditional ones, but without achieving a significant restructuring of operating costs, either for their own physical networks or for their own internal processes.

Furthermore, on the revenue side, only a few results were actually differential, in comparison with the ones obtained through “channel conflict” which, as matter of fact, cannibalized traditional sales.

Such a phenomenon is typical of the migration between different standards of economic processes. Until a demand remaining anchored to the previous standard endures (in this case to non-Internet based processes), the offer will be forced to face a dual cost structure, as well as an uncertain distribution of revenues [4]. A way out from this useless economic situation may be speeded up, and it is possible to reach a critical mass that is able to generate value by making obsolete the traditional processes, while forcing the demand for a transition towards a new system through a switch off process similar to the one implemented for the digital terrestrial TV broadcast. Therefore, it is necessary to act on the demand front.

The Digital Government is not necessary to make traditional document exchange processes more efficient. It serves to make them useless. Useless because they are overcome by a new model of information exchange, and not only through the replacement of a paper form by its electronic version. Otherwise, the role of the Digital Agenda is reduced to that of a PDF version of the old forms that needed to be filled out. The Digital Agenda should not aim at dematerializing paper, but to materialize new organizational and financial processes that are more consistent with the current economic environment. [9]

The objective of the Digital Agenda should be the construction of a modern “cloud system” that becomes an economic institution, and not just a technological infrastructure. In this paper, we wish to suggest the hypothesis that, due to the lack of public planning, private companies, along with banks, should act independently, in their own interest, in order to acquire a Digital Agenda of the national economy that, in turn, should become a workshop for organizational innovation, a crossroad for information exchange and a platform for business relationships.

The public sector will have to do its part too for the Digital Agenda, but by providing services to the economy and not just by changing the current format Public Administration's services to make them electronically available.

Today, another important thing that should be required from the state does not concern just the planned measures, but the fact that an annual update of the Digital Agenda and its alignment with the European policies should be provided for by law, a fundamental appendix to the national budget law. This should be required because the Digital Agenda is not a fashionable technology trend of the moment, but a permanent commitment in public government processes and an essential condition for the functioning of the economy.

The mere “dematerialization” of paper documents is not innovation, but just a camouflaged and inefficient kind of conservation. The old drafts of the Digital Agenda had become a sort of “scanned version” of many activities carried out by the PA, either through paper documents or analogically. They did not change their flow and rationale, and thus they did not exploit the efficiency potential introduced by ICT. The underlying assumption has been that the digital approach is just a new “format” and not a new process model. Therefore, the efforts have been focused on creating a digital (additional) version of the same analogical activities that have been carried out so far. An even more serious issue is that a clear replacement principle (i.e. a “switch off”, as the one implemented for the transition from analogical TV to digital terrestrial broadcast) has not been envisaged yet.

On the other hand, a digital system not only should it be a “default” option, i.e. a basic option for all PA activities, but, in many cases, may it be the only option provided as a standard one, leaving the traditional analogical processes to be provided against payment. Yet, the analogue processes and their staunch defenders are still the ones that carry the burden of proof. [7]

3. OBJECTIVE: EVERYBODY ON THE INTERNET, EVERYTHING ON THE INTERNET

If Internet is considered a universal right/duty of citizenship, then we should move towards an “Internet of Everything and Everybody”. Unfortunately, the “moral suasion” of some benevolent digital champions, although very important, will not be sufficient to win the opportunistic resistance and the conflict of interest of many.[12]

To overcome the cultural “digital divide”, we cannot wait for the population still not included in technological innovation processes, to adopt them naturally: in fact this transformation is not occurring at the pace necessary to facilitate the Country economic development, especially if compared to most advanced nations. The growth of Internet penetration has basically stopped among the most elderly segments of the population. [15]

To fill this structural gap, it is essential to understand what didn’t work and what will not work in the future:

- ✓ Incentives
- ✓ Tax deductions
- ✓ Information campaigns
- ✓ Optional training

In brief: in Italy, without an institutional and economic standard, the digital doesn’t work as subjective option. It is necessary to take a different approach, adopting the principle of “Digital by default”. Those who intend to remain knowingly and intentionally clinged to analog processes, in spite of all supports and solicitations, should be aware that they will have to bear the social costs intended as negative externalities imposed on the Country.

To do this, the current dynamics of relative prices between analog and digital processes should be reversed. Nowadays, those who want to use the Digital are penalized in terms of additional costs and complementary assets; on the other hand, those who use the analog, benefit from economic advantages and counter-productive cross subsidies. It is far from our intention to suggest an approach limiting the individual freedom by means of prohibitionist and distortive measures, but rather to invert the economic and social incentives system between analog and digital. A clear organizational and fiscal disincentivization of analog practices should be started, through a systematic delegitimization associated to a rebalancing of the current distorted economic incentives. All that is analog, should be penalized from the fiscal, organizational and cultural point of view, by increasing the relative price of analog services vs. digital ones.

By using those practices that already proved to be valid, i.e. the DVB---T Switch---off or the standards change---over in the relationships between citizens and Public Administration (e.g. the F24 form in the tax context), the Government should make a targeted use of its monopoly of legitimate coercion, adopting the role of “market---maker” through the forced creation of demand flows that, in turn, generate the conditions for the investment business case by operators and businesses world.

A first interesting step in this direction is the recent approval of an amendment to Stability Law 2015 that envisages the increase of fiscal deductions for meal vouchers in electronic format. This will result in more transparency and total traceability, with an important impact on the national added value and consequently on the GDP, but will result also in important private investments for the adoption and diffusion of new technologies among millions of citizens and hundreds of thousands of businesses.

4. CONCLUSIONS

The Digital Government should not take as a reference the old models of monopolistic public infrastructures, but the new paradigms of the so called “sharing economy”, also described as “collaborative or on-demand economy”. [11]

The first stakeholders called to the principle of assets sharing are the public and private companies that already own a significant stock of often underused technological investments. They can offer the Country System the expertise and approaches used in their organizations to facilitate the transformation of business and service processes on digital platforms. Thus will be generated “positive externalities” with the ICT processes managed by them, as it usually happens when the effects of a technology bring benefits to a wide group of stakeholders and to the society in general.

One of the main objectives is that ICT technologies ensure a better and more efficient integration of work, family and citizenship to everyone. In particular, the organization of “distributed work” models will allow to speed up the necessary involvement of young people and women, especially in the services market where the opportunities of increasing the Country competitiveness are greater.

The Digital Government shall provide that each public servant or employee of companies participated by institutional stakeholders, as well as every recipient of public money transfers, will be informed and incentivized to adhere to the principles of “sharing economy”. Every recipient of public expenditure, being a user of fiscal resources borne by taxpayers, has in fact the strong civic duty of promoting the sharing processes typical of the “sharing economy”. In this sense, it is necessary to study public information plans and to provide each citizen and each public servant with a suitable “sharing kit”, able to explain opportunities and requirements for the participation to “sharing economy” processes, thus to address relevant fiscal and regulatory doubts as much as possible and to let the Government take a clear institutional position in favour of new models of sustainable and efficient sharing and, possibly, provide guidelines supporting the sharing processes.

Italy and Europe historically are legitimate places where a new institutional model of Digital Government can be generated. They have a tradition in managing complexity and, since after World War II, are global leaders in terms of Nations sovereignty sharing and in the re-definition of the perimeters of jurisdiction and subsidiarity. The Agenda for Digital Government is a new workshop of multilateral international public law, an extraordinary opportunity to ensure that this process doesn't run ashore on the shallows of a dysfunctional design of European institutions. If we are no more able to export technological infrastructures, at least let's continue to export new juridical institutions, as Europe has been doing for centuries, now based on the innovative usage of digital technologies. Without this new public right, supported by technology, there is no market, no modern economy, but only abuses of power, monopoly rents and the perspective of a centuries-long stagnation.

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E-GOVERNMENT: CONSULATE GENERAL OF PORTUGAL IN MACAO AND HONG KONG

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ABSTRACT

This paper describes an exploratory case study on e-Government area held at the Consulate General of Portugal in Macao and Hong Kong. Through several meetings with key players in the Consulate of processes were outlined some improvements in order to make the most efficient Consulate, effective and close to the citizens. With this vision was intended to respond more promptly to all requests of the citizens attending the constants problems reported. We created a Facebook page and a new Online Booking System (OBS). At this time, the Facebook page of this Consulate (of Portugal) is the one that has more followers in the world (from those analyzed) and the new OBS proved to be a crucial key to reducing the enormous waiting lists previously existing and significant advantages for citizens. This project proves that there is still much work to do in this diplomatic representation but that can be a model to be followed by other diplomatic missions in the world.

KEYWORDS

Consulate; Portugal; Macao; Hong Kong; e-Government; e-Society.

1. INTRODUCTION

The Consulate General of Portugal in Macao and Hong Kong (Consulate) is responsible for supporting about 165.000 citizens with Portuguese passport in both Special Administrative Regions of Macao and Hong Kong. We have a team of 21 employees that has raised the consular revenues in 7% to 13.223.134 MOP in 2013 and to the record amount of 15.565.239 MOP in 2014. Macao is one of the most complex Diplomatic Missions: 31 km² of territory with several media in Portuguese: 6 newspapers, 1 TV channel, 1 radio station and 1 news agency. This Consulate was considered as one of the most important in the world, saying very clearly that the connection with Macao is a strategic orientation of the Portuguese external policy. From the many working areas that the Consul General outlined for his diplomatic mission we highlight the internal reorganization of the Consulate, the promotion of the Portuguese language and culture education and the economic diplomacy. In reorganizing the internal work - both in material terms and in human resources - and although it has lost 16 employees in the last 2 years, the Consulate has been getting closer to the population. The bilingualism and the promotion of the Portuguese language make up another very important strategic area in partnership with the Instituto Português do Oriente (IPOR).

This paper is a case study (Yin, 2009) that describes the e-Government experience implemented at the Consulate since April 25, 2014. Taking into account the small number of publications produced in Portuguese diplomatic representations, it is important to investigate further and try to create new ways to mobilize and bring citizens closer to the existing government entities around the world. With the new technologies and an increase in computer skills of citizens, it is possible to establish new models for interaction and communication in order to i-Government (Fonseca & Carapeto, 2009). With this purpose were implemented changes in the internal working model of the Consulate and their communication tools, which we will call as a communication platform. Communication platforms are all the digital systems, interconnected, that allow the communication and interaction with the citizens (in a bilateral way): 1) The Social Networks, being Facebook (www.facebook.com/cgmohk), for now, the most used one. But we are also present on Google+ and on YouTube. 2) The institutional website (<https://www.cgportugal.org/>) that

provides information and connection to the government's services and should be increasingly more dynamic according to the changes that occur throughout time. 3) The OBS, which is software for the citizens' registry, scheduling and management of the online services. The OBS allows scheduling the renewal of the citizen card and passport but in the future it may be used for other services. The communication platform that is currently used in the Consulate has unique characteristics because it was designed according to the specificities of this Consulate and the most advanced communication and interaction systems available nowadays. It is a system that allows a more extensive interaction and communication with the citizens keeping the highest level of coherence, updating and relevance. Resorting to Social Networks and to the institutional website we created a new format and institutional attitude for the Consulate that is innovative, informed and computerized. To meet the pressing need to solve the problem of urgent requests we created in 2014 a form on Facebook where citizens may ask for immediate help in an easy way and without having to go to the Consulate. This measure was very successful and it also facilitated the internal handling of the requests, being more effective in its routing to the different responsible people and in its resolution, leading to a faster and quality procedure. In this way we confirmed how useful it was to create an OBS. It was developed and officially introduced by the Secretary of State on the 1st of February, 2015. Next we will introduce the concept of e-government and the way it has become increasingly used in this Consulate. We will explain the methodology followed, the Facebook Page, the OBS and the internal reorganization that was implemented to reach the e-government.

2. E-GOVERNMENT

According to the United Nations, in United Nations E-Government Survey 2014 "E-Government for the Future We Want" (2014), e-government is the use of Information and Communication Technologies to communicate with the citizens either directly by the government, or by the public services. They consider that innovation and the e-government may be the key to change the Public Administration and to make it more efficient with better services and more transparency. With this idea of future we started innovating continuously to create a communication platform that allows a faster interaction with the citizens, with more proximity and personalization, leading to more efficiency in solving each situation.

To build an intelligent organization the Consulate has been developing a project that involves Technologies, People, Structures and Processes (Ferraio, Galvan, & Rodrigues, 2009; Ferrão, 2011). The most visible side is the technological but everything has been planned in a very specific organizational context, coordinating the existing structures with the people who will use them and the consequent restructuring and optimization of the internal processes. The use of Social Networks by the diplomatic representations is still recent. There is no outlined strategy by the Foreign Affairs Ministry but each head of mission is trying to implement them without creating any obstacles to the pre-established mission. Today, social networks are important for democratic participation of citizens (e-democracy), and consequently economic growth of countries (Karakaya & Kantarci, 2015). The "Advances in e-government services have been broadly adopted and used in various developed countries, as well as being adapted to develop countries" (Alkaabi & Ayad, 2016).

3. METHODOLOGY

The operational problems of the Consulate have been identified throughout periodical team meetings. Some serious matters like the daily waiting lines outside the building and the delay in the problems' resolution have triggered the restructuring of the whole functioning system. Without human and financial resources to make structural changes we have implemented small and concrete advances and measured their efficiency so that progressively we could reach the developed position we have at the moment. We designed a plan and made specific bets that have been showing results and inciting its continuity. With the release of the Facebook page we created a new communication channel which allows the citizens to send private messages to a team that is prepared to answer them online with the highest efficiency. In this phase we were able to identify some serious troubles that were reported to us which, given their urgent character, would require a special treatment. In the next phase we provided an online form that citizens can use to make appointments in order

to take care of urgent processes as well as of citizen identity card or passport issues. As we can verify, the measures and changes that were implemented were progressive. The project was developed according to the specific needs of this Consulate and to the new processes that emerged to deal with the difficulties in order to increase the efficiency and efficacy of the service with a special concern about the quality of the entire process. After the first phase, we realized it would very useful to create an online system to manage and control appointments since it was the area where we found more problems and complaints. We chose to create a custom-made solution, proprietary software, designed with the know-how of the internal resources and the implementation support from an external entity that developed the software. This software is still being upgraded and will be more comprehensive in a close future. The objective is to facilitate as far as possible the processes requested by the citizens, reducing the service time and their visits to the Consulate.

3.1 Facebook Page

The Facebook page was officially released on the 25th of April, 2014. It contained general information like the description and characterization of the institution and of the goals it wanted to achieve, the contacts and location among other elements.

Table 1. Number of followers (2014, 2015 and 2016) - Analysis of the Facebook pages of the Diplomatic Representations

Number of followers	19/05/2014	20/08/2015	15/03/2016	Last update	URL	
Macao	3594	10267	12116	32602	15/03/2016	www.facebook.com/cgmohk
São Paulo	1274	7932	11674	18088	15/03/2016	www.facebook.com/consuladodeportugalsp www.facebook.com/Consulado-Geral-de-Portugal-em-Caracas-150116499042
Caracas	4878	4858	4926	5002	30/10/2011	www.facebook.com/consuladogeraldeportugalrj
Rio de Janeiro	0	1414	2267	4483	10/03/2016	www.facebook.com/ConsuladoGeralPortugalParis
Paris	2075	3055	3450	4482	15/03/2016	www.facebook.com/Cgptoronto
Toronto	734	791	3445	3626	12/03/2016	www.facebook.com/ConsuladoGeralDePortugalemM www.facebook.com/Consulado-Geral-de-Portugal-em-Maputo-625022390942411
Maputo	3642	4301	2203	3016	15/03/2016	www.facebook.com/ConsuladoGeralPortugalSanFrancisco
S. Francisco	1809	2186	2391	2782	15/03/2016	www.facebook.com/consuladoptnewbedford
New Bedford	241	2480	2562	2744	15/03/2016	www.facebook.com/cgptbarcelona
Barcelona	542	1189	1280	1881	15/03/2016	www.facebook.com/consuladogenebra
Genebra	113	640	814	1395	11/11/2015	www.facebook.com/Portugal.Belem
Belém do Pará	849	1088	1182	1340	15/03/2016	www.facebook.com/pages/Consulado-Honor%C3%A1rio-de-Portugal-em-Santos/223101834420123
Santos	524	822	990	1195	15/03/2016	www.facebook.com/EmbajadaPortugalSantiagoChile
Santiago do Chile	471	787	883	1121	18/02/2016	www.facebook.com/consuladonewark
Newark	257	598	675	819	04/03/2016	www.facebook.com/pages/Consulado-Geral-de-Portugal-na-Beira/578858095482222
Beira	224	264	277	292	14/05/2013	www.facebook.com/Consulado-Honorário-de-Portugal-em-Bilbao-607670485998583
Bilbao	42	66	85	104	01/03/2016	
Benguela	272	3679	3757	Page not found		
Dusseldorf	259	816	871	22/ 877		(2)

(1) New page creation on 17/12/2014.

(2) Multiple pages but none with recent updates.

We present in the table 1 a comparative list of the number of followers and update level of some of the Portuguese diplomatic representations in the world (ordered by number of followers in 2016). This list was created through direct observation on the specified dates over the years 2014, 2015 and 2016.

Given the difficulty in finding all representations in the world the selection of the list of diplomatic representations was created according to the data in the “Emigration Report 2013” (Gabinete do Secretário de Estado das Comunidades Portuguesas, 2014) and was made in August and September 2014, where we found what were the countries with the highest number of diplomatic representations and then we chose

(preferably) those that were of the same category of the Consulate General Macao and Hong Kong, i.e. Consulate General. We conducted searches online and on Facebook, trying to find their pages and official web-sites and we account how many followers they showed. Through the statistical analyses we can see that Macao is still the first of the group, having registered an incomparable growth to other diplomatic representations. Over the years, we have found that we have registered a constant growth in the number of messages received. It is one of the most effective ways to immediately answer the citizens' questions. Over time we incremented features and connections, namely the creation of entries for Events, Notes, Questions, Videos, the connection to YouTube and urgent bookings among others. We posted information of public interest and created photo albums whenever necessary. On the 3rd of May (2014), we created the sections "Reflections on Saturday" and "Sentences & Moments on Sunday". This first experience with the Facebook concluded the high benefit for the population using digital systems to communicate more directly with the Consulate. We also realized the advantages to develop a more powerful system to manage appointments directly with citizens of all-digital way, and so began the development of OBS and internal processes restructuring (presented below).

3.2 Online Booking System

The OBS is an electronic platform that allows making bookings to renew documents, namely passports and citizen cards. The web application is available in Portuguese and Chinese languages. The management of the available vacancies is made by the system with adjustments whenever necessary. The citizens who have problems in making online bookings have the chance to make them in person with the help of a clerk. After launching the OBS we stopped distributing daily tickets to book the documents renewal, being that operation totally done online. This ended an ordeal that lasted for 15 years and which brought a bad reputation for the diplomatic action in this Special Administrative Region. The new system allows performing 2 processes: to register in the Consulate for later admission and to schedule bookings. 1) To make the registration you only need to have an e-mail address and then you will be given notice via e-mail and SMS, if you wish so. 2) After submitting the information from your identification documents (citizen card/ identity card and passport) you will receive warnings when they are about to expire. 3) To help in this process we provided short notes to give users some explanations about aspects related to procedural matters, legislation or even more technical issues. 4) The option "Urgent Situation" is still available to solve the most critical cases. We always request a proof document about the situation but it's the way to sort out or select the cases that really need a special treatment.

Besides this part that is more visible to citizens we have also been developing an intranet system for the corresponding internal follow-up and routing of the processes. The support and availability of the collaborators were crucial throughout the entire process. Of course that with the inclusion of new technological tools we made organizational changes that implicated a close collaboration with all the employees which resulted in the attribution of new tasks and learning of new organizational procedures. On the 17th of August 2015 the OBS had 32.489 active users, between 1/2/2015 and 31/07/2015 registered 11.740 bookings, on the 17th of August 2015, the OBS had 32.489 active users and on 12/10/2015 they were already 38.004. The value keeps increasing, since all the processes are only handled through the online service. The number of daily bookings before the implementation of the system used to vary between 95 and 110, after the period of adjustment to the new model and the complete restructuring of the processes is now able to deal with 130 requests, per day. This value may vary when there are technical problems in the kiosks forcing the rescheduling of the appointments. The average time to service each citizen ranges from 10 to 15 minutes. With this new system the citizens have many advantages: 1) they don't have to go to the Consulate to make appointments and now there is a more precise scheduling; 2) there a strict control of the schedule compliance regarding the booked day and time. There is a better management of the bookings which allows scheduling the most urgent processes for an earlier time and the least urgent for later; 3) the pre-preparation of the processes is made according to the documentation that was previously sent, which facilitates the service and allows reducing the average waiting period for each citizen. This prior preparation of the processes also allows detecting irregularities in the appointments and forwarding the processes to other sections or departments.

4. CONCLUSIONS

There is still a long way to go until we achieve all the goals we outlined, but the success is already visible. The Consulate has changed, there's a significant raise in the number of requests served every day. The urgent cases are expedited with special attention. There's more motivation and hope in the future. The activities and developed projects are frequently divulged on the local press (Macao and Hong Kong) and in Portugal or even on the local TV channel (TDM), which shows the prominence and production of a positive, constructive, innovative, reliable, dynamic, modern and leading image in all dimensions. The most important mission is to serve the community and that's why we constantly ask for help and suggestions so we can become increasingly better. Our success is the citizens' satisfaction and our satisfaction is to be able to provide fast services with quality. The support and availability of the collaborators have been crucial throughout this entire process. Regarding future projects we aim at increasing the integration of the several applications that are currently used and develop new ones such as Instagram, Twitter, LinkedIn and Skype, among others. The Social Networks are always evolving and so is the presence of the users. The big objective is to be present where the citizens are, keeping the proximity and promoting the immediate interaction with everybody who needs support. We also intend to complement the inclusion of the existing information technology systems making them boosters of productivity. In the medium term it would be good to have collaborations with Tertiary Education institutions where the investigation of new products and the optimization of services are continuous. We are already projecting a new stage of computerization in which we will develop an app for mobile gadgets that allows the accomplishment of all the options that are already available on the Web environment.

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THE UNIVERSITY LIBRARY AS AN E-LEARNING SUPPORT CENTER IN THE PROCESS OF HIGHER EDUCATION

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ABSTRACT

The purpose of this academic research paper is to outline new possibilities for successful integration of university libraries in the educational models related to knowledge economy. The evolution of classical functional library models is presented as an inevitable result of the transformation of typical learning models towards the modern E-learning ones. This change is related to the fast development of the contemporary information and communication technologies and the positive pressure that they exert worldwide. Furthermore, the total globalization has a great impact on this irreversible process. The identification of the interaction areas between the university libraries and the alternative educational models is based on a few factors, such as: the conceptual instruments of the General Applied System Theory; the applied technology of so-called architecture approach and the ideas of re-engineering of the classical model of university libraries. **The role** of the integrated e-learning environment for university students is presented in the dynamic development of the university library's functional model, the intensity and the growing volume of library and information resources in the European research and educational area. **The achieved results** can be defined as a practical application of the theoretical basis of the new E-learning models. The convergence of the university libraries as E-learning support centers and the creation of prognostic model of successful university education processes provides a basis for dynamic social changes and is a projection of the different educational models upon the modern society.

KEYWORDS

Education models; university library, e-learning; digital libraries, library resources, higher education, support center

1. INTRODUCTION

The world economic development and knowledge economy have changed the requirements towards education bringing about the shift in measuring the educational outcomes, based on the new educational paradigm of UNESCO: from ACCREDITED QUALIFICATION to CERTIFIED SKILLS (Global Education & Skills Forum, Dubai - 2013). This concept takes higher education to a new level, focused on the influence of reforms on the internal life of higher educational institutions.

The above-said makes it clear that the impact of educational changes based on knowledge as a resource, form the foundation of the knowledge economy, where the knowledge and education become the most significant factor of the producing economy; the role of the human capital is growing and for that matter – life-long learning in particular; the share of the services in the economy is expanding thus marking an increase in the knowledge hiring business services; information Infrastructure and Information Technologies begin to play an even bigger role; innovations become key characteristics of economies and a major form of turning knowledge into wealth (Denchev, Peteva 2006).

Thus, the changes in university education range from the need for fundamental transformations to the gradual adaptation to the changed conditions for acquiring knowledge, skills and competences and their suitability for practical application.

The first assumption requires a paradigm shift in education – the need for knowledge skills and "reengineering" of all elements of the university educational model: functional, administrative structure, the learning environment. The second assumption is applied almost everywhere - introducing hybrid models of

training, gradual transition to electronic form in all versions of modern communications – mobile, personalized and intelligent.

The provided training "infrastructure" - e-learning platforms and their potential to create different types of electronic resources are a prerequisite for flexibility and adaptability of the curriculum and the learning content in a modern information and communication environment.

Nowadays the role of the university library has been changed into platforms for migration and sharing educational content and is corresponding with the new forms of educational process organization, and aims to create new educational content (Denchev, Varbanova et al, 2008).

One of the most stable institutions in the history of human civilization development that represents the preservation and dissemination of knowledge and information is the library. Nowadays, the University Library organized as a modern information center fulfills its mission by providing a supporting role to both trainees and trainers. It has a key importance for the development of future specialists, helping them to cultivate their knowledge, skills and competences through subscriptions to scientific and research literature; providing access to online databases, incl. abstract and citation databases of peer-reviewed literature (scientific journals, books and conference proceedings); delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, arts etc., and facilitating the library users in terms of work with e-catalogs, information resources and digitized library units. In the contemporary conditions of frequent introduction of new, innovative educational and E-learning models, identifying the factors and defining the development trends of the university libraries' functional models is closely related to both communication infrastructure modernization and society's dynamically flowing processes.

2. UNIVERSAL EDUCATIONAL MODELS

As mentioned before, the paradox is whether education should remain a keeper of traditions or it should be transformed to new ways of offering quality and innovative research methods. It seems that a combination of both is the right way of approaching the matter. Educational systems usually comprise seven naturally occurring stages: 1) Pre-primary education; 2) Primary education (first degree of basic education); 3) Lower-secondary education (second degree of basic education); 4) High-secondary education (third degree of basic education); 5) Vocational high-school education; 6) First stage of higher education (Bachelor's degree); 7) Second stage of higher education (Master's degree).

If we, in accordance with the established practice in Europe, try to expand that basic ladder and add an eighth stage, i.e. the PhD, then we speak of the formation of trained workforce as the potential of the global educational system.

Classical alternative educational models

The classical alternative educational models can be applied to all the spectrum of the eight-stage educational ladder presented above. They are sort of imitative models for cases in which the common traditional models are hard to implement in practice and not applicable at all. They are:

Virtual Schools, where the pupils study online rather than being physically present at the school. They are suitable not only in regions where pupils have no access to an educational institution (high up in mountains or islands), but also for pupils who do not wish to physically go to school due to medical, psychological or physical reasons (Russell, 2006).

Virtual Colleges - institutions for high-school vocational education and training where trainees study at home or at their work place, most of the time. Since the trainees have reached a level of self-sufficiency in life, this is a good alternative to traditional educational and training courses, providing professional knowledge, skills and competences, within the context of academic learning.

Virtual Universities, i.e. online based educational institutions where students can study regardless the time and place, the idea being to obtain university education without actual physical presence at seminars or lectures. The so-called 'open' virtual university offers free-access to everyone wishing to be educated, adopting an open approach to the syllabuses.

Blended Learning - a combination of physical presence while attending lectures and online educational process via e-learning, providing the students with immediate access to information resources and communication activities.

Training based on resources - Mass Open Online Courses (MOOC) that have appeared in the context of Open Educational Resources (OER) as part of university practices. The model of MOOC is characterized by:

Automated Assessment Systems allowing the enhancement of the educational process and providing opportunities for several versions of assessment in the system, thus avoiding the subjectivism in grading, that so many tutors complain about. Having in mind the concern expressed by university tutors on the degree of developing critical thinking habits in students and also the need for greater practice in students' academic writing skills, reducing the application of automated assessment systems still raises a concern.

Mass application of various presentation techniques, which assist in a better information arrangement and a higher degree of visualisation. Therefore, it is used, not only encourage the tutor's interest, but also to increase the students' attention in the professional use of modern information technologies. Interactivity is required, if this model is to be implemented, also the attention of the students should be engaged to guarantee better student concentration.

A College of the OER Type. This educational model implies the mass use of Online Educational Resources and automated assessment systems to provide at low cost qualification competences with an international certificate or a certificate by the provider (Cisco, Microsoft, MikroTik, etc.).

European University Complex is based on the quality of teaching; compulsory practices/trainings that are regularly monitored; and a joint complex of various educational forms corresponding to the students' needs (from distance learning, through blended learning to one-to-one learning when necessary /Sunday schooling, summer universities and practices). The model provides the opportunity to cooperate with other universities and/or firms and associations for the monitoring of state examinations and the opportunity of receiving an international diploma qualification (such as an international baccalaureate).

A Digital Bridge between Traditional Universities – a joint initiative between traditional top universities, an inter-institutional cooperation, aimed at providing innovative/sustainable digital educational and research environment. The formation of research culture of the first-year students is fostered, special attention is paid to the case-study training and accelerated training is provided to gifted and talented students. This mechanism is facilitated by the free access to research results and education in a way that scientists and tutors in a country and outside the country have access to all research resources (books, magazines, databases, laboratories, learning corps, etc.)(Enders, De Boer, Westerheijden, 2011).

Modern Alternative University Educational Models, based on the educational paradigm – from ACCREDITED QUALIFICATION to CERTIFIED SKILLS:

➤ **University Scientific Research Institutes** - university structures providing high-quality training environment and the required conditions for various scientific research and implementation of scientific projects. Training activities within this alternative educational model are accessible only to students with a special status – MA students and PhD candidates.

➤ **Open Training Practices and Summer Universities** aimed at preparing appropriate practical habits, skills and competences in young people both for independent scientific research work and for the challenges of real life work environment.

➤ **University Youth for Knowledge Academy (UNYKA)**- a contemporary university alternative educational model that enables young people in a university structure to organize their scientific and training activity in accordance with the syllabuses of the university, as well as with their visionary wishes and interests. The activities of the UNYKA focuses not only on the theory but also on the practice, by enabling different categories of students to participate in real cases and develop group projects under the direct supervision of mentors not only from the university but the practice as well (Denchev, Trencheva, 2015).

Cloud Computing University Model – a university virtual environment where all the necessary ITC resources, software programmes and applications, information content and their maintenance and provision are concentrated, which does not require for the end user to know the real location of such systems.

The Portfolio as an Alternative Assessment Tool of Educational Processes that helps to assess the students' achievements in the context of alternative educational models and the impact of reforms of education in the EU integration processes of the South East region is the Students' Portfolio.

Modern Alternative University Educational Models became a vital factor in the development of quality of university's education in the modern globalized society. In R&D institutes, students study the same subject as members of different groups to meet and exchange information as experts on the matter and thus improve the quality of their training. It is appropriate to encourage students and teachers to activate their creative work in a self-management, self-assessment and self-improvement. (Trencheva, Denchev, 2015).

Based on the analysis of all of the above listed models, can be summarized that the University library is an essential part of the integrated educational environment. The modern dynamic development of the universities and the competitive academic environment are key factors in the implementation and development of university infrastructure. The main goal is to provide better conditions for education and training by improving the facilities and the application of modern ICT in support of the learning process and the development of research strategies. University libraries as an inseparable part of the university infrastructure have a leading role in this process. The library as an evolving center is constantly improving and increasing its functions, offering services that combine traditional and modern technologies. Shifting its appearance from a service unit into operational information center that stimulates scientific and research process provides, teaching, educational and training activities and maintaining contacts between the universities on national and international level.

3. JOINT TRANSFORMATIONS OF THE UNIVERSITY LIBRARIES AND EDUCATIONAL MODELS

The formulation of basic communication channels for information dissemination is traditionally formed in university libraries and requires the definition of basic areas of interaction between educational models and university library models, which requires reviewing the dynamic of changes in the specific working conditions.

Relevantly, the new functions of the university library, connecting with the E-learning are considered to be in the so-called condition of 'dynamical balance'. Thus, they can provide dynamical educational content, adaptive enough to meet the changing requirements, and corresponding to the new criteria.

Identifying the conditions, defining the perspectives and the sustainable models for dynamical interaction between university libraries and educational models is a key to development and implementation of long-term strategies and concepts and provides appropriate conditions for strategic plans execution (Ignatova, 2014 a.).

The integration of the educational and training content in the intelligent platforms, based on mobile communications, is a precondition for engaging the university library as a basic support center for knowledge saving. The problems concerning the quality of education are a consequence of several factors: the rapid transition from specialized higher education to mass higher education; financial restrictions in the field of university education, as well as the increasing autonomy of the higher educational institutions. The educational system is gradually reforming. When obtaining knowledge, the accent of the educational process shifts from fundamental to specialized problematic areas of study, especially considering the high technologies. This requires restructuring and harmonizing the entire educational cycle – in terms of both quantity and quality (Todorova, Peteva, 2013).

Knowledge management encompasses various management tools related to the concepts of management of intellectual capital and the idea of the learning organization (Ignatova, 2014 a,b).

4. FROM INFORMATION ACCESS TO KNOWLEDGE ACCESS

According to the research, during the last 15 years different measurements have been taken concerning the so-called library transformation process from information access to knowledge access. Most of those are coordinated at a higher state level. Ratification of strategies for reform and modernization in the entire educational sphere has been implemented. (Enders, De Boer, Westerheijden, 2011).

Specification of these strategies within the contemporary social reality submits a number of difficult questions. The answers to those questions, the solution of those problems can be found in application of good practices, established in the leading countries worldwide, as well as with keeping in step with the high criteria for education quality.

The following three basic trends in the development of educational and library technologies have been defined as dominating: 1) Forming and development of a university library consortia of the leading academic libraries; 2) University libraries integration in the framework of the leading European and International

Libraries Associations and Networks (LIBER, EBLIDA, OCLC); 3) Immediate introduction of digital technologies, supporting new educational models (e-Learning, mobile learning, distance learning).

The topic concerning digital technologies application in the educational system has two basic aspects: First of all modification of traditional teaching tools and methods in a new digital form (E-learning), and second of all changing of educational paradigm.

5. CONCLUSION

The adopted strategy of providing e-learning processes and creating libraries as an e-learning support centers aimed at for each university student is a matter of financial support. In all aspects, providing financial resources is only possible within the establishment of competitive economy, based on innovations in every sphere of development. That way each university student will be stimulated to maintain, broaden and renovate his knowledge and skills.

In conclusion, we can summarize that the university libraries, in all their varieties and types (e-libraries, digital libraries, mobile libraries, smart libraries, etc.) using the information capabilities of their external resources transform into virtual libraries, employing experts, specialists in searching and providing access to the global information resources.

Following the development of the educational models, university libraries play a significant role in determining priorities for the future development and implementation of new technological innovations in the educational process, particularly through their functionality as e-learning support centers in higher education.

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BRIDGING THE DIVIDE: E-SOCIETY OR ECOSYSTEM? AN ANALYSIS THROUGH DIGITAL-MEDIA ART

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ABSTRACT

More than buzzwords, the "digital divide" and "e-society" have come to represent a growing problem and an unstoppable tendency in our world. Their definition isn't static. Both problem and tendency are constantly evolving, shifting scope and bringing more variables to the table. If the digital divide was once a question that concerned mainly governments, its scope has evolved and the decisions that influence its evolution are no longer centralised. In this article I use the digital-media art paradigm to present a model I believe will provide possible insights to answer the question of "how to effectively bridge the divide", as well as come to represent the future thriving b-society (blended-society) where the digital divide will mutate and evolve, increasingly requiring attention and solutions lest it will threaten the depth and scope of the very e/b-society that feeds it. Why art? In the words of the poet (Oppenheim, 1911) "Our lives shall not be sweated from birth until life closes; Hearts starve as well as bodies; give us bread, but give us roses!". Art-as-roses evolves according to periods and social contexts, it becomes a model of sociability, relating artists, audience, medium and technology. Departing from the natural sciences model of ecosystem, where several entities reach a balance in order to thrive as a collective, I believe that there should be a similar balance among virtual and material key players, on and offline, for the e/b-society to prosper, and what is happening in the digital-media art world is very significant.

KEYWORDS

Digital divide, e-society, b-society, digital-media art, ecosystem.

1. INTRODUCTION

When we consider the concept of e-society, we usually also consider its separate founding blocks: e-learning, e-commerce / e-business and e-government / e-democracy. But the concept is evolving beyond that scope to encompass all areas of society, and eventually be as pervasive as society itself is in every day's "material" life.

The broad definition of e-society is one that uses digital media in most relationships: peer to peer (personal communications, business to business purchases, etc.), government to other (online government), other to government (voting/governance), peer to other (business to consumer, etc.) (Jayashree et al., 2010).

So, when we consider the e-society as a virtual set of individuals engaged over different types of relationships, exchanging information and knowledge, with technological access and use, we should also be able to determine the driving force behind such a society: the pursuit of a better living through the ever-present quest for technological innovation.

The second important concept – the digital divide – is often found in literature as distinguishing between individuals who have access to the technology and information, and those who don't. However, in an increasingly connected world, this classification is becoming less useful, as there are different levels among users on the positive side of the divide (those with access to the technology). As a quick example consider someone who systematically uses but their Facebook page as opposed to someone who uses the Internet for conducting scientific research, engaging in contacts with peers and institutions alike and sharing online the results of their research with an engaged audience. The digital divide is thus no longer a "simple" divide, but an increasing number of disjoint sets of individuals found along an axis of growing technological dependency and sophistication.

2. E-VOLUTION

Let us consider the three stages of the digital divide: information accessibility (mostly related to economic factors), information utilization (using information to obtain and create added value) and information receptiveness (using information to enrich the quality of life) (Mun-cho et al, 2001). As the e-society develops, the focus of the digital divide shifts from economic factors to social factors and to cultural factors.

The expression "digital inequality" was proposed by Paul DiMaggio (DiMaggio et al, 2001) to stress out this difference: it is no longer enough to distinguish between those who have and those who don't have. It is becoming more important to understand how those who have, effectively use what they have.

Digital-media art (DMA) is itself a product of the e-society, relating far more players than a first glance would assume. DMA refers to any type of artistic creation that uses digital technology to incorporate added value in any way to create, disseminate, enjoy and exhibit artworks (Marcos, 2009). It covers genres and categories as diverse as algorithmic art, electronic music, internet art and live coding, only to cite a few. It presents a unique set of challenges to traditional ideas of collection, presentation, documentation, and preservation.

DMA curation has to address this complex set of mutual implications covering all sectors where artistic production can occur: academia, government, business and others. Because digital media art is deeply interwoven into our information society – the network structures and collaborative models that are creating new forms of cultural production and autonomy and profoundly shape today's cultural climate – it will always transcend the boundaries of the museum and gallery and create new spaces for art (Paul, 2008).

Due to its very nature, DMA also epitomizes different levels of digital inequality. We can distinguish between individuals that would otherwise be considered on the positive side of the "usual" digital divide, i.e. those who have access and use digital technology efficiently, who may even create content through research and analysis, but have yet to go to the next step: to develop artistic creation skills through an efficient use of digital technology.

Whereas education and financial status are accepted as statistically related to the digital divide (Bernhardt, 2000), the DMA inequalities could also naively be attributed to individual skill and creative thinking. This happens mainly because of the apparent contradiction through which DMA flourishes – a technological mind is not the typical artistic mind, or vice-versa. But the DMA inequalities go beyond individual skills and creativity, as they are a product of many factors that DMA needs to flourish, prosper and develop, for both artists and genre.

A digital media artwork is characterized by numerical representation, modularity, automation, variability and transcoding (Manovich, 2001). Variability implies the artwork isn't static; therefore it will change and react to user/audience inputs, each time potentially providing the user/audience with a new revelation, a new meaning, a new insight or reaction, also enhanced by the eventual pseudo-randomness contained in the artwork itself. Numerical representation and transcoding imply the artwork exists in – or creates – a virtual space where it dwells and reveals itself, a cultural transcription of the artist's vision, which can be influenced by cultural background, education, formal training, technology, location, exhibition constraints, the arts community and the audience, only to name a few of the most significant agents. The real work of art is the experience (Dewey, 1980), which establishes an inseparable connection between artist, work and audience.

Consider the artist at the core of the creative process and the audience that is exposed to the artwork. The audience should be skilful enough to interact with the artwork; familiar with the technology that enables the artwork's interactivity. There also needs to be an infrastructure where the artwork can be presented – whether virtually or materially – and enjoyed by the audience. And as a final result – the goal of the artwork – consider what impacts the artwork will have over the environment (virtual and material), from all perspectives – ranging from the philosophical and aesthetic to social and economical: new media artists are expected to experience the most acute contradictions of our time and express them in the most appropriate language (Machado, 2004), but they also expect to make a living out of their work.

Another inequality arises from two types of digital-media artists: the "transitional" artists and the "native" artists. Even though these groups may overlap in some ways, the "transitional" group has had a steeper learning curve to adapt from material to virtual artworks, using virtual modelling and creation tools in ways similar to those of the "material" world, whereas the "native" artists will seamlessly identify and use those same tools in novel and creative ways to produce ground-breaking artworks, in ways not dissimilar to what happened throughout History, where each tool – from chisel and paintbrush to film, videotape and mouse –

Ecosystems "organically" self-balance in order to achieve longevity. Problems arise when an agent outgrows the balance, when a change in relationships isn't compensated and links break off, threatening parts of the rhizome that should critically be kept in contact.

A paradox arises from the massive democratization of the production means used for DMA production, which places at everyone's fingertips the creation tools as well as a potential audience of millions. But this massive amount of creation leads to saturation and questionable standards; as Verena Conley puts it (Conley, 2009) "the febrile and generalized creativity is often not entirely divorced from a notion of profit". The old ways re-emerge and become sought-after: most rising artists crave for "material" recognition, for an agency/gallery, for material means to support their living, sometimes even to transition their artworks from virtual to material, by using paper or canvas printing, 3-D printing or other techniques and genres, including live performance.

If contemporary art is developing a political project when it endeavours to move into the relational realm (Bourriaud, 2002), new media art shatters and expands the possibilities, by "speaking" the very same language that it appears to fight: by using the information super-highways while avoiding the tolls and engaging in picnics outside the designated areas. Artworks have historically been collected as a symbol of status, taste and culture. Would you collect screen-savers or avatars to the same purpose? The audience seeks curation that will ensure quality. DMA disrupts the established model and the artists struggle harder than ever before to find balance in the ecosystem: only a small percentage of the digital-media artists are able to prosper strictly in the unmediated virtual space, even less than that of the traditional artists who succeed – i.e. are able to live exclusively off their artwork – in the "material" world, especially due to the difficulty to monetize digital-media artworks in a world of free access, free distribution and very little copyright, and thus the paradox.

3. CONCLUSION

The digital divide(s) will have to be regarded as digital inequality(ies) and suitably addressed or risk developing new gaps that are actually harder to bridge than the original inequalities. Like in artistic creation, access is the first step, then (basic to sophisticated) usage and finally (relevant and qualitative) creation.

The purely all-encompassing "e"-society needs to have anchors in the "material" society, and this b-society should be looked upon as a network, where different relationships are built among all the players, where those relationships are multidirectional – as opposed to, for example, being government-driven, or material to virtual alone – and can thrive and dynamically compensate for the loss and/or birth of new ones.

Governments are often seen as the enablers of e-societies by stimulating the introduction of technology in households, presenting citizens with desirable advantages and ease of access to services. But it is through blended-ecosystems, like the DMA ecosystem, that the b-society truly flourishes and naturally – as opposed to forcefully – establishes itself, when "organic" content/value creation is no longer in the hands of appointed key players, but distributed in such a way that it is the rhizome that holds a greater value than the sum of its parts, like every true balanced society.

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Reflection Papers

BEWISER AN EU FUNDED PROJECT TO PROMOTE CLUSTERING AND CYBERSECURITY

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ABSTRACT

Building Enterprises – Wireless and Internet Security in European Regions (BeWiser) is an FP7 funded Regions of Knowledge project. Grant agreement 319907. The Regions of Knowledge (RoK) initiative raises the capacity of regions to invest in and carry out Research and Innovation activities through innovation-driven clusters. These clusters consist of businesses (in particular SMEs), regional and local authorities and academia. The activity contributes to the Europe 2020 "Innovation Union" Flagship Initiative which links Structural and Cohesion Funds to Research and Innovation. The 2012 RoK call supported transnational cooperation of clusters that contribute to one or two Europe 2020 Flagship Initiatives: Research and Innovation aspects of the "Digital Agenda" and the development of technologies relevant for the implementation of "Resource-Efficient Europe." This paper provides an account of the work and achievements of seven ICT clusters in BeWiser project.

KEYWORDS

Clustering, Triple Helix, Innovation, Cybersecurity, Regional development

1. INTRODUCTION

This paper outlines the progress of BeWiser project, Building Enterprises - Wireless and Internet Security in European Regions. Twelve partners representing 7 ICT regional clusters made an application for a CSA (Co-ordination and Support Action) project to FP7, and the 3 year BeWiser project began in July 2013.

1.1 Be Wiser Goals Summarised

- Help SMEs to innovate, grow and internationalise.
- Strengthen each ICT ecosystem by learning from top performing ICT clusters.
- Raise awareness and improve practice in wireless and internet security.
- Improve the Triple Helix by building links between Industry, Academia & Government

1.2 Be Wiser Partners

The project partners are seven ICT Triple Helix Clusters (THCs), in seven EU members states, namely:

- Systematic Paris Region (SPR) – Lead partner, the ICT Triple Helix cluster in Paris area
- Cork, Ireland – it@cork with its business membership plus relationships with the Cork Institute of Technology (including Nimbus Centre) and Cork County Council.
- Momentum, Invest Northern Ireland, and CSIT in Queens University combine to form the Northern Ireland Triple Helix Cluster. This cluster represents the United Kingdom.
- CyberForum e.V. the Baden-Württemberg (Germany) ICT Triple Helix cluster
- Eurecat – the Cataluña (Spain) ICT Triple Helix cluster
- ICT Technology Network – the Slovenian ICT Triple Helix cluster
- Cyprus Computer Society (CCS) – a developing ICT Triple Helix cluster in Cyprus

In addition to the Be Wiser THCs, inno TSD, France, provides regional benchmarking, cluster policy and finance management support.

CSA projects include measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination, policy dialogues, mutual learning exercises and studies, and may also include strategic planning, networking and coordination between programmes in different countries. (IATROU Alexandros DG RTD, K.7, Dec 2013)

1.3 Triple Helix Clusters

A cluster is a concentration of an industry sector in a region where companies and institutions benefit by interaction and collaboration. THCs support and animate a network of businesses, regional research and technology centres, and public authorities responsible for investment in economic development. Be Wiser project brings together seven ICT regional clusters with the intention of learning from the more developed clusters, supporting their SME members to innovate and internationalise, and getting the Triple Helix working effectively in each region.

The Triple Helix concept conveys the interaction of three strands of society, business, sources of knowledge such as universities and public research labs, and government. Etzkovitz and Leydesdorff (2000) suggest what when these institutions work well together, innovation flourishes.

2. WORK PACKAGES IN BEWISER PROJECT

The description of work has 6 work packages (WP), listed in table 1, each with a number of deliverables.

Table 1. BeWiser Work Packages

1 Project management and coordination
2 Regional cluster SWOT analysis
3 Definition of a Joint Action Plan
4 Definition of an international cooperation strategy
5 Measures towards implementation of the Joint Action Plan
6 Communication and dissemination activities

Work package1, led by Systematic Paris Region (SPR), ensures effective management of the project and its finances. WP 2 involved a study of each cluster, fact finding, a visit by the WP leader, inno TSD to each cluster, and a SWOT analysis of each region. A Joint Working plan set out a menu of collaborative actions which the partners could undertake. This was accompanied by a market study of wireless and internet security, and a citizen survey into individuals’ perceptions and practices in regard to digital security of their personal data. During 2014 a Roundtable meeting was held in each region, bringing together representatives of each strand of the triple helix to discuss: a) Current provision of ICT skilled graduates, b) Industry involvement in the research agenda of Research Centres and HEIs, and c) Cluster management and its strategic direction. Following several iterations, a Joint Action Plan (JAP) was agreed among the partners in March 2015.

3. JOINT ACTION PLAN

The Joint Action Plan is the centrepiece of BeWiser project. The JAP sets out the actions to be undertaken, the partners who collaborate in each action, the timeframe, the sources of finance for each action, the impact of each action, and metrics to judge the success of the action. It is intended that the JAP will support Regional Innovation Smart Specialisation Strategies (RIS3) of partner regions, and identify further research and project opportunities as part of their broader economic development strategies.

3.1 Content of the Joint Action Plan

- Objective A Raise awareness and improve cybersecurity practice of citizens, and fill gaps relating to the cybersecurity skills of employees
- Objective B Address the business needs of the ICT sector through
- (i) Development of technological and business relationships between actors in BeWiser clusters
 - (ii) Developing and influencing ICT policy relating to security
- Objective C Support the development of cybersecurity RDI initiatives, and facilitate SME and large enterprise access to RDI funding
- Objective D Strengthen the governance and operation of clusters through mentoring, staff exchange and cluster matchmaking

4. CLUSTER KNOWLEDGE SHARING

At a consortium meeting in Belfast (March 2015), and special training workshops convened in Ljubljana (June 2015) and Nicosia (Oct 2015), more advanced cluster partners shared their programmes and insights on how to support SMEs with other BeWiser clusters. Systematic Paris Region and CyberForum (Karlsruhe) shared the lead in this activity, as the management of both cluster organisations bear the ESCA Gold label.

5. VISUALISATION OF LINKAGES IN NETWORKED CLUSTERS (V-LINC)

V-Linc is a method for recording, categorising, mapping and measuring the business importance of linkages or relationships that companies engage in. In BeWiser project, Dr. John Hobbs and Eoin Byrne, Cork Institute of Technology (CIT), interviewed 70 firms in ICT clusters across the seven BeWiser regions to gather data on their linkages. V-LINC displays on a map which trading and non-trading linkages are most numerous, and also the geographic footprint of trading, research and other linkages. V-Linc analysis provides the basis for strategy recommendations to help the cluster to grow and internationalise.

6. BEWISERCONNECT - CONNECTING SMEs THROUGH CLUSTERS

Following the interview of 70 firms and V-Linc analysis in each cluster, CIT developed an online platform to enable connections to be made between firms in each cluster. Each company has the opportunity to review the web pages of all other V-Linc participating companies, and request an introduction from the local cluster organisation. Providing the target company is happy to accept the enquiry, the connection goes ahead. This facility helps to set up trading and technology links across BeWiser regions. It is intended to add a profile of ICT research centres and universities engaged in ICT and cybersecurity research in each region to the www.bewiserconnect.cit.ie website.

7. INTERNATIONALISATION, TRADE MISSIONS AND DISSEMINATION

WP 4 addresses internationalisation of BeWiser member companies, and the aim of strengthening European Union's position in the evolution of wireless technology. BeWiser agreed an 'Internationalisation Strategy' in December 2015. Its objective is to support export initiatives from clusters, especially SMEs. BeWiser partners participate in trade missions to penetrate world markets for cybersecurity, and partners disseminate information about BeWiser in international conferences, such as TCI conference in Mexico 2014, and Korea 2015.

In accordance with WP4 and JAP objective B1, BeWiser organised B2B meetings at Mobile World Congress, Barcelona in 2014 and 2015. ICT SMEs from France and Spain pitched their products and services to other firms. In October 2014, several BeWiser partners participated in cluster to cluster meetings in Brussels, which open the door for future collaboration and joint applications to EU project calls. BeWiser partners attended Horizon 2020 Proposers' Day, October 2014 in Florence, and presented BeWiser programmes like V-Linc, BeWiser Connect and Business Roaming Agreement at ICT Lisbon in Oct 2015. Firms from four BeWiser partners attended GITEX Technology Week in Dubai, in October 2015 and five partners and member SMEs visited RSA Security conference in San Francisco last month. Participating companies received financial support from BeWiser, and a business tour of Universities, companies and tech centres in Silicon Valley was organised.

8. BUSINESS ROAMING AGREEMENT

The Business Roaming Agreement (BRA), co-ordinated by CyberForum, our German partner gives members of clusters who have signed the BRA, access to the use of an office in 32 countries and 87 locations worldwide. See www.clusterize.org

The BRA service means that any cluster which signs BRA, will allocate a work space for a few days to a visiting SME from another BRA member, without charge or obligation to buy any services,. The Business Roaming Agreement is designed to help SMEs in their efforts to internationalise. The host cluster organization will provide a desk, phone and internet connection to the visiting SME. The host will also give introductions and advice regarding business support organisations like HR recruitment, Research centres, tax advisers, State support of business etc.

9. CONCLUSION

The EU Commission and in many European countries, e.g. France, Spain, Germany, Austria, the government provides financial support to industry clusters. "Clusters are the DNA of Smart Specialisation" is a quote from a senior official in DG Growth when speaking at a 2015 Brussels conference on RIS3 (Pattinson, 2015).

European Union websites which support clusters include: www.clustercollaboration.eu and www.clusterobservatory.eu. The European Secretariat for Cluster Analysis website is www.cluster-analysis.org

A brochure about French clusters (Pôles de compétitivité) is available at http://competitivite.gouv.fr/documents/commun/Documentation_poles/brochures_poles/anglais/brochure-ang-internet.pdf . In order to be effective, clusters need a stable policy and funding Framework. Mature clusters tend to have 50/50 public/private funds. In countries like Ireland, Slovenia and Cyprus, there is a need to persuade government that providing financial support to clusters is an effective way to increase innovation, exports and jobs.

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CHALLENGES OF TRANSFORMATION FROM E-GOVERNMENT TO E-DEMOCRACY

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ABSTRACT

The impact of information revolutions on public administration necessitates the establishment of new mechanisms or international management structures. Effective public administration and e-democracy can be realized through the participation of citizens and civil societies in the socio-political decision-making process. In the literature, different concepts of e-democracy and e-government exist. The paper investigates views on the transformation of public administration and the formation of e-democracy. Despite the different approaches to e-government and e-democracy, it can be concluded that e-government is established by the higher level of the hierarchy to serve the government interests. In contrast, e-democracy reflects the interests of citizens and emerges from the lower level of the hierarchy.

KEYWORDS

Public administration, electronic government, electronic democracy, direct democracy

1. INTRODUCTION

The development of information communication technologies (ICT) affects social, economic and political life. Specifically, developments of ICT, electronic government (e-government) and the forming of electronic democracy (e-democracy) mechanisms have significantly modified public administration and political processes. Currently, advanced technologies and the requirements imposed on public services are transforming the functions of e-government. For the formation of efficient public administration mechanisms, the development of a new e-government concepts targeting direct democracy is essential. Civil rights and widespread participation in social processes and decision-making facilitate efficiency and democracy in public administration.

The analysis of the published scientific literature on e-government in 2005–2010 in developing countries reveals an increase of interest in several research areas, including research methodologies and paradigms, higher quality scientific research and the development of a conceptual basis for e-government (Wahid, F. 2012). The main research topics include the factors affecting the development of e-government, the impact of e-government on governmental entities and citizens and the link between ICT infrastructure and e-government (Zhang, H. et al. 2014).

The informatisation process is part of the trajectories of all countries. As a result of the rapid development of ICT and the effects of information revolutions, the considerable digital divide among governments in different regions of the world will be observed in near future.

2. INFORMATION REVOLUTIONS AND E-GOVERNMENT

In globalization processes, the role of information in society is increasing. If we consider the evolution of society from the perspective of the broadening role of information in human life, several information revolutions are apparent (Fang, I. 1997; Robertson, D.S. 1990). The establishment of new communication tools and the emergence of new technologies in the sphere of information processing have led to the reformation of the relations between the government and citizens.

Through the process of computerization, informatisation relieves workers from everyday routine tasks by providing secure access to information resources, leading to the opportunity for high-level automatised information processing in the government, production and social spheres. Economic development and the informatisation of social relations stimulate reforms in government administration in accordance with the demands of the information age. The formation of e-government leads to transformation in all spheres of society, which creates qualitatively new information and communication environment for the realisation of direct democracy (Drucker, P.F. 1999). In comparison with an industrial society, more information is produced and consumed in an information society. This, in turn, causes the share of intellectual labour to expand, requiring people's creative skills and increasing the need for knowledge.

All countries implement the informatisation process differently depending on their level of development. There are national informatisation programs pursued by the governments that take into account local characteristics. The rapid development of information technologies and the impact of information revolutions will lead to digital divide between regions of the world in the near future. The incorrect selection of informatisation strategy can affect all spheres of activity. According to another approach, information revolutions are one means of transforming financial-economic relations globally. In the near future, information revolutions could substantively affect public administration mechanisms and lead to the formation of new political structures.

The impact of information revolutions on public administration necessitates the establishment of new mechanisms or international management structures. Specific mechanisms include a well-developed infrastructure to enable the rapid adaptation to any changes in public administration and a legislative framework for the protection of intellectual property rights.

3. FROM E-GOVERNMENT TO E-DEMOCRACY

Communication or information revolutions alter management concepts and political technologies. These modifications necessitate the formation of e-government as a technological solution to several management issues, and the projection of relations between the state and citizen to the virtual space. In this regard, the attempts to increase the activities of governments and to creating electronic space to achieve political power are understandable.

Rahman, Sh. et al. (2014) identify the potential factors of applying e-government in their literature review on e-government, classifying those factors into four categories: institutional, resources, access opportunities and legal aspects. Chen, Y. C. and Knepper, R. (2005) suggest tools and strategies for the application of e-government. Ozkan, S. and Kanat, E. I. (2011) shows that an increasing number of countries have adopted the e-government strategy after considering the advantages such as the strengthening of activities in the sphere of public administration and increased efficiency. Shareef, M.A. et al. (2011) state that e-government formation depends on technological issues and the complicating human, social, cultural and economic factors. Bwalya, K.J. et al. (2014) comment on problems encountered in the sphere of e-government formation in developing countries. Alshehri, M. and Drew, S. (2011) have analyzed recent research regarding the stages of e-government and existing problems and advantages in e-government. The research of Siskos E. et al. (2014) recommends a system consisting of eight criteria to assess e-government. The assessment of e-government is based on four parameters: infrastructure, investment, electronic processes and users' attitude.

The research shows that the views of researchers on the realization of reforms in public administration and the concept of e-government formation differ. Some researchers suggest that the initiatives completely differ from previous approaches or that e-government formation increases the efficiency of governmental activities and forms an implicitly new public administration model. Other researchers have a more cautious stance and consider e-government as a new tool for solving the existing problems. In this regard, three elements of e-government have been identified (Schedler, K. and Scharf, M.C. 2002; Schedler, K., and Schmidt, B. 2004):

1. Electronic democracy and participation –the formation of public opinion and decision making with the help of electronic tools (e-voting, citizen networks, etc.)
2. Electronic production network –a tool for cooperation among public institutions and civil society institutions.

3. Electronic public services –the provision of services to users, citizens or the business sector via national, regional or local portals.

The first element is related to a political system in general, and the other two elements can be seen as the continuation of the reforms achieved at any level (Schedler, K. and Scharf, M.C. 2002). Efficiency in administration can be achieved through the active participation of citizens and civil societies in the process of political-administrative decision making. According to some researchers, the transition from the term e-government to e-democracy is necessary [Wimmer, M. 2003; Meier, A. 2012; Williams, R.W. 2006; Carrizales, T. 2008]. The framework of this process is built through an increase in the trust of government agencies and a corresponding trust in citizens. The development of democratic institutions and the use of ICT and information infrastructure for the purpose of broadening the participation of citizens in public and political processes reflect the essence of e-democracy (Meier, A. 2012; Carrizales, T. 2008; Anttiroiko, A.-V. 2003]. In the broad sense, e-democracy can be defined as the engagement of citizens and organizations in political processes by considering their thoughts and opinions. Reviewing the evolution of the notion of e-government reveals several important phases of its development. First, the notion of “teledemocracy” emerged with the creation of cable television at the end of the 1960s and the beginning of the 1970s (Becker, T. 1981; Becker, T. 2007). According to some researchers, teledemocracy can be viewed as the precursor of e-democracy. Teledemocracy is expressed as enabling the participation of citizens in any political debate by using the television and telephone at the same time. The viewer of any political event on television can participate in that event by using the telephone. The main purpose of teledemocracy was the participation of citizens in political processes and the realization of structural reforms based on the existing technical feasibilities of communication tools (Becker, T. 1981; Becker, T. 2007). However, in the 1980s, the experiments conducted using the television and telephone neither determined the establishment of new form of democracy, nor the efficiency of the participation of citizens in political processes.

The first stages of the formation of e-democracy confined citizens’ access to information to that which was publicly important, and included the opportunity to vote on government decisions. In subsequent evolution processes, the opportunities of both parties were widened and an opportunity was created to select the extent of participation in processes of citizens (Kaczmarczyk, A. 2011; Hill, K.A. and Hughes, J.E. 1998; Hilbert, M. 2009). This was considered to be an opportunity for citizens to express their opinion freely at any level of decision making and to increase transparency considerably.

In the literature, different concepts of e-government and e-democracy exist. ICT experts believe that e-democracy must be viewed as an integral part of e-government. Experts on the social sphere have the opposite perspective, which is that e-government must be viewed as an integral part of e-democracy. It can be concluded that e-government is created by the initiative of the upper level of the hierarchy for the purpose of serving government interests. E-democracy can emerge from the lower level of the hierarchy as it reflects the interests of citizens. If the state responds to current trends, e-government can be a strong and effective administration mechanism that solves several social problems and initiates a direct dialogue between the citizen in a democratic society and the government, that is, a transition from a representative democracy to direct democracy.

Effective public administration and e-democracy can be realized through the participation of citizens and civil societies in the socio-political decision-making process. E-democracy promotes more effective relations among the citizens, between the citizens and government structures and between civil society and the business sector. Different approaches to e-democracy exist and those are subject to criticism. The contradictions between the e-government concept which is essential for achieving reforms in the spheres of public administration and e-democracy have been debated in the recent literature.

4. CONCLUSION

Different considerations concerning the efficiency level of e-government have been proposed. E-government formation has altered the structure of public administration, while the knowledge economy has caused advanced technologies to develop rapidly and become an integral part of government activity. E-government improves the efficiency of government structures and facilitates the formation of democracy. The complete openness of governmental activities to society and the opportunity for citizens to directly participate in proposing solutions to governmental and local issues via online voting constitute the basis of e-democracy.

Despite the different approaches to e-government and e-democracy in the literature, it can be concluded that e-government is established by the higher level of the hierarchy to serve the government interests. In contrast, e-democracy reflects the interests of citizens and emerges from the lower level of the hierarchy. Hence, the realization of the concept of e-government is directed toward the development of e-government, and establishing effective mechanisms of e-democracy will alter the views how to manage society.

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Posters

NEGATIVE FEELINGS WHEN WAITING FOR A LINE RESPONSE AND DEGREE OF SNS DEPENDENCY: FOCUSING ON READ STATUS

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ABSTRACT

This study investigated the relation between negative feelings experienced by the sender of a LINE text message and the waiting time for a response. This relation was examined for cases where the message has and has not been read and the sender's degree of social networking service (SNS) dependency is also considered. As a result, it was found that negative feelings would arise more quickly when the message has been read but no response has been received. Additionally, senders with a higher degree of SNS dependency would experience negative feelings sooner.

KEYWORDS

Social networking service (SNS), smartphone, read status, LINE, SNS dependence

1. INTRODUCTION

With the spread of smartphones, social networking service (SNS) messaging has become a communication tool that plays a large role in daily life (Ahad and Lim, 2014; Church and Oliveira, 2013; O'Hara et al, 2014). With SNS communication using mobile phones, which are carried during daily life, exchanges are comparatively faster than exchanges using larger computers. However, SNS messages are primarily asynchronous text-based media. According to Kato and Kato (2015), there are psychological differences between computer users and mobile phone users. For example, the time between sending a message and receiving a response, which has only a small effect with computer-based email, has a greater emotional effect on mobile phone users (Kato and Kato, 2015; Tyler and Tang, 2003). This study focuses on the emotions of users in relation to this waiting time. Here, we examined exchanges over LINE, which is currently the most widely used smartphone SNS in Japan.

LINE is an instant messaging application similar to WhatsApp and Facebook Messenger, but is more commonly used in Japan. It is used in place of mobile email or other chat applications. In LINE, there is a "read status" function that automatically notifies the sender when the recipient has read the message. Because of this, in LINE exchanges, it is thought that many senders take notice of the time it takes for an unread message (which is not being displayed as "read" because the other party has not read it yet) to display as "read," rather than focusing strictly on the total time spent waiting for a response. For example, there are likely senders who, when time passes and there is no response, suspect that "the recipient has not read the message and is ignoring me" when the message does not indicate being read. In contrast, these senders may suspect that "the recipient has read the message and is ignoring me" when the message is displayed as read. Also, there are likely recipients who excessively worry that the sender will feel ignored and so feel pressure to respond quickly (Church and Oliveira, 2013). This psychological pressure, "LINE fatigue," is becoming problematic, especially among young users.

In a survey of Japanese youth by the Ministry of Internal Affairs and Communications (2014), those with a high tendency to develop Internet dependency (Young, 1998) responded that Internet-based communication such as email and SNS is important in maintaining personal relationships. It is thought that many exchanges are conducted via email and SNS by users who consider them to be indispensable in personal relationships,

and additionally that rapid exchanges are strongly desired. In other words, it seems that the emotions of those with a high tendency to develop dependency are strongly affected by the time spent waiting between sending a message and receiving a response.

2. PURPOSE

The aim of this study was to elucidate the relation between a LINE message sender's degree of SNS dependency and the time it would take for negative feelings to arise in the sender after he or she has sent a message requiring a response. In particular, we considered cases where "the message was read right away but there was no response" and where "the message was not read and there was no response."

3. METHOD

Participants in this survey were 317 university students (128 men, 189 women; mean age \pm standard deviation, 19.69 ± 1.56 years; age range, 18–28 years) at universities in the Tokyo area. Participants responded to a paper questionnaire. This survey was conducted in October 2015.

The questionnaire asked, "At noon, you sent a LINE message to a friend, to which you expected a response. The message displayed as read immediately. As you continue to receive no response, how long will it take for negative feelings to arise (Message Read)? How long would it take negative feelings to arise if the message continues to remain unread (Message Unread)?" Using the response column shown in Table 1, respondents were asked to check the choice that applied to each condition. Responses ranged from "Until 13:00" to "Until after noon of the next day."

Also, the 15-item short version of the Text-message Dependency Scale by Igarashi et al. (2008) was used to measure SNS dependency. The communication tool was "email" in the scale's original 15 questions, but this was changed to "LINE" in this study. We obtained the permission of the scale's creators for use of the text-message dependency scale with this modification.

This scale is composed of three subscales: *emotional reaction* (e.g., "I feel disappointed if I don't receive any LINE messages"), *perception of excessive use* (e.g., "I sometimes spend many hours on LINE messages"), and *relationship maintenance* (e.g., "I cannot maintain new friendships without LINE messages"). Five questions were asked for each of the subscales, with responses scored on a 5-point Likert-like scale from "1 = Does not apply at all" to "5 = Strongly applies."

To group participants by degree of dependency, the three subscale scores were calculated for each participant and two-step cluster analysis was performed using SPSS 23 with the three subscale scores as inputs. For statistical analyses, the Mann–Whitney U test was used for comparisons between clusters and the Wilcoxon signed-rank test was used for comparisons between read status conditions.

4. RESULTS AND DISCUSSION

The cluster analysis resulted in the division of the participants into two clusters. Table 2 shows the average subscale scores by cluster and the numbers of participants classified into the two clusters. From the results, we classified cluster 1 as the high-dependency group and cluster 2 as the low-dependency group.

Next, waiting times before negative feelings would arise under the read and unread conditions were compared between the groups by the Mann–Whitney U test. Significant inter-group differences were seen under both conditions. Table 3 shows the number and percentage of participants who gave each waiting time response in each group according to read status.

Table 1. Responses for waiting times until negative feelings would arise

1) Until 13:00	2) Until 15:00	3) Until 17:00	4) Until 19:00	5) Until 21:00	6) Until 23:00	7) Until 01:00	8) Until the next morning	9) Until noon the next day	10) Later than noon of the next day

Table 2. Average subscale scores by cluster and the number of participants classified into each cluster

	Subscale scores						Number of participants		
	<i>Emotional reaction</i>		<i>Perception of excessive use</i>		<i>Relationship maintenance</i>		Female	Male	Total
	M	SD	M	SD	M	SD			
Cluster 1	16.13	3.53	17.41	3.53	12.65	2.99	76	42	118
Cluster 2	10.06	3.76	11.79	4.15	7.51	2.52	113	86	199

Note. M=mean. SD = Standard Deviation.

Table 3. Comparisons of number of responses for waiting times until negative feelings would arise between the groups under each read status condition

Condition	Dependency group	Waiting time until negative feelings would arise											P
		Until 13:00	Until 15:00	Until 17:00	Until 19:00	Until 21:00	Until 23:00	Until 01:00	Until the next morning	Until noon the next day	Until after noon of the next day		
Read	High	N 12	12	16	11	16	9	5	10	17	10	<.001	
	%	10.2%	10.2%	13.6%	9.3%	13.6%	7.6%	4.2%	8.5%	14.4%	8.5%		
Unread	Low	N 4	9	13	13	21	18	5	25	16	75	<.001	
	%	2.0%	4.5%	6.5%	6.5%	10.6%	9.0%	2.5%	12.6%	8.0%	37.7%		
Unread	High	N 6	6	9	13	15	13	7	14	14	21	<.001	
	%	5.1%	5.1%	7.6%	11.0%	12.7%	11.0%	5.9%	11.9%	11.9%	17.8%		
Unread	Low	N 6	4	7	8	18	23	5	25	22	81	<.001	
	%	3.0%	2.0%	3.5%	4.0%	9.0%	11.6%	2.5%	12.6%	11.1%	40.7%		

Note. N = Number of participants. P = Mann-Whitney U test significance probability for comparisons between the high- and low-dependency groups under each read status condition.

Additionally, when the condition was “read,” the median waiting time response was 5 (“Until 21:00”) for the high-dependency group and 8 (“Until the next morning”) for the low-dependency group. When the condition was “unread,” the median was 6 (“Until 23:00”) for the high-dependency group and 9 (“Until noon the following day”) for the low-dependency group. These results suggest the following difference between the clusters: When a message is sent at noon, participants in high-dependency group expect a response on the same day (i.e., by the time they go to bed), while participants in the low-dependency group find it acceptable to wait until the following day. Finally, the Wilcoxon signed-rank test showed significant differences in the time until negative feelings would arise between the read and unread conditions ($p < .001$). This suggests that when waiting for a response, negative feelings will be experienced sooner when the message has been read than when it has not.

5. CONCLUSION

Negative feelings would arise more quickly while waiting for a response to a LINE message when it has been read than when it has not. Independently of read status, senders with a high degree of SNS dependency would experience negative feelings sooner.

In this study, the other party in the LINE exchange was described as “a friend,” but in the future it will be necessary to focus on the effect of other types of relationships with the people in LINE exchanges. It would also be meaningful to conduct an international survey with the same purpose as this study, using the applications similar to LINE that are popular in other countries.

ACKNOWLEDGEMENT

This work was supported by JSPS KAKENHI Grant Numbers 24501220, 24700913, 15K01095, 15K01089.

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SENDER EMOTIONAL STRATEGIES AND RECIPIENT RESPONSES IN SMARTPHONE EMAIL COMMUNICATION

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ABSTRACT

We examined communication by smartphone email, focusing on the emotional strategies of senders and recipient responses. As a result, we found that senders felt concern about the recipient and so tried to convey emotions other than those they actually felt. However, these were not conveyed as intended and so did not convey the intended emotional state to the recipient. In other words, it is suggested that emotional strategies of senders do not necessarily work.

KEYWORDS

Smartphone, text messaging, emotional strategy, emotional transmission, emotional interpretation

1. INTRODUCTION

Many people experience difficulty in conveying emotion during text-based communication (Daft and Lengel, 1984; Dyer et al, 1995; McGuire et al, 1987; Sproull and Kiesler, 1986). Kato et al. (2007) compared the results of experiments on emotions arising during exchanges conducted by PC-based email between parties who successfully conveyed emotions. Emotional transmission is defined there as occurring when the “emotion arising in the sender when sending an email” matches the “interpretation of the sender’s emotion by the recipient of an email (Scott et al, 2009).” That result clarified that, typically, negative emotions were not successfully transmitted. A follow-up, Kato et al. (2010), focused on the senders of mobile text messages, describing a paper questionnaire survey used to assess emotional strategy in communication. For that purpose, emotional strategy is defined as “how emotion arising in oneself is conveyed to the other party, and what kinds of emotions one expects to arise in the other party.” As a result, only one emotional strategy was found for conveying joy, but multiple strategies were found for conveying negative emotions. In other words, negative emotions cannot be precisely conveyed in many cases. Inter-person variability in emotional expression can account for the difficulty of conveying negative emotions.

In the present study, we assessed emotional transmission in combination with emotional strategy, using an experiment with smartphone email to do so. Five items related to emotions are measured; these are shown in Figure 1. The relations between these items are analyzed and investigated, particularly the accuracy of emotional transmission and emotional strategy. Preliminary results of this study are reported here.

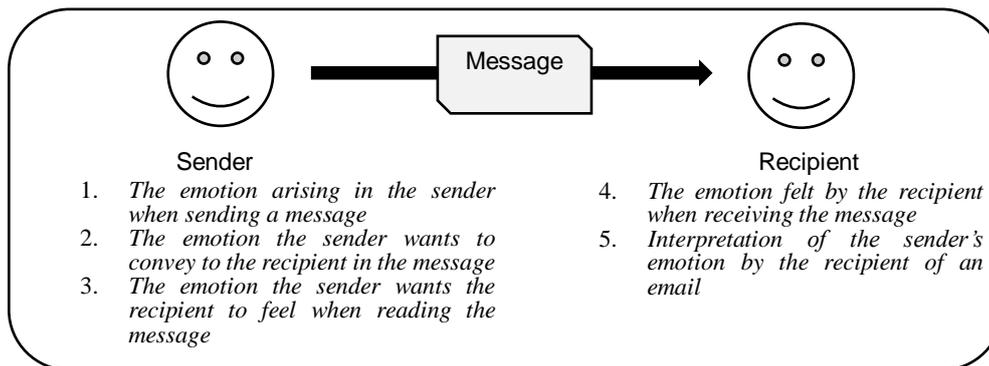


Figure 1. Five emotion-related items measured in the experiment

2. METHOD

Participants in the experiment are 24 people (mean age: 20.1 years) recruited from universities in Japan's central region. Each participant was assigned at random to one of two rooms, with half assigned to each. Pairs of participants were then chosen such that each participant was paired with exactly one participant, who was in the other room, and participants were instructed to conduct email exchanges as a pair, using smartphone email. Four request types were set as exchange scenarios. Each participant of each pair was assigned two request types, with each pair assigned all four request types. After task assignment, participants were instructed to make requests of the other party by email for their assigned requests and to decline the requests of their partner by return email. Participants could freely decide the text of the messages and expressions so long as the request was made by the sender and declined by the respondent.

A paper questionnaire asked about the emotions shown in Figure 1 for each stage in the email exchange. Items 1, 2, and 3 in the figure are aimed at the sender, and items 4 and 5 are aimed at the recipient. At the next stage, the sender of the email declining the request (that is, the original respondent) answered items 2 and 3, and the participant receiving the decline (that is, the requesting party) answered items 4 and 5. The five task items are applied to each of four emotions— joy, sadness, anger, and guilt— and function as questions for which there were five possible responses on a Likert-like scale. For example, for joy in item 1, participants were asked to select from “1. Don't feel at all” through to “5. Feel very strongly” to express the degree of joy felt upon sending the request.

3. RESULTS AND DISCUSSION

Mean differences with standard deviations of those differences are shown in Table 1 for the emotions shown in Figure 1. The results are divided into stages of the exchange, with questions asked about between the sending of the request message and its receipt and between the sending of the (negative) response email and its receipt.

We analyzed the collected data in stages. First, a comparison of the emotion actually felt by the sender (item 1) and the emotion the sender wanted to convey to the recipient (item 2) was performed by applying a t-test to the difference for each item response for each request-and-decline exchange. As a result, a significant trend was seen ($t(47) = 1.95, p < .10$) in the difference of joy in request exchanges. In decline exchanges, significant differences were seen in all emotions (Joy: $t(47) = 3.44, p < .01$; Sadness: $t(47) = 3.94, p < .001$; Anger: $t(47) = 2.02, p < .05$; Guilt: $t(47) = 3.79, p < .001$). These results are interpreted as indicating that the senders were trying to convey different emotions to the recipient than those the sender actually felt. This seems to be particularly likely in decline exchanges, where the declining party tries to convey a stronger feeling of regret than is actually felt as a way of sparing the other party's feelings.

Next, the emotion actually felt by the sender (item 1) was compared with the recipient's interpretation of the emotion (item 5) for each exchange. The results showed significant trends for two of the emotions in

request exchanges (Sadness: $t(47) = 1.96$; $p < .10$; Guilt: $t(47) = 1.85$, $p < .10$). In decline exchanges, significant differences were seen for joy ($t(47) = 3.78$, $p < .001$) and significant trends were seen for anger ($t(47) = 1.77$, $p < .10$). In particular, in decline exchanges, there was a trend for the recipient to perceive low joy and high anger on the part of the sender. In other words, it seems that the sender, when making a request and being declined by the other party, may feel that they have angered the other party by making it.

Continuing, the emotion the sender wanted to convey to the recipient (item 2) was compared with the interpretation of the emotion by the recipient (item 5) for each exchange. The results showed a significant trend of a difference in guilt during request exchanges ($t(47) = 1.74$, $p < .10$). Significant differences were seen for three emotions in decline exchanges (Sadness: $t(47) = 2.72$, $p < .01$; Anger: $t(47) = 3.36$, $p < .01$; Guilt: $t(47) = 3.37$, $p < .01$). In decline exchanges, in particular, emotions of sadness and guilt were interpreted as low while the emotion of anger was interpreted as high, contrary to the expectations of the sender. The results seem to indicate that the declining party's feeling of being in the wrong is insufficiently conveyed.

Finally, the emotion that the sender wanted the recipient to feel (item 3) was compared with the emotion actually felt by the recipient (item 4) for each exchange. The results showed significant differences in three emotions in request exchanges (Sadness: $t(47) = 2.56$, $p < .05$; Anger: $t(47) = 2.79$, $p < .01$; Guilt: $t(47) = 6.97$, $p < .001$). Also, a significant trend was seen in the difference for joy ($t(47) = 1.69$, $p < .10$). Significant differences were seen in two emotions in decline exchanges (Sadness: $t(47) = 3.49$, $p < .01$; Anger: $t(47) = 2.92$, $p < .01$). It is thought that, in request exchanges, the lower joy experienced by the recipient than intended by the sender and the higher sadness, anger, and guilt are a consequence of the recipient declining the sender's request. It seems, too, that feelings of sadness and anger felt by recipients in decline exchanges are estimated by the declining party to be less intense than they actually are.

Table 1. Averages and significant differences ($n=48$) in items related to sender and recipient emotions

Emotion-related items	Emotion	Request exchanges		Decline exchanges	
		M	SD	M	SD
1. Emotion arising in the sender when sending an email	Joy	2.19	1.30	2.63	1.38
	Sadness	2.19	1.18	2.40	1.38
	Anger	1.25	0.53	1.56	0.94
	Guilt	3.04	1.57	3.15	1.34
2. The emotion the sender wants to convey to the recipient in the message	Joy	2.44	1.41	2.02	1.28
	Sadness	2.38	1.25	3.29	1.27
	Anger	1.17	0.38	1.35	0.84
	Guilt	3.04	1.69	3.88	1.23
3. The emotion the sender wants the recipient to feel when reading the message	Joy	3.04	1.46	1.90	1.15
	Sadness	1.65	1.00	2.48	1.30
	Anger	1.17	0.38	1.35	0.89
	Guilt	1.46	0.99	1.81	1.33
4. The emotion felt by the recipient when receiving the message	Joy	2.63	1.38	1.60	0.82
	Sadness	2.40	1.38	3.50	1.20
	Anger	1.56	0.94	1.90	1.02
	Guilt	3.15	1.38	2.10	1.10
5. Interpretation of the sender's emotion by the recipient of an email	Joy	2.13	1.21	1.88	0.98
	Sadness	2.65	1.36	2.60	1.35
	Anger	1.29	0.58	1.81	1.08
	Guilt	2.65	1.51	3.17	1.31

Note. M = Mean. SD = Standard Deviation. Answers are in the range 1–5.

4. CONCLUSION

The use of emotional strategies during exchange of smartphone messages was confirmed. In particular, senders tried to convey emotions other than what they actually felt, but this emotional strategy did not always work, meaning that senders were ineffective at conveying the intended feelings. In fact, recipients felt more negatively than senders expected.

Some analysis of emotional strategy is reported here, but more analysis is still necessary. For example, a detailed analysis of results for each pair, including the content of exchanged messages, is not reported. The next task is to perform an overall analysis of all data obtained from this experiment. We note that the experiment participants in this study were Japanese, and so the results of this study will not necessarily generalize beyond Japanese people. Because of this, we think it will be necessary to conduct the same kind of experiment in different cultures in the future.

ACKNOWLEDGEMENT

This work was supported by JSPS KAKENHI Grant Numbers 24501220, 24700913, 15K01095, 15K01089.

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