Editorial for the Special ECIME Edition of EJISE – Volume 5 Issue 1

The 12th European Conference on Information Management and Evaluation has been hosted in Como (Italy) by the Department of Informatics and Communication of the University of Insubria. At the Conference 74 papers were presented which, as usual with the Conferences of this series, were all high level papers describing multiple aspects of information management and evaluation. Out of these papers we selected twelve to be included in this special issue of the Electronic Journal of Information Systems Evaluation.

Besides the obvious criteria related to the quality of the papers, in the choice of the papers to be included within this special issue we tried to give an overview of the main topics covered by the Conference and of those we believe are the more relevant under the current global crisis.

Actually, today even more than in the past, ICTs are expected to contribute positively to help people (especially people that are at risk of exclusion) and enterprises (especially small and medium enterprises, that are more vulnerable in times of crisis) to better deal with the current adverse conditions and to be an active part in the efforts for the recovery. However, this could require a re-definition of the information systems architectures, the adoption of new organizational models and new approaches to information management, as well as new approaches to the design and implementation of innovative and inclusive ICT-based services.

One of the topics that, directly or in directly, is addressed by many of the papers included within this special issue concerns Small and Medium Enterprises (SME). Indeed, both Begg and Caira’s paper and Devos, Van Landeghem and Deschoolmeester’s explicitly refer to SMEs. Begg and Caira presents the results of a research conducted on a set of typical SMEs with the aim of considering how they deal with data governance. The main results of the research are a limited awareness of SMEs concerning data governance and a scarce interest in the data governance community as well as in the industry towards solving the specific needs of SMEs. This is a serious problem that need to be addressed both because information is increasingly a critical strategic asset and because current technological developments such as cloud computing are likely to encourage SMEs to store and process even greater amounts of data.

SMEs often suffer from a lack of IT proficiency and therefore depend heavily on external IT expertise. As a result of this lack of internal competences, SMEs are not likely to adopt high quality software applications. This is a serious problem since, as discussed by Devos, Van Landeghem and Deschoolmeester, a market with unbalanced information or information asymmetry, can eventually completely disappear or can offer products with poor quality which wipe out the good ones (the lemon market effect). The research described in the paper shows that the software market for SMEs really reveals elements of a lemon market. This is partly due to the SMEs themselves that enter the market with insufficient managerial and technical IT/IS capabilities, and partly due to the vendors that indirectly encourage SMEs to withdraw from the finalization of the software acquisition process due to their inadequate or inferior IT/IS capabilities.

Among the most strategic IT-related services today are those related to e-commerce. The paper by Carton et al presents an evaluation framework for this kind of service, with a particular focus on mobile payment. The framework is based on two main dimensions of value and integration, which are thoroughly discussed in the paper. A case study showing a concrete application of the framework is also presented.

IS outsourcing relationships is the object of Johansson and Bergkvist’s paper, which claims that a boundary spanning perspective can be useful in identifying what management practices are more likely to lead to the IS outsourcing success. The authors argue that boundary spanning roles are crucial for the management of IS outsourcing relationships. Based on the discussion of two case studies, a set of propositions is presented that can be used as a guiding tool for how to further develop boundary spanning roles in outsourcing relationships. A particularly interesting point in this paper is the discussion of a case in which the supplier resorts to off-shore insourcing, thus extending the outsourcing relationship to include three parties, the client, the supplier’s onshore site and the supplier’s offshore site. In a globalized world, this extended relationship will be more and more common in IS outsourcing.

The widespread ability of managing and processing geo-localized information has opened the path to many advanced applications that can benefit from mining and extracting knowledge from geographical data, as well as to linking them to conventional data. In the paper by Ferreira, João and Martins it is shown how knowledge extraction can be performed by correlating crime data with geo-spatial information. Moreover, more sophisticated analysis can be performed by complementing spatial analysis with other background knowledge, such as the historical and cultural components of a given territory. Such correlations will help in defining new models for crime analysis and prediction, as well as drive policy makers in taking more conscious and informed decisions.
The paper by Kbar and AlDusari addresses the issue of knowledge management from the perspective of a knowledge-based economy, where effective and efficient knowledge management and sharing is one of the key success factors. The paper proposes a conceptual analytical tool to help managers to evaluate the performance of a knowledge-based economy in a variety of scenarios and reasoning as to how to improve the organization. The tool is based on a set of performance indicators that span across several dimensions, such as the availability of knowledge, the knowledge investment, and business project continuity. A comparison between developed and developing countries is also presented, as well as a case study taking into accounts a set of Saudi Arabia projects.

Due to the ongoing change in demographics, older people are becoming the majority in Europe; this makes relevant the design and implementation of ICT tools and services specifically tailored on the needs of older people in order to support independent living. This is the problem addressed in the Isomursu and Harjumaa paper, which considers how ICT services for older people should be implemented. In particular, the paper shows the relevance of the evaluation of the user experience in order to make these services really usable. This can be achieved by directly involving users in the design phase and by basing the development of the services on the feedback from the users. By referring to the direct experiences of the researchers, the paper describes how to design and conduct field trials, and how to improve data analysis with the aim of implementing better ICT-based services for older users.

Nor and Nordin in their paper address a different aspect of inclusion through ICTs, which is the use of ICTs to enforce indigenous microenterprises producing objects with a strong cultural identity, such as the batik production in Malaysia. In the paper it is argued that the facilitation of batik microenterprises, ICT adoption can happen by developing an ICT-based information system that emphasizes the cultural context and the ecological aspect of batik production, which are equally imperative for business productivity. The approach described in the paper gives an interesting perspective on how ICT-based information systems for indigenous or cultural influenced businesses should be designed, implemented and deployed.

In the globalized economy, agility is one of the main requirements for successful enterprises that should be able to rapidly change the business strategy and business operations to dynamically adapt to the continuously changing environmental conditions. In their paper van Putten and Schief discuss the relation between Business Model (BM) and Business Case (BC) and claim that BM and BC together provide the way to fill the gap between strategy and operations hampering companies’ agility. Using the case of mergers and acquisitions as an example the authors show how changes in the BM can influence the BC and vice versa, and how enterprises’ agility strictly depends on their capability of keeping BM and BC aligned.

The need to rapidly adapt to new requirements and business changes is also addressed by the papers by Serova, and Magoulas et al. The paper by Elena Serova analyzes the information system solutions that can better fit in today's rapidly changing business environments, where only flexible and dynamically developing companies will be able to meet competition. It proposes a shift from traditional ERP systems to the new concept of EISs (Enterprise Information Systems). The main characteristic of EISs is their openness to all business partners, which share a common business interest. The paper also presents an analysis of the Russian ERP and EIS market.

The paper by Magoulas et al claims that one of the most relevant ways to cope with the increasing complexity and dynamicity of today business environments is to turn to Enterprise Architecture. Unfortunately, there is still the lack of a conceptual model for the evaluation of the various solutions and options. This paper takes a step in this direction by investigating one of the main drawbacks of current proposals, which is the lack of architectural alignment among the component of the developed models. The paper also provides a comparative analysis of some of the existing proposals.

Finally, the paper by Van Bussel addresses the problem of accountability, which is today a widespread need for a variety of scenarios, e.g., privacy protection, process re-engineering and, more generally, decision making. Clearly, the most important requirement is ensuring the trustworthiness of the managed information. The paper, besides reviewing the state of the art, discusses the main building blocks of any system for accountability management, namely enterprise records management, organizational memory and records auditing.

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Exploring the SME Quandary: Data Governance in Practise in the Small to Medium-Sized Enterprise Sector

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Abstract: The purpose of this paper is to explore how small to medium-sized enterprises (SMEs) perceive data and data governance and investigates whether current data governance frameworks are applicable to SMEs. Enterprises of all sizes and complexity have had to learn how to operate in an increasingly digital business environment. Such an environment demands that an enterprise equips itself with the ability to use its data effectively both internally and when dealing with external partners such as suppliers and customers. Enterprises now recognise that both their survival and success requires taking control of all aspects of their data as a critical business resource. In recognition of the demands placed on enterprises in this digital age, a discipline has emerged called data governance. Although the definition of data governance is still evolving, current usage describes this discipline as being a facilitator for enterprises to take control over all aspects of their data resource from the setting of integrity constraints for data quality to the creation of enterprise-wide policies on data access and security. Large enterprises are often better placed to absorb the necessary demands that data governance places on resources. However, for the resource-poor SME, the investment in data governance is far more challenging but nevertheless critical in the digital business environment. This paper reviews examples of published data governance frameworks to establish whether these frameworks are applicable to SMEs. A data governance framework (Khatri & Brown, 2010) is assessed using ten SMEs that have differing data requirements. This research is further enhanced by reviewing the results of a project which audited technology use in SMEs. This paper finds that although many data governance frameworks claim to be adaptable and scalable, there is little published evidence by industry or academics on the application of data governance to SMEs. Furthermore, our research revealed that the optimal use of data governance frameworks requires that those with authority and responsibility over enterprise data must have knowledge and some understanding of the terminology that describes data, data-related issues, and data-based technology and this requirement may not be met for many SMEs. The initial reflections on the reality of data governance for SMEs reveal that they do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business processes. The paper concludes, amongst other things, that SMEs are poorly served by the data governance community and that further research is required to fully appreciate their data governance needs.

Keywords: data governance, SME, data management, data quality, framework

1. Introduction

There is a wealth of evidence that large enterprises are waking up to the inherent value of their data and this realisation brings the need to control and manage data as with all other enterprise assets. An increasingly popular approach is through data governance, which assigns authority, responsibility and tasks for all aspects of data management throughout the enterprise. However, as an industry, data governance solutions are largely directed at solving the needs of large enterprises with little evidence of an equivalent interest in small to medium-sized enterprises (SMEs). There appears a common assumption by industry that data governance solutions for large enterprises can be scaled down and applied to SMEs. This paper seeks to explore the validity of this assumption.

The great interest in data governance by industry is not matched by the academic community. The academics currently working in this area do appear to agree that there is no single approach to the implementation of data governance in all enterprises. However, although their research uses a wide range of organisations to test their theory, all were large enterprises (Weber et al. 2009), (Khatri & Brown 2010). This paper takes published data governance approaches and explores the particular requirements of introducing data governance to SMEs.

The authors believe that the lack of attention given to SMEs by the data governance community is unwise given the significant contribution that this sector makes to economies worldwide. Furthermore, the commonly used criteria that determine the size of an enterprise do not reveal the nature or volume of data used by the enterprise. The authors believe that the characterisation of enterprises used to demonstrate the effectiveness of data governance should include some measure of the complexity of
their data environment. In addition, current technological developments such as cloud computing are likely to encourage SMEs to store and process even greater amounts of data.

SMEs will continue to face significant and unrelenting pressure to work in an increasing digital business environment and this will place significant demands on them to take control and effectively manage their data. Therefore, SMEs will need to adopt data governance practices to help them both survive and find success. However, our initial investigations of how SMEs perceive data and its governance reveal that SMEs do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business processes. As a consequence, SMEs cannot easily envisage how data governance can be achieved without first achieving control over their IT systems.

This paper examines, in Section 2, the definition of a SME as described by the European Community and comments on this categorisation. Section 3 presents definitions of data governance and provides examples of published data governance frameworks that propose to be adaptable and scalable. Section 4 presents our research and findings concerning the application of a data governance framework (Khatri & Brown, 2010) in ten SMEs. Section 5 discusses the realities of data governance for SMEs and the quandaries that they face when considering data governance. This paper concludes, in Sections 6 and 7 by identifying the original contribution of our research to the body of knowledge and presents future avenues for investigation.

2. SME defined

The term ‘SME’ refers to micro, small, or medium-sized enterprises that meet criteria defined by the European Commission Recommendation (2003/361/EC). An enterprise qualifies as an SME if the maximum number of staff is less than 250 with an annual turnover ≤ 50 million or an annual balance sheet total ≤ 43 million euros.

The significant contribution that SMEs make to the European Union’s economy is acknowledged and well documented in both the Lisbon strategy (EC, 2000) and its successor Europe 2020 strategy (EC, 2010a). An annual performance review for 2009 revealed that 99.8% of all European businesses are SMEs and are responsible for providing two out of three jobs in the private sector and contribute more than half of the total gross value added by businesses in the European Union. Furthermore, nine out of ten SMEs are actually microenterprises with less than 10 employees. (EC, 2010b)

The characteristics that determine an SME such as number of staff and the turnover or balance sheet total does not have any strong correlation to the amount and nature of organisational data. In fact, it is entirely possible that many SMEs use far larger amounts of data to support their business than some larger enterprises. This will become increasingly true as enterprises (including virtual enterprises) of all sizes move to exploit the capacity and services offered by cloud computing to capture, process and store growing amounts of data without necessitating an equivalent increase in accommodation, computing resources and staff to manage these resources.

For the purpose of this paper, we do not distinguish between micro, small and medium-sized enterprises but use ‘SME’ as a collective term to represent all enterprises that do not exceed the criteria identified for a medium-sized enterprise.

3. Data governance

3.1 Data governance defined

Data governance formed from a convergence of several well-established areas concerned with data such as data quality management, data management systems, data security, and data administration. The major driver for this convergence was a need to co-ordinate the control and management of all aspects of data throughout an enterprise.

Since the initial emergence of data governance as a critical and fundamental enterprise-wide discipline, the data governance community has published several definitions of the discipline. While earlier definitions focused on procedures, policies, processes, technologies and responsibilities for the control and management of enterprise data, more recent definitions place more emphasis on identifying roles and/or business structures that have authority over data-related matters.
While most definitions present the ‘what’ aspects of data governance, others can also include the ‘who’, ‘how’ and sometimes ‘why’ aspects. The range of definitions is partly due to the fact that data governance is currently an industry-led discipline, which can mean that vendors tend to use definitions that focus on the ‘what’ and ‘why’ aspects that best match the product or services being promoted. Organisations such as the Data Governance Institute (DGI) and Data Warehouse Institute (TDWI) that aim to inform and share good practice, present definitions that place emphasis on ‘how’ data governance is to be achieved.

Our research suggests that the definition of data governance is still evolving and that the data governance community does not appear to be converging on a single agreed definition. For the purposes of this paper, we will not contribute to this evolutionary process but use a data governance definition by (Weber et al. 2009), which is based on an adaptation of an IT governance definition by (Weill 2004). This definition states in simple terms what data governance aims to achieve.

“Data governance specifies the framework for decision rights and accountabilities to encourage desirable behavior in the use of data. To promote desirable behavior, data governance develops and implements corporate-wide data policies, guidelines, and standards that are consistent with the organization’s mission, strategy, values, norms, and culture.”. (Weber et al. 2009).

Examples of published frameworks that propose to facilitate the establishment of data governance within an enterprise are presented in the following section.

3.2 Data governance frameworks

Some authors of data governance believe that enterprises are too diverse, for example in terms of organisational structure, culture, politics and policies, to use a common framework or approach, (Weber et al. 2009), while others believe that published frameworks offer a good platform on which to establish data governance for any enterprise. Taking these perceptions together there are several options available for enterprises to consider when planning a data governance programme (Dyché 2007). These options include creating your own unique framework, adopting an industry standard framework such as the ISO 9000 series, or using an adaptable and scalable framework such as the Data Governance Institute Framework (2011).

As this paper is focusing on the needs of SMEs with their limited resources and based on the fact that SMEs taken as a group form a highly diverse sector of industry, the most obvious option to explore is those frameworks that propose to be adaptable and scalable. In this section, we review some of the most prominent contenders of published data governance frameworks and also examples of frameworks published by the academic community. The purpose of this review is to present examples of the types of published support available for an SME seeking advice and expertise on data governance.

IBM and other enterprises formed the IBM Data Governance Council with the aim of establishing best practices for data governance. This collaboration resulted in the creation of a framework referred to as the Data Governance Maturity Model (IBM 2007), which proposes to assess and measure the data governance maturity of an enterprise. This model is available as a free on-line self-assessment tool (at www.infogovcommunity.com) and is organised as a series of questions and responses on a range of data-related areas. The tool also provides simple reporting of the responses gathered so far.

The Data Governance Institute (DGI) (at www.datagovernance.com) describes itself as being “a mission-based, vendor-neutral authority on essential practices for data strategy and governance.” A major aim of the DGI is to provide a single framework that is capable of dealing with data governance programmes that focus on one or more data-related areas. The framework proposes to work by establishing that, no matter what the focus area(s) are, any data governance programme shares the same ‘universal objectives’ from enabling better decision making to ensuring transparency of process. A partner company of the DGI provides an online workspace tool called Stakeholder Care (at www.datagovernance.com/software) to support an enterprise following the DGI framework. This tool is available through monthly subscription.

There are many vendors offering data governance solutions to enterprises able to pay for their services. For example, Kalido (at www.kalido.com) offers consultancy services and data management software referred to as the Kalido Information Engine. Kalido encourages clients to first undertake a
self-assessment of their data governance maturity using an online tool, which uses criteria that cover three potential aspects (organisation, process and technology) of data governance implementation. Based on the results of the assessment, an enterprise is then deemed to fall into one of four data governance maturity stages: Application-Centric, Enterprise Repository-Centric, Policy-Centric, and Fully Governed.

Weber et al. (2009) states that there is not one approach to data governance and hence proposes a flexible data governance model made up of roles (executive sponsor, chief steward, business data steward, and technical data steward), decision areas (or tasks) and assignment of responsibilities. The components of the model are drawn together into a responsibility assignment matrix. Their proposed data governance model documents data quality roles and their type of interaction with data quality management (DQM) activities. The paper also proposes that contingency factors taken from IT governance (such as organisation structure and decision-making style) influence the design of the data governance model in achieving successful data quality management. This influence is thought to facilitate the creation of company-specific data governance solutions. The paper presents initial results of a data governance action research project involving six large enterprises from various industries.

Khatri & Brown (2010) propose a data governance framework that is an adaptation of a previous published IT governance framework by Weill & Ross (2004). This approach promotes the idea that the control and management of data assets (data governance) should be closely aligned to the control and management of IT assets (IT governance). The data governance framework uses five interrelated data decision domains: data principles, data quality, metadata, data access and data lifecycle. The purpose of each domain in exploring data-related matters is established along with identifying ‘the locus of accountability for decision-making’ in each domain; in other words the key decision makers in each domain. The investigation associated with each domain is presented as a series of possible questions. In addition, a matrix is available, to establish the locus of accountability, ranging from two extremes of centralised to decentralised against each decision domain. The paper concludes that all data-related decisions that establish the data governance for an organisation must be achieved in close association with IT-related decisions and IT governance. The proposed data governance framework was tested on a case study for a large insurance company.

3.3 Critique of data governance frameworks

The examples of data governance frameworks are presented in this paper to illustrate the range and types of support available for SMEs seeking to establish data governance. As the SME sector is considered to be a highly diverse sector, those frameworks that are adaptable and scalable are mostly likely to be useful. This section highlights some of the features of available frameworks.

Before data governance can be introduced to an enterprise, all published frameworks recommend that a data governance maturity assessment is undertaken to establish the current state of data management and control. Some frameworks have supporting (online) tools that can facilitate this process by directing an enterprise to assess all key aspects of data management.

Implementation of data governance involves defining the owners or custodians of the data assets in the enterprise. All data governance frameworks emphasize the importance of assigning responsibilities for data areas to individuals or groups that are also given appropriate authority to make decisions and take appropriate actions.

Optimal use of available frameworks and assessment tools appears to require that those with authority and responsibility over enterprise data have knowledge and some understanding of the terminology that describes data, data-related issues, and data-based technology. All proponents of data governance frameworks agree that responsibility for this data governance must be shared between business and IT departments and this suggests that alignment of data governance with IT governance is likely to be a productive approach for the management of both data and IT enterprise assets.

The frameworks examined display a wide range of complexity. For example, the Data Governance Institute (DGI) (at www.datagovernance.com) is formed from several interrelated items (including programmes, phases, decision domains, universal objects, and components) requiring significant
effort to learn and use. Whereas, the Khatri & Brown (2010) framework is relatively simple and includes few items (including tables and matrices) requiring less effort to learn and use.

Many published frameworks propose to be scalable with some providing case studies. However, the particulars of each case study, including the size of the organisation, are not provided in detail and the authors could find no examples of data governance applied to SMEs.

In the following section, we justify using the Khatri and Brown framework and present the initial findings from our action research involving ten SMEs.

4. Research

4.1 Overview

While most data governance frameworks claim to be adaptable and scalable, there are few, if any, notable cases of frameworks being applied to SMEs. Given the important contribution that SMEs make to economies world-wide, and their ever increasing reliance on data as an enabler of more effective performance, there is a need to explore SME awareness and understanding of data governance.

Caira et al. (2009) highlight the data-related issues that are typically faced by SMEs in their operational environment and comment that, in ICT audits undertaken in over 100 SMEs, every enterprise had data management issues. Given that data-related issues appear to be endemic in SMEs and that such issues should, in theory, be addressable by data governance, the authors chose to assess whether the Khatri & Brown (2010) data governance framework can be applied, in practice, to SMEs.

4.2 Selecting the data governance framework

In this section, we discuss why the Khatri & Brown framework was selected to support our action research on how data and data governance is perceived by SMEs. Our selection process used the ‘typical’ characteristics of SMEs and their approach to data management, which was well-known by the authors through decades of practical experience working with SMEs and was evidenced in ICT audits of over 100 SMEs (Caira et al. 2009). These ‘typical’ characteristics dictated that candidate data governance frameworks must be simple and use non-technical language. A simple, non-technical data governance framework is required to reflect the simpler organisational structure of ‘typical’ SMEs with no IT department and with very few, if any, dedicated IT staff.

Furthermore, SMEs tend to have very few employees with comprehensive knowledge of core data and business processes and these employees ‘typically’ play a critical role in the day-to-day running of the enterprise and as such are in constant, high demand. Unfortunately, our review of published data governance frameworks revealed that only one framework, namely the Khatri & Brown framework, appeared to be both simple and non-technical. In addition, this framework claimed to be both adaptable and scalable; however there was no published evidence to support these claims as the framework was only tested on a single large organisation.

In the following section, we describe our experiences of using the Khatri & Brown framework in practise to assess how ten SMEs perceive their data and data governance.

4.3 Methodology

The methodology used takes the form of action research with both authors acting as change agents in collaborative projects with ten SMEs whose organisations form the basis of the research. The findings of this action research were supported by further research of technology audit reports on SMEs located in the West of Scotland.

The enterprises involved in the research were all small or micro enterprises with less than 30 employees. They ranged across manufacturing, distribution, retail and service-based industries, as well as both the private and voluntary sector. The enterprises had varying reach from entirely local to Europe-wide. None of the enterprises were from the IT sector. In every case, enterprise business processes were supported by both paper-based and computer-based systems. Office automation and
accounting services were provided by standard application packages. Some of the enterprises used additional specialist software packages but none of the enterprises involved in the research were sharing data between any of the software packages that they utilised. Communication with external partners was through telephone, fax and e-mail with data transferred by paper or e-mail attachments. All enterprises had a web presence but only three of the ten utilised e-business functionality. Most of the enterprises had a mainly internal company focus in relation to their access to and use of data, but the three who had implemented e-business functionality all recognised the need to also maintain a significant focus on external data access and use.

There was no evidence that any of the enterprises overtly utilise any form of data governance. The aim of this research is to explore the awareness of and attitude to data governance within each enterprise and, given the differing data focus between the enterprises, to explore the potential benefits that could be provided by the implementation of data governance and to highlight any barriers that might restrict these enterprises from capitalising on such. We use the data governance framework proposed by Khatri & Brown (2010) due to its uncomplicated format, as this is likely to engender a better level of understanding of data governance concepts within the enterprises and hence provide for better elicitation of valuable research data.

4.4 Research
A board-level representative of each enterprise was asked to comment on what they considered to be their key organisational assets and the response was compared against the “key organisational assets to be governed” as defined by Khatri & Brown (2010), namely: Human assets; Financial assets; Physical assets; IP assets; Information and IT assets; Relationship assets. A summary of the responses is presented in Table 1.

Table 1: Summary of responses to key organisational assets

<table>
<thead>
<tr>
<th>Asset</th>
<th>Enterprise Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>All ten enterprises identified this as a key organisational asset</td>
</tr>
<tr>
<td>Financial</td>
<td>All ten enterprises identified this as a key organisational asset</td>
</tr>
<tr>
<td>Physical</td>
<td>All ten enterprises identified this as a key organisational asset</td>
</tr>
<tr>
<td>IP</td>
<td>Eight of the ten enterprises identified this as a key organisational asset</td>
</tr>
<tr>
<td>Information and IT</td>
<td>All ten enterprises identified this as a key organisational asset. However, all organisations identified IT assets as being the physical IT hardware employed within the organisation and four of the ten did not differentiate this from other physical assets. Only three enterprises referred to information as an organisational asset and in each case considered this information to be part of their IP assets.</td>
</tr>
<tr>
<td>Relationship</td>
<td>Five of the organisations identified this as a key organisational asset, with the other five including it in their description of either their human or financial assets.</td>
</tr>
</tbody>
</table>

None of the enterprises identified any key organisational assets that had not been defined by Khatri & Brown. Significantly, however, only one of the enterprises commented on ‘data’ being a key organisational asset and even then was somewhat reticent to classify it as such.

Each enterprise was also asked to provide an explanation of their understanding of the term ‘data governance’ and of the decision domain terminology used in the Khatri & Brown framework as a means of establishing awareness and understanding of the concepts. The authors then provided an explanation of the terminology and used the questions contained in the framework to effect a discussion that revealed organisational attitudes to data governance and engendered consideration of potential benefits and barriers.

When asked to provide an explanation of ‘data governance’, all enterprises referred to governance by external entities such as government and regulatory bodies (e.g. UK Data Protection Act) and then, almost as an afterthought, to the internal governance of business data, the management of client data and the provision of effective data backup and security.

The enterprises were then asked to provide an explanation of their understanding of the five ‘decision domains’ that are contained in the Khatri & Brown framework and these responses are summarised in Table 2.
Table 2: Summary of responses to organisational awareness and understanding of decision domain terminology

<table>
<thead>
<tr>
<th>Decision Domain</th>
<th>Awareness and Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Principles</td>
<td>All of the enterprises struggled to explain this term with most believing it to relate to external regulatory or compliance frameworks and only three of the enterprises providing responses that provided any focus on internal use and management of corporate data.</td>
</tr>
<tr>
<td>Data Quality</td>
<td>All of the enterprises identified this term as relating to the accuracy and integrity of their electronic data.</td>
</tr>
<tr>
<td>Metadata</td>
<td>None of the enterprises could offer any form of explanation for this term.</td>
</tr>
<tr>
<td>Data Access</td>
<td>Enterprises offered differing explanations for this term with some enterprises relating it to security and others explaining it in relation to the variety of ways in which a dataset can be accessed.</td>
</tr>
<tr>
<td>Data Lifecycle</td>
<td>Only one of the enterprises provided an explanation of this term that matched the definition provided in the framework.</td>
</tr>
</tbody>
</table>

An explanation of data governance and of the decision domain terminology was then provided to the research subjects, who were then asked to further comment on how they felt that such should or did impact on the management and governance of their business data. A summary of responses is presented in Table 3.

Table 3: Summary of attitude and perception of benefits and barriers associated with data governance

<table>
<thead>
<tr>
<th>Decision Domain</th>
<th>Attitude and Perception of Benefits and Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Principles</td>
<td>In all but one of the enterprises, data was not perceived in any way as an asset. The general perception in the other nine enterprises was that data is not currently viewed as an asset by other organisations within their locus of operation and hence has no perceived value to the enterprise, as opposed to intangibles like goodwill. All of the enterprises recognised the value of data as an essential element of operational management but most considered this data to be little more than a transient component of corporate business processes that enabled the enterprise to function effectively. Whilst many of the enterprises had enshrined their business processes in corporate policy and procedure, they did not consider such to be required for their data.</td>
</tr>
<tr>
<td>Data Quality</td>
<td>All of the enterprises commented that their data was not 100% correct and that inconsistencies, duplications and missing data were identified and corrected in a reactive manner. All enterprises felt that this was sufficient to provide effective company services with data quality perceived as a reactive process driven by practical needs. In all of the enterprises, a great deal of trust was placed in employees to maintain data accuracy. All of the enterprises commented that the software application packages that they utilised both aided and hindered data quality: aiding by imposing quality constraints at data entry time but also hindering by forcing adherence to the built-in data structures defined by the packages. Many of the enterprises commented that they do, on occasion, have to handle data that does not fit within their normal business processes or within the data structures defined by the software application packages used and that management of this data can often, therefore, be problematic. All of the enterprises commented that the need to conform to the built-in data structures defined within the software application packages that they utilised was overly restrictive at times and that they often perceived themselves working in a form of data “straitjacket”. In general, data quality issues were considered to be easier for SMEs, and particularly microenterprises, to address because of the small size of the workforce which facilitated regular personal contact between all staff.</td>
</tr>
<tr>
<td>Metadata</td>
<td>All of the enterprises struggled to understand this term even when further explanation was provided. None of the enterprises have documented their corporate data. In general, the meaning of data tends to be passed on to new employees through training and personal contact, thus establishing a ‘community’ view of metadata. All of the internally focused enterprises consider this to be adequate given the small size of their workforce. The enterprises that have implemented e-business functionality commented that they recognise the need to formalise their metadata and communicate such to all parties and especially to those involved in accessing and manipulating data through their e-business facilities. They were, however, unsure of how to best accomplish this.</td>
</tr>
</tbody>
</table>
| Data Access       | All of the enterprises recognised that their data-handling systems are too open to internal abuse. Enterprises are aware that this makes their organisation vulnerable to malicious attack by disgruntled employees and all of the enterprises acknowledge that they place a great deal of trust in their employees in this respect. Whilst all of the enterprises have backup procedures in place that can reactively resolve any potential data loss, the enterprises, in general, felt that this was not an ideal protection mechanism and that they would far rather establish appropriate data security in a proactive manner. Most of the enterprises echoed the comments that they gave in relation to data quality in that reliance is placed on application packages providing inbuilt data security functionality and that if such is not available or not fully understood then the enterprise does not have the necessary knowledge and skills in-house to be able to establish appropriate data security. The enterprises that have implemented e-business functionality commented that they very much relied on external organisations to provide for appropriate data access and data security and that...
4.5 Research findings

Our primary research finds that, whilst the enterprises involved in our research have a variety of data needs and differing data focus, they all seem to have similar views on developing a data governance strategy and are experiencing similar issues in relation to their ability to successfully address the management and control of data as an organisational asset.

Awareness seems to be a key factor in the SME view of, and approach to, data governance. Even the most uncomplicated published approach to data governance uses language that is not easily understood by SMEs. In addition, awareness, or lack thereof, of the technology that is used to manage and maintain electronic data has a major influence on an SME’s ability to develop a data governance strategy. All of the enterprises lacked full awareness and understanding of how to address data lifecycle issues (in particular data retirement) and were reticent to take action on this for fear of disrupting live data or the processes that operate thereon.

Another key factor for SMEs is their perception of the value of data both within and outwith their enterprise. Only one of the enterprises had some recognition of data as an organisational asset. Data is viewed internally as a somewhat transient ‘means to an end’ in that it provides the ‘fuel’ to drive business processes but is not viewed in itself as having any intrinsic value. All of the enterprises recognise the value of intangibles such as goodwill and customer loyalty but do not regard data governance as providing intangible value in this respect. All of the enterprises commented that if data governance received such recognition within the business community then they would see value in implementing a data governance strategy but, as this recognition is not currently perceived to exist, the practical needs which tend to drive SMEs force them to operate in a ‘reactive’ manner. As such, they would struggle to implement and maintain the required ‘regimented practices’ and would likely therefore not extend to embracing the concept of data governance at this time.

SMEs do not tend to explicitly acknowledge or define data principles. Standards, policies and guidelines for management and use of data tend to evolve over time and become established as a norm which is communicated to, and developed between, existing and new employees within the organisation on an ongoing basis. This is particularly true in microenterprises where data quality issues are perceived as being easier to address because of the small locus of control. All of the enterprises identified the locus of accountability for decision making to be decentralised for data quality and centralised for all other decisions domains. Non-conformance of data in non-regulatory situations is not generally viewed by SMEs as an issue.

Trust in employees is perceived as a major contributory factor in ensuring data quality and conformance to any implicit data principles within SMEs. Again the small locus of control and accountability has a positive influence on a SME’s ability to maintain its data at an acceptable operational level.
The use of standard application software packages within SMEs has both a positive and negative influence on data governance. On the positive side, these packages demand data quality to maintain operational effectiveness, assist with data access and data lifecycle provision, and offer a tacit framework for data principles. However, on the negative side, SME data needs are constrained by the application software packages they utilise and by their limited technical expertise in gaining access to the full range of facilities that such packages provide. SMEs have to adapt their business operations and any implicit data principles to suit the restrictions imposed by the implementation of application packages as this software imposes its own data principles which may not necessarily completely match those currently in place.

It is also interesting to note, in this respect, that all of the enterprises commented that they have no issues with data governance of paper-based data as they have long-established, tailor-made data principles and business processes for effectively managing such.

5. Discussion

In this section, we present a discussion on the quandaries that SMEs now face working in an increasingly digital business environment. Following this discussion, we highlight what we consider to be our main contribution to the data governance body of knowledge and conclude this paper with some ideas for future work.

The first and perhaps most obvious quandary is while SMEs may recognise the benefits that data governance could deliver, in that poor data is clearly bad for business, the effort required to achieve data governance often seems far higher than the perceived benefits. Much of the dilemma is due to the relationship that SMEs have with their IT systems. SMEs find the idea of data governance difficult to accept without first gaining control over their IT systems (IT governance). Furthermore, SMEs can find that they are treated as ‘sinks’ for data as it flows into their organisation from external sources such as suppliers and customers. For SMEs with many external partners this can mean that the SME must adapt internal systems to deal with data of various forms, controlled by the data governance of others and not by the SME. SMEs are often followers in terms of data format and use and this often leads to inefficient and ineffective data management as they try to govern this resource.

The second quandary is that SMEs may not seek data governance because they do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business. Many SMEs view their data as being ‘owned’ or worse still being ‘trapped’ by application packages that have been purchased to meet a particular business requirement. The use of standard application packages can often help SMEs achieve some control over their data such as improved data quality, data access and data management. However, on the negative side, SMEs can also be constrained by the same packages as the business changes to meet new requirements and cannot easily align their IT systems to support new or changing business practices due to a lack of in-house technical expertise. This is evidence of IT systems dictating data governance.

The third quandary for SMEs that do recognise the value of data governance is that there are no published data governance frameworks that are appropriate for use by SMEs. While most data governance frameworks claim to be adaptable and scalable, this was not supported with evidence. The authors could find no published examples of academic or industry-based research showing data governance adoption in SMEs. In addition, the language and terminology used by published data governance frameworks is not appropriate for SMEs, especially those with minimal technical expertise. Khatri & Brown (2010) claim to have provided a data governance framework that can be used by practitioners to develop a data governance strategy and approach for managing data as an organizational asset. Although such practitioner expertise can be brought in and paid for, resource-poor SMEs are commonly unable to fund such an approach.

The fourth quandary for SMEs is how they are viewed by the data governance community in that SMEs may be perceived as requiring ‘simpler’ data governance. However, this may not be true. The commonly used criteria (staff count, turnover, balance sheet) to identify an enterprise as being an SME is not necessarily indicative of their data environment. In fact, it is entirely possible that an SME could have a far more complex data environment than a large enterprise, in terms of the volume and nature of their data. Furthermore, it is thought likely that SMEs will use far greater amounts of electronic data due to technological advances such as cloud computing, enabling the provision of utility-type data capture, storage and processing services. Although cloud computing is promoted as
being a mechanism to deliver affordable computing to resource-poor SMEs, these SMEs may find themselves dictated to by the data governance practises used by third-party cloud computing providers.

The authors believe that the lack of attention given to SMEs by the data governance community is unwise given the significant contribution that this sector makes to economies worldwide. In addition, SMEs need to recognise the value of their data and the importance of data governance for their own survival in an increasingly digital business environment. It is likely that SMEs will continue to increase their use of IT, and e-business systems in particular, and this will bring growing amounts of data that requires their governance. It is also thought possible that data governance for SMEs will move from being a highly desirable achievement to a regulatory requirement, (Trope & Power 2005), (Khatri & Brown 2010). For SMEs, it would no longer be acceptable to ignore data-related issues or to have company data inaccessible to the auditors. Such regulation is likely to affect the banking and financial services industries first, and will emerge as a growing trend worldwide. However, once established, this regulatory requirement is likely to ultimately encompass all enterprises of any size, in all sectors.

6. Contribution to body of knowledge

The main research contribution of this paper is in identifying that SMEs are poorly served by the data governance community. Our research shows that while most data governance frameworks claim to be adaptable and scalable, the most straightforward and simplest of data governance frameworks (Khatri & Brown 2010) was not suitable for use with SMEs. However, the time spent working in collaboration with the ten SMEs did provide the authors with greater insights into how SMEs perceive their data and its governance. The authors believe that these insights are critical pre-requisites for those interested in developing data governance frameworks, methodologies and/or tools suitable for SMEs seeking to reap the benefits that can accompany data governance.

7. Implications for future work

The research described in this paper raises several questions and avenues for further work with regard to SMEs and data governance; some of which are discussed below.

In this paper, we revealed that even the simplest published data governance framework is not suitable for use with SMEs. However, given the diversity of the SME sector, we ask the question - Can a single data governance framework meet the needs of all categories of SME? For example, is it reasonable to expect that a framework suitable for an enterprise with 250 employees will also be suitable for use with an enterprise with only a few employees? Furthermore, the true diversity of enterprises that make up the SME sector may be partly obscured by the abbreviation ‘SME’, which is commonly described in full as ‘small-to-medium-sized enterprise’ but does, in fact, also refer to a ‘hidden’ third category, namely the microenterprise. The European Commission (EC) provides criteria to identify this category as an enterprise with less than 10 staff and an annual turnover or balance sheet total that does not exceed 2 million euros (EC Recommendation 2003/361/EC). Microenterprises account for 90% of all enterprises (EC, 2010b) and it is therefore perhaps no surprise that nine out of the ten enterprises researched in this paper are in fact microenterprises. We therefore have the basis to continue this research to answer questions such as – What are the particular requirements of microenterprises in terms of facilitating their appreciation of their data and of data governance? In addition, are there any significant differences, in this respect, between microenterprises and the other categories of SME?

In this paper, we considered whether the commonly used criteria that determine the category of enterprise such as number of staff, annual turnover or balance sheet total are ‘good’ indicators of the complexity of an enterprise’s data environment. We suggest that while these criteria are appropriate for the categorisation of enterprises according to their size and wealth, they do not necessarily serve as a good indicator of the data management requirements for an enterprise. While it is likely to be true that larger, more resource-rich enterprises will normally require more complex data management, it is increasingly possible that smaller enterprises will face similar data environments. Additional factors are likely to impact on the nature and quantity of data that an enterprise must manage such as whether the enterprise conducts much or all of its business online, the frequency of transactions and other interactions with customers and suppliers, and the use of third party companies offering data services. These factors can impact both small and large enterprises. This raises the question – Is it useful to categorise enterprises according to size and wealth when considering the development of
data governance frameworks? In addition, what factors determine the complexity of the data environment for an enterprise?

In this paper, we proposed that data governance will become an increasingly critical issue for SMEs as more enterprises conduct more of their business online. In addition, third party cloud computing will offer an affordable solution to SMEs seeking to increase their data storage and processing requirements. This raises the question – Will SMEs view cloud computing services as a means of acquiring data governance? Poor data management practices will prevail on the cloud unless SMEs regard the ‘move’ to the cloud as an opportunity to improve data governance in areas such as data security, data integrity and data accessibility. Currently, the impact of cloud computing on enterprises seeking to achieve data governance is not fully understood. In fact, data security and data privacy continues to be the major concerns for enterprises seeking to use the services of third party cloud computing providers. These concerns are so significant and persistent that many larger enterprises are delaying their ‘move’ to the cloud, storing only less important, less sensitive data. (Chow et al 2009), (Popovic & Hocenski, 2010). However, resource-poor SMEs may find the cost-effectiveness so attractive that they ‘move’ to the cloud before these concerns are fully addressed. This raises the question - How aware are SMEs of the concerns surrounding data management in the cloud? In addition, can we develop an approach to raising awareness and minimizing the risks for SMEs proposing to use third-party cloud providers?

The authors believe that it is important that the data governance community focuses more attention on the plight of SMEs. Failure to support this critical business sector will mean less wealth creation for economies dependent on SMEs. Instead of generating wealth, SMEs may waste significant resources trying to achieve data governance by applying frameworks that are not best suited to their business environment and culture.

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Framework for Mobile Payments Integration

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Abstract: This paper derives a theoretical framework for consideration of both the technologically driven dimensions of mobile payment solutions, and the associated value proposition for customers. Banks promote traditional payment instruments whose value proposition is the management of risk for both consumers and merchants. These instruments are centralised, costly and lack decision support functionality. The ubiquity of the mobile phone has provided a decentralised platform for managing payment processes in a new way, but the value proposition for customers has yet to be elaborated clearly. This inertia has stalled the design of sustainable revenue models for a mobile payments ecosystem. Merchants and consumers in the meantime are being seduced by the convenience of on-line and mobile payment solutions. Adopting the purchase and payment process as the unit of analysis, the current mobile payment landscape is reviewed with respect to the creation and consumption of customer value. From this analysis, a framework is derived juxtaposing customer value, related to what is being paid for, with payment integration, related to how payments are being made. The framework provides a theoretical and practical basis for considering the contribution of mobile technologies to the payment industry. The framework is then used to describe the components of a mobile payments pilot project being run on a trial population of 250 students on a campus in Ireland. In this manner, weaknesses in the value proposition for consumers and merchants were highlighted. Limitations of the framework as a research tool are also discussed.

Keywords: payments, framework, mobile, value

1. Introduction

Payments are central to the growth of modern civilisations. Payment systems have evolved substantially over time, from earliest bartering systems, to systems based on coins of precious metal, to the virtual payment systems of today (Ferguson, 2008). The mobile phone is capable of providing a bridge between the traditional and the new payment systems, supporting on demand purchase and payment processes in a manner heretofore not conceivable. The transition to mobile phone driven payment processes is not smooth, however, not because of a lack of technology innovation, but because the underlying players in the industry are reluctant to change their existing business models. Banks and their customers are not in agreement as to what constitutes good value in terms of payment alternatives, a phenomenon also found among stakeholders to technology adoption (Au and Kauffman, 2008). Research has suggested that the high failure rate of mobile payment solutions is linked to their inability to provide the right value proposition to customers (Ondrus et al., 2005). Banks promote payment instruments that earn them most revenue. These tend to be centralised and inconvenient. Customers have little choice in selecting payment instruments, but are being seduced by the control and convenience of on-line and mobile payment solutions, which provide flexibility and connivance. Until a solid value proposition emerges that combines value for both banks and customers, the innovation in terms of payment solutions will remain sporadic and piecemeal. This paper explores the existing research domains from which such value propositions or business models could be drawn, and extrapolates a theoretical basis for further research in the area of payments.

The challenge of understanding the driving forces in the market for electronic payments is that there are an accelerating range of solutions that address shortcomings in legacy payment processes. For example, many innovative solutions support the connection of existing bank or credit card accounts to on-line virtual wallet transactions (Olsen et al. 2011), substituting the phone for the desktop computer but without changing the underlying value proposition. Other solutions leveraging the processing capability of Smart phones seek to associate the payment transaction with other customer related processes such as loyalty points programmes, but are by definition focused on a particular segment...
of Smart phone using consumers. While such developments espouse key technology adoption factors such as consumer convenience and ease of use, they also tend to obscure visibility of the comparative value of choosing a particular payment instrument over an alternative.

The language used for describing payments has relied on traditional banking terminology such as payment instruments, or on technological concepts such as connectivity. There are many other possible dimensions for describing payments such as transaction type, payment domains or geographic scope. Indeed one of the difficulties for the development of an ecosystem for mobile payments has been the lack of a common vocabulary between the financial services community and the technology service community. The method used in this study is to categorise the concepts used to describe mobile payments, and map these “technological” categories against factors describing the business setting of procurement and settlement, thereby allowing us to effectively accumulate knowledge, and to interpret previous findings (Dahlberg et al., 2008). This framework is based on the assumption that mobility (Gumpp and Pousttchi, 2005) is simply an extension of the same virtualisation technologies that have been used by organisations since the earliest days of information technology. Rather than considering laptops, PDA’s, smart phones and tablets as disruptive technologies (Christensen, 1997), we take the view that their pervasiveness as access devices to processes and information does not fundamentally alter the relationship between people, processes and technology. Virtualisation provides users with visibility and control of resources, and mobile technology should provide this visibility and control on the move.

Researchers have adopted different units of analysis in studying the evolution of mobile payments, including exploring the payments market (Dahlberg et al., 2008; Ondrus et al., 2005) in the macro-economic sense, payments technologies (Ondrus and Pigneur, 2007), payments technology adoption factors (Pousttchi, 2003; Plouffe et al, 2001) or design of mobile wallet (Olsen et al., 2011). In this study, we are interested in understanding mobile payments as an element of a purchase and settlement process. In a sense we take a contractual law perspective, meaning that a payment is one part of the fulfilment of a legal contract between a supplier and a customer. From this perspective we are not only interested in the footprint of mobile phones in the payments landscape, but also the topography of that landscape in terms of the actors involved, the nature of the payment and the value to the customer of different levels of payment automation. It is suggested that adding this value dimension (Osterwalder, 2005; Ondrus et al., 2005) helps to conceptualise mobile commerce in the context of micro-economic transactions in public, commercial and social interactions.

The structure of this paper is as follows. Firstly, we provide an overview of the payments industry and why the potential of mobile technology has not (yet) translated into innovative payment instruments. The specific issues surrounding the adoption of mobile payments are then discussed. Based on research in this domain we then describe the dimensions that may be used to delineate the different payment service offerings and scenarios, and from this an integration framework is presented that may be used to investigate the relationship between payment service offerings and the associated value proposition from a customer perspective. The final section discusses the theoretical implications of this paper and it’s relevance to existing research.

2. Inertia in the payments industry

Traditionally, the transfer of value from payer to receiver, along with the associated risk, is managed by a small number of highly centralised intermediaries (banks). Funds are transferred from the payer’s bank account to the receiver’s bank account via a number of physical or electronic payment systems that check each payment against terrorist lists, money laundering lists, credit limit lists, etc. The key value of these centralised systems is managing the risk of account holder liquidity and fraud, and complying with international law, as stipulated by individual countries and supra national organisations. The cost of managing this risk is recouped by levying “interchange fees” on users of these payment instruments, merchants and consumers. A successful business model has thus built up around the use of payment cards, which involves charging merchants and ultimately customers for the facility and convenience of using particular payment instruments. The perceived value for the customer is access to a universally accepted payment instrument, and instant access to significant lines of credit.

The revenues generated from the provision of payment services have been estimated at $900bn, representing 25-30% of total bank revenues. Reluctance to move away from a winning formula no doubt constitutes the principle barrier to faster integration of mobile technology into the payments
ecosystem, but also an opportunity for innovation. Three additional factors contribute to the inertia in the evolution of traditional payments services, related to technical skills, customer expectations and management culture. Firstly, many retail banks run back office payment processing systems that are so old that Universities are now being solicited to create programming modules focused on legacy development environments such as Cobol, PL1 and RPG, such is the reliance on these systems and the associated scarcity of skilled resources. The costs of re-writing back-end payment processing modules is therefore prohibitive. Currently internet banking could be characterised as providing a web-based front end to account information that is embedded in legacy applications, without addressing any other requirements that customers might have with respect to liquidity control, budgeting or access to alternative products. Legacy banking systems were simply not designed to empower customers in this way.

Secondly, the virtualisation of banking and the sense of empowerment among smart phone application users have whetted the account holder’s appetite for a different relationship with his or her bank. Providing on-line visibility of customer accounts is the first step in controlling expenditure, supporting customer requirements for flexible payment instruments is the second. Ultimately the integration of bank accounts with planning tools will empower customers to manage their finances in a more pro-active way. Exhibitors at the Finovate Europe 2011 event in London showed a marked tendency towards personal finance management products (PFM), with payment instruments being seen as lifestyle commodities influenced by customer perceptions of value as communicated in social networks.

Thirdly, it is likely that management in both the commercial and retail banking sectors do not have experience of the newer forms of collaborative business models familiar to service providers in the new payments ecosystem. Particularly with respect to mobility and payments, it is clear that financial institutions, in order to achieve critical mass, will have to collaborate with new intermediaries such as hardware vendors, payment solution providers and trusted service managers. The next section discusses the adoption of mobile payments and the likely shape of such a new ecosystem.

3. Adoption of mobile payments

A mobile payment is any payment where a mobile device is used to initiate, authorize and confirm a transfer of value in return for goods and services (Pousttchi, 2003; Au and Kauffman, 2008). Mobile payments emerged in the 2000’s, with early successes in the sale of mobile content and services such as ring tones and logos. Later, mobile payments were suggested as an alternative for micro-payments at point-of-sales systems, where the use of cash had been declining for many years. Many mobile and electronic payment solutions have been introduced ever since, but most of them have failed or have had a low penetration rate (Mallat, 2007; Dahlberg et al. 2008). The “chicken and egg” situation for emerging payment models means that enough merchants need to be on-board with any new solution for it to catch on with consumers, but in order to be appealing to merchants there must be a critical mass of consumers interested. Lee et al. (2004) refer to mobile payment liquidity as the extent to which it is accepted by sellers and therefore adopted by customers. Au and Kauffman (2008) refer to the theory of network externalities to explain value creation in the networked economy, suggesting that the value of such services to banks and their customers will increase as the network grows. One such failure is the Dancoin (our translation) in Denmark, which did not reach critical mass of users, either payers or merchants. Standardisation and technology maturity have equally been highlighted as key requirements for expansion of mobile payments (Mallat et al., 2004; Lee et al., 2004).

So, while the most popular payment instruments are still cash, debit and credit cards (Dahlberg et al, 2008) with smart cards being the most serious challenger to traditional cash (Dahlberg and Mallat, 2002), the ways to make contactless payments and especially mobile payments are increasing. When looking into the future, companies and experts agree that the mobile phone is the technical device that they will try to turn into the new wallet, mainly because of the diffusion of mobile phones, which no other technical device can match, but also due to the fact that most of us carry our mobile phones with us most of the time (Olsen et al., 2011). If the mobile phone as e-wallet succeeds it will very likely be at the expense of traditional payment instruments. But it is also a possibility that the mobile wallet will simply become a new way of entering the current card and account-based payment services (Dahlberg et al., 2008).
Contini et al. (2011) describe the mobile ecosystem as a complex set of interconnected entities and relationships which interact to form a stable functioning payments system, with participants including financial institutions, money service providers, handset makers, technology service providers, mobile network operators, mobile virtual network operators, merchants and consumers. Internationally, national governments have individually pledged support to developing electronic payment capabilities as part of the broader adoption of e-Government capabilities, while in Europe, much of this development has been driven by the establishment of SEPA (Single Euro Payments Area). At the same time the European competition agency tends to inhibit banks collaborating on new payment solutions, since this might be perceived as creating barriers to trade.

Understanding the importance of these emerging solutions is the key motivation for developing an integration framework for mobile payments. Webster and Watson (2002) describe how theory in the IS field evolves from ad-hoc classification systems through taxonomies to conceptual frameworks. There is a need for a “robust analysis framework” (Kauffman and Walden, 2001; Au and Kauffman, 2008) to abstract meaning from the myriad technology offerings, and indeed to differentiate between business value and technology capability. Practitioners and academics require an abstracted view of the business requirements and their solutions in order to design lasting solutions. The next section outlines the dimensions that can be used to build this abstracted view.

4. Classifying the dimensions of mobile payments

Mobile payment solutions may be described by a number of attributes that relate either to the process or the technology of making a payment. The process dimension refers to what type of payment is being made, and crucially should include the notion of customer value. The technology dimensions describe how a payment process works, and typically involves the integration of a number of physical and virtual payment instruments.

4.1 The value dimension

The value dimension, described as a market perspective by Ondrus et al. (2005), or as a value taker perspective by Kauffman and Walden (2001), relates to both customer benefits and needs respectively. Ondrus et al. (2005) suggest that it is the failure to address the demand issues that undermine many payment service offerings. It is therefore suggested that the customer demand (value) dimension be used to characterise mobile payments. This dimension will calibrate customer value across a “consumer to merchant axis” (Ondrus et al., 2005; Dahlberg et al., 2007). Clearly the time and location independence afforded by the mobile phone user is an advantage (Mallat, 2007; Kim et al., 2010). Indeed the “anytime, anywhere” accessibility of mobile phones increases merchant access to location specific consumers, thereby potentially instigating demand and increasing sales opportunities, but not necessarily creating customer value. Customer value, for example, might be providing the payer with visibility of, and direct access to, alternative payment execution options, as well as related decision support information such as account balances, loyalty points, discounts and special terms. The customer value here is created through the information value as distinct from the mobility value (Gumpp and Pousttchi, 2005).

For the purposes of this paper, the value proposition is considered to include the context or scenario (Kreyer et al., 2003) of the purchase and payment transaction. This covers the nature of the goods or service being purchased, where the payment is being made, and who is involved. The nature of the purchase covers, for example, the purchase of physical and digital goods, the payment of utility bills or the purchase of on-line services. The procurement of physical goods by individuals or organisations may be considered to be part of the supply chain. Supermarket shopping for groceries and household goods (B2C) or raw material purchases by manufacturers (B2B) has the characteristics of being repetitive, subject to scrutiny on price, and sensitive in terms of lead time. The point of sale may be physical, virtual or both.

All businesses have payment processes for overhead expenditure related to personnel (payroll, tax and expenses), rent, maintenance, catering or hygiene services. Utility payments could be considered to include energy supply, refuse services, tax, banking services, digital network services and digital content. Transportation related services include local transit tickets, parking, automobile taxation, and fuel, holiday, and airline payments. Consumer goods might include white goods, electronic equipment, computer equipment, clothing and furniture. Leisure and entertainment payments include cinema tickets, concert and event ticketing, use of sports facilities, vending machines and access to
public amenities. Digital content includes phone credit, digital media (music, video, newspapers, and books), gift vouchers and virtual gaming products. Person to person (P2P) payments might include payments to tradespeople, babysitters, and home Helpers, local and cross border remittances, micro-payments and micro-finance. Charity or fundraising donations constitute a section of "person to non-profit" organisation payments (P2NP). Social and Government payments include welfare, pension and health payments (G2C).

On the other hand, the context of the payment also distinguishes the location of the payment and the actors involved. For example, payments may be made from a mobile phone at a point of sale, from a mobile phone remotely, in person at a bank branch, in person at an ATM or payment kiosk, in person at a post office or credit union branch. Payments may be sent by post, or made over the phone, via a digital TV service, or through a gaming or digital content interface such as iTunes. Bill payment services may be made on-line or via physical points of sale such as PayZone and PayPoint. On-line payments may be made via electronic wallets such as PayPal or Boku. Economic definitions of commercial actors include shareholders, debtors, creditors, managers, employees, community and government (Au and Kaufmann, 2008). The purpose of this dimension is to understand where value is being consumed, and by whom.

4.2 The integration dimension

The second dimension for mobile payment attributes relates to the products, instruments or technologies through which the payments are executed. These attributes describe how the payment is processed, and are independent of either the transaction types or the payment channels discussed above. This virtualisation axis calibrates the extent to which payment execution has been mobilised (Gummp and Pousttchi, 2005) using information technology. Technology or product related aspects of the mobile payments landscape are more "inward" looking (Dahlberg et al., 2008), defining customer value making (Kauffman and Walden, 2001), as distinct from value taking. This corresponds to the service provision (vertical axis) on the framework described by Dahlberg et al. (2007). The purpose of this dimension is to understand where value is being created, and by whom.

The payment products include traditional physical instruments such as cash, cheques, coupons, pre-paid gift cards, postal orders and bank drafts. Credit transfer instruments include credit cards, debit cards, Electronic Funds Transfer, Direct Debits and Standing Orders. Mobile phone related instruments include bill to carrier account, bill to credit card account and bill to current account (ACH). Pre-loaded virtual instruments include electronic money accounts, virtual gift cards, and virtual loyalty cards. Payment authorisation options include signatures, passwords (on-line, SMS), PIN number, Chip, card user verification services, voice authorisation or biometric methods. The degree to which the payment is integrated into an enterprise or domain driven process defines an interface dimension including Buy-now, Accounts Receivable, Accounts Payable, Payroll, Expense disbursement, Bank reconciliation or treasury management. Geographic scope for payments may include proximity, local, national, European or global. Payments across different currencies should include exchange rate calculations. The account types from which payments are drawn include unbanked customers, postal office accounts, credit union accounts, bank accounts (current, credit, deposit, savings), commercial or merchant accounts, e-Money accounts, Mobile Network Operator customer accounts, merchant loyalty account and digital media accounts. Account funding mechanisms include cash loading, SMS with top-up, Direct Debit, wire transfer, electronic funds transfer, credit transfer by SO/DD from third party bank account, remittances and on-line e-Money transfer. Device connectivity options include credit cards, such as Visa / Mastercard, debit cards, such as Maestro / Cirrus / Laser, Internet (TCP/IP, GPS, WiFi), Bluetooth and NFC. Clearing and settlement options include paper (e.g. IPCC), electronic (e.g. IREPCC), Credit Card and ATM. Timing of payment execution may be in advance, at moment of purchase, days or weeks after purchase.

4.3 An initial framework for mobile payments integration

Drawing on the discussion regarding the dimensions of payment integration (virtualisation) and value (merchant to consumer axis) in the previous section, a framework is proposed to conceptualise the position of mobile payments within the greater context of electronic payments. This framework is presented in Figure 1. In this framework, payment integration is conceptualised as an on-going process of reconciling demand with supply. The degree to which payment processes are integrated, or supported by electronic means, is recognised as an economic lever in the value proposition to customers. The information that is valuable for consumers (as individuals or enterprise buyers) in
making payments is defined along two dimensions, one related to the level of visibility of purchase and payment information, and one related to control of the transfer of value. The purchase control dimension maps the gradation between a commitment to purchase and settlement of the amount due. This axis is temporal, left to right, representing the stages between the commitment to purchase and the actual transfer of value (ultimately there is value in offering a consumer the ability to intervene at these stages). The payment integration dimension refers to the degree to which the attributes of payments (both supply and demand related) are known and communicated, and represents a gradation from traditional physical payments instruments to increasingly virtual payment instruments. It is only with the virtualisation of payment information that it is possible to compare the cost of a planned expenditure with the actual availability of funds (budget).

Figure 1: Integration framework for mobile payments

The quadrants represent stages in the value proposition to consumers in electronic payments. The purchase (bottom left) quadrant represents the buyer’s commitment to purchase. With traditional physical payments instruments, visibility of budget information is limited. Information that would be valuable to the buyer at this point relates to product supply (for example, price, discount or loyalty credits), but also related to the available consumer budget. How this information is provided is a question of integration. The budget visibility quadrant (top left) represents the degree to which visibility of available funds can be provided. This may also entail electronic decision support tools to inform the consumer’s decision to purchase.

The settlement quadrant (bottom, right) represents the actual transfer of value from the consumer to the merchant, which may be automated or happen in stages. Payment in cash is instant settlement whereas payment by card is deferred settlement. The payment visibility quadrant (top right) represents the degree to which settlement information is available. This visibility provides the merchant with his confirmed revenue and the customer with his real time budget position.

5. Application of the framework to mobile payments pilot project

The illustrative case study is a five month NFC (Near Field Communication) enabled m-payment project that goes live in February 2012. The scope of the project includes payment for goods at the
point of sale, loyalty points and physical access to buildings and rooms via an embedded staff card. The project began as a concept to evaluate if students and staff could “leave their wallets at home” by embedding typical wallet functions into the phone. Purchases at a point of sale are provided via a virtual wallet maintained on-line. The virtual wallet, which is based on a standard pre-paid debit card, can be topped up at specific points of sale (with cash) or on-line (with access to other on-line funds). Participants will also be able to make peer-to-peer payments between on-line wallets.

The researchers have been working with a Mobile Network Operator (MNO) on the scope of the project. The goal is to investigate customer adoption and customer retention issues in a controlled environment. Aimed at retail payments at any of the 20 points of sale on campus (cafés, restaurants, bars, convenience stores, newsagents), this research is aimed at the micro-payment area (sub-€15 expenditure). The research objective is to understand the acceptability of contactless payments and associated customer behaviour over a period of 20 weeks from February till the end of June in 2012. Participants in the pilot have been recruited such that there is a balance in their consumer profiles. A range of ages was sought by including both students (18-23 years old) and staff (30-60 years old). Certain staff participants were sought because of their role as stakeholders, for example, senior university management, buildings and estates staff, security staff and merchant staff involved in point of sale activities. A gender balance was sought across the sample, and for students there was a breakdown between those living at home and those living in rented accommodation. As possibly the most price sensitive segment of the consumer market, it was important to understand the constraints that students face in terms of disposable income. In addition, certain criteria related to experience to date with smartphones, with a balance sought between those who were already users of smartphones and those who were not. As the project involved the distribution of new NFC enabled handsets to participants, there was a breakdown between participants who wished to retain their existing mobile phone and contract. In these cases, participants are offered a new SIM card and mobile number for the project.

The researchers screened and selected over 225 participants who were characterised as “Generation Y”. Participants were also selected from naturally formed groups (i.e. second year undergraduate students) as such groups tend be more relaxed and at ease in conversations. At the pre-launch phase, which took place in November 2011, six focus group interviews consisting of four to eight participants were carried out. The researchers were also engaged in the preceding stakeholder meetings with merchants, mobile network operator, and the NFC terminal provider; and face-to-face interviews with each of stakeholders are on-going. Individual interviews rather than focus group interviews with the two participating merchants are judged to be preferable as they are competitors on the college campus and both provide food and retail services to over 17,000 students on a daily basis.

The project aims to provide valuable insight and experience in cashless payments in a restricted environment that mimics quite adequately the retail environment of the high street. Ultimately the project will extend to businesses in the vicinity of campus, which are all subject to the same ebbs and flows of business as campus based merchants. The key issue for campus points of sale are that congestion tends to build at hourly intervals due to the nature of the timetable for lectures. This means that on the hour, every hour, all the points of sale experience an influx of customers. The potential benefit of a mobile payment option in terms of convenience and speed is therefore significant.

5.1 A case study approach

A case study approach is employed in this study, since it permits the researchers to examine the phenomenon in its natural setting and employ multiple methods of data collection. Case studies are also suitable for researching an area in which there is a paucity of research and to finding answers to “how” and “why” questions (Benbasat et al., 1987). At each phase, the researchers use focus group interviews and on-line surveys. The focus group method is suitable for qualitative data gathering (Calder, 1977) and has been employed in previous mobile service studies (e.g. Mallat, 2006), which demonstrates its suitability in this study (Jarvenpaa and Lang, 2005; Garfield, 2005). Using multiple methods of data collection techniques to study the same phenomenon provides the opportunity to triangulate, thus reinforcing the conclusions of the study (Benbasat et al., 1987).

An important aspect of this research is the longitudinal nature of the study, where spending habits and user acceptance may be observed over an extended period. One of the key questions for MNO’s regarding mobile payments adoption has been how to stimulate continued usage over time, after the “novelty effect” wears off. Loyalty programmes are a key driver in this area, but also the observed
value to consumers of using this new payment channel. The value that a consumer perceives in using the phone for payment must be reflected in a merchant willingness to promote the channel, and this project provides a stage on which to study the motivations and business model of the infrastructure providers in this regard (MNO, payment acquirer, issuing bank, acquiring bank and merchant).

The project consists of three distinct data gathering phases: pre-launch (Nov 2011), mid-pilot (April 2012), and end-pilot (June). The purpose of the pre-launch phase was to understand the anticipatory context: awareness and perceptions around payments, understand impacts and reactions during the launch phase. The purpose of the mid-launch phase is to track and evaluate usage and behaviour: gain insights into functionality and performance of the system, identification of drivers and barriers to adoption. The purpose of the late-launch phase is system evaluation and generation of developmental insights: establish where improvements can be made to enhance consideration and usage of the system.

5.2 Preliminary findings

During the focus group interviews at the pre-launch stage, participants were invited to discuss the value-propositions been offered by the use of the NFC enabled phone and the service providers (e.g. research question 1). Key themes that were discussed included: their understanding of the m-payment concept, the value propositions that would entice them to a) migrate and b) remain with a new mobile network operator, and the barriers that would prohibit them from participating in the trial. Participants strongly favoured customer loyalty schemes that offered a range of options, instant or short-term rewards, and the ability to use the rewards with other branded goods and services. Key barriers to participating in the project included: top-up charges, the use of a low-end smartphone due to its limited functionality and the fear of technical errors at the point-of-sale once the project is live.

Interviews with the merchants revealed that they anticipate the potential of m-payments in terms of it reducing the time and cost required to managing physical cash, as well as, a faster through-put at peak service times (e.g. 12pm-2pm). Merchants expressed a high level of commitment to the project on condition that they did not incur the cost of installing the NFC enabled terminals at the 31 point-of-sales located on campuses. Yet, even at the prelaunch phase, the issue of cost has remained "unelaborated" and could be a decisive factor in the next phase of the project.

Specific to the question the value dimension, the researchers have identified that infrastructure management is a central issue that requires diplomacy, coordination and the need for a shared terminology amongst the integration partners. The integration partners in the project include: the mobile network operator, handset and operating system manufacturer, the SIM card manufacturer and SIM card integration team, the mobile wallet application developers, the funding account and card issuer, the payment transaction processor, the NFC terminal provider, and IT technicians from the host university.

Key to the adoption by merchants of a new payment channel is the associated interchange costs. In the pilot study, the MNO is providing a new way of accessing traditional payment rails, but not intervening in terms of the contract between the merchant and the payment processor, meaning that there is little or no advantage for the merchant to promote this method. Furthermore, although loyalty is perceived as key in retaining m-payment customers, this is equally seen by the MNO as an aspect of the customer relationship to the retail outlet, instead of being considered as loyalty to a merchant and payment channel. These findings present an early indication that the cultural barriers to new business model development are significant, with players inevitably burdened by their inherited perceptions of customer value propositions. The next stages of the research study will yield a wealth of observations that will allow us to develop an intricate understanding of the dynamics of m-payment solutions.

These early findings provide a basis for judging the applicability of the integration framework, see Figure 2 for an illustration. The value proposition for m-payments in the pilot case is presented as a series of steps in a specific customer scenario, where a consumer pays for coffees and snacks at a point of sale for a total bill of €10. The various steps in the purchase and settlement process are mapped on the framework. The customer pays by mobile phone, which is convenient and merits loyalty points from the merchant, but incurs top-up costs. For merchants, providing customers with a fast and convenient way to pay for goods increases throughput at peak busy periods, thereby increasing revenue. The payment authorisation transaction, involving a card network, an acquiring bank and an issuing bank, each charging for the processing of the transaction, results in a total
charge of 22c to the merchant for the €10 spend. These figures are based on standard interchange fees for credit card transactions of 2.16% (the case study is based on the use of a pre-paid debit card from one of the major networks for account funding, the interchange rates to be applied are not available at the time of writing the paper). Using this account also incurs a top-up charge for the customer of 48c per top-up. The settlement of the €10 transaction therefore results in the merchant account being credited with €9.78 (retail price minus interchange), the customer being debited for €10.48 (cost of goods plus top-up charge).

The value proposition for consumers and merchants is unconvincing based on this case study. Customers will be penalised by using this payment instrument, although clearly they may recoup some of the costs through loyalty points. However, given the number of partners involved, and their cultural background, it is not clear how the ownership of the customer relationship will be negotiated. Equally, in this case merchants are paying (dearly) for the right to offer their customers a new payment channel. In fact the only winners in this scenario are the banks who acquire a new source of interchange fees for little infrastructure outlay. The only initial cost to the card issuers and acquirers are the marketing and promotional costs associated with setting up the new virtual wallet accounts, the development resources to test the new terminals, and any overheads associated with new merchant ID’s. These are the same costs associated with the sign-up of any new customer base. The card network equally invests initially in the development of the wallet and security integration.

One limitation with the framework is that it does not show the recovery of value by the customer in terms of loyalty points. Although it is clear that usage of this payment channel will be stimulated through the use of loyalty points, it is not clear in this case what the customer relationship is between merchants, mobile operator, banks and customer. Incredibly, the mobile operator expects that the merchants should offer increased loyalty points for the use of the new payment channel, while simultaneously expecting the merchant to bear the burden on interchange costs with the banks. Underpinning the case are the twin assumptions that in order to use a mobile phone for payment, the customer must open a new bank account, and, secondly, that both the customer and merchant are prepared to pay a premium to allow payment by mobile phone. One of the most significant outcomes of this research will be the testing of these assumptions, which are undoubtedly inherited from the business models that apply to existing payment instruments.

Neither does the framework show the other payment use case envisaged in the pilot study, peer-to-peer payments. The cost of making a payment between two mobile wallets was not available at the
time of study. The success of such payment schemes in developing countries, particularly those where populations were unbanked, suggests that this model will be of significance where there are strong economic constraints on budget. Students are astute shoppers, and often underbanked, so it will be of interest to the researchers to gather data on the adoption and customisation of peer-to-peer payment features during the project.

6. Discussion and conclusion

The proposed integrated payment framework highlights the difference and relationship between payment integration and value proposition. It also strives to increase theoretical parsimony by integration of previous literature, such as Ondrus et al. (2005), Mallat (2007), and Kim et al., 2010) into a two by two matrix. The validity of the framework can be assessed by three particular properties: the integration of the framework (logical coherence), its practical and theoretical relevance, and its relative explanatory power (Glaser, 1978). These properties are derived from Glaser’s (1978) work on theoretical sensitivity and have been applied in previous research (Hedman and Kalling, 2003). The logical coherence is addressed in the previous section and will not be further addressed here.

There are both practical and theoretical aspects to the relevance of the framework. Firstly, it facilitates discussion of the nature of information required by consumers and merchants and the associated value they may place on the automation and visibility afforded by payment integration. It was shown, for example, that despite the lack of a convincing value proposition to customers (Ondrus et al., 2005), mobile operators are not well disposed to designing such propositions, being focused on extracting revenue from only one piece of the mobile payment transaction. Disintermediation of services is unsurprisingly perceived by consumers as an opportunity for more charges to the consumer to support the multiple partners involved in the provision of the service. This might be considered paradoxical from the point of view of the technical integration occurring (sharing of customer data, sharing of payment transaction information). A customer might be forgiven for expecting that technology driven integration should drive greater value for the consumer at the transactional level.

For example, visibility of available budget to spend could be an extremely valuable feature for consumers in making purchase decisions, particularly in periods of economic pressure, but the implementation of this feature may imply sophisticated design scenarios, with each of the integration partners ultimately looking for some compensation for that effort. In the case studied, the virtual wallet on the phone will be updated with an outstanding balance, giving customers a reactivity that was hitherto impossible with legacy payment instruments. Indeed this visibility is of significant value for consumers, for which they may be prepared to pay a premium. The visibility provided by traditional credit card networks for both consumers and merchants is significantly less automated, but merchants will sacrifice margins for the convenience afforded to consumers, who in turn are prepared to pay for the line of credit. However, it is not clear that merchants will understand the value proposition for the new mobile payment channel, and particularly how it relates to existing channels. The lack of forethought concerning the value proposition (for both customers and merchants) in advance of the technical implementation appears to be hampering the success of the project.

The application of the m-payment integration framework for the case study necessitated some extensions to allow for the different players on the value dimension. As well as consumers and merchants, it was useful to depict also the mobile operator and banks. The value proposition is summarised on the horizontal dimension by summarising the key benefits and costs for each of the players involved. In this sense the theoretical framework has been enriched through contact with the field. Further research incorporating other use cases for mobile payments should validate what other players and attributes would be required to coherently portray the value proposition for dis-intermediated payments. Of particular interest, for example, would be the notion of payments being made via the mobile network account, that is, the use of phone credit to pay for products and services other than calls and texts.

The interfaces between the quadrants, represented by the arrows, are points where integration decisions may be conceptualised. For example, the use of cash versus direct debits versus online payment can be positioned along the payment integration axis. The question of mobile payments involving settlement from a bank account, credit card account or carrier account could also be represented on this axis. In the case studied, settlement was via a pre-paid debit card account, but there would be value in using the framework to make these settlements and funding account choices
visible. As mentioned above, the value of visibility and control afforded by mobile payment transactions requires further research, as there are probably different use cases in which the increased visibility is considered worth paying for.

The framework provided a basis on which to consider the contribution of payment integration to the value proposition for consumers and merchants. On the one hand, mobile payment solution providers offer convenience based services to consumers, and, on the other, consumers have control and visibility requirements related to planning for and making payments. As we have seen in the case study however, the crucial nature of the value proposition needs to be addressed as much as the technology solution. The framework allows for the consideration of both these dimensions, and in so doing, provides a unique approach to highlighting the key questions underpinning the adoption of technology in a commercial environment.

The framework is extremely meaningful for the players in the payments ecosystem: financial institutions, payment solution providers, merchants, mobile network operators and, ultimately, consumers. Using the framework, the evaluation of innovative payment technologies can take place in the context of actual customer and merchant value. The framework is developed to conceptualise the driving forces in the mobile payments industry, in that sense it builds on the existing body of theoretical work (for example, Au and Kauffman, 2008; Ondrus et al., 2005, Mallat, 2007, and Kim et al., 2010). Furthermore, it is felt that the framework brings to centre stage the notion of customer value discussed in such literature.

Further research on this topic should entail validating the framework empirically on a range of different emergent payment scenarios, for instance Google wallet or bio-metric payments. Such research should aim to clarify the collaboration decisions for players in the market for mobile payments. Notably, the framework should provide a basis upon which infrastructure partners might engage in meaningful debate around the costs to consumers and merchants of making mobile payments. On the basis of these collaboration discussions, real progress in the provision of consumer oriented payment services that leverage the “anytime, anywhere” visibility and control of the mobile phone might be envisaged. Research should focus less on gathering consumer data on adoption patterns and technical features, and more on facilitating the discussions between the collaborative partners, and on developing a vocabulary for the conceptualisation of what value in payments means for a consumer, a merchant, an infrastructure provider or a financial institution.

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SMEs and IT: Evidence for a Market for “Lemons”

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Abstract: It is well known that Small- and Medium-sized Enterprises (SME) suffer from a lack of IT proficiency and therefore depend heavily on external IT expertise. The acquisition of a strategic IT artefact by an SME is mainly initiated in a market where Independent Software Vendors (ISV) and customers meet. This complex process is dominated by information asymmetry and leads to the ‘lemons’ problem, where low-quality vendors drive out high-quality vendors as predicted by the Lemon Market Theory (LMT). The diversity in quality makes it difficult for prospective buyers to evaluate a product or service with complete certainty and makes the decision to acquire risky. According to LMT, there is incentive for vendors selling poor quality, where quality of services is linked to an entire group rather than to an individual vendor. Although many scholars refer to this phenomenon in their work, empirical evidence is scarce. In this paper, we present the results of an enquiry into the ‘lemon’ problem within a group of 484 Belgium ISVs that target the SME market. A survey of the websites of the selected ISVs was conducted, in which we examined the way the products and services were presented. This was followed by six case studies, in which Chief Information Officers (CIOs) of SMEs were interviewed about the way they perceive the services of the ISVs. Our findings suggest that there are elements of a ‘lemons’ market present. However, there are also indications of a self-cleaning mechanism present in the market within the group of ISVs, leading to a globally higher degree of quality and leading to positive filtering from ‘the buy side’. However, the strongest conclusion is that some SMEs are encouraged by ISVs to withdraw from progressing further with their software acquisition process due their inferior IT capabilities and practices.

Keywords: SMEs, IT/IS, lemon market theory, ISV

1. Introduction

Small- and Medium-sized Enterprises (SMEs) tend to focus on their core business and do not always have the necessary resources and capabilities to govern an internal, professional information technology (IT) department or an information systems’ (IS) function. It is said that SMEs suffer from resource poverty, not only financially but also in the amount of their internal IT/IS expertise (Thong 2001; Thong, Yap & Raman 1996; Verhees & Meulenberg 2004). Therefore, SMEs depend heavily on external IT/IS expertise delivered by Independent Software Vendors (ISVs) to develop and implement their strategic IT artefact and conduct the indispensable IT projects (Dibbern & Heinzl 2009; Thong, Yap & Raman 1996; Yap, Soh & Raman 1992). Large Enterprise Resource Planning (ERP) developers have already been shifting their attention toward SMEs by offering simplified and cheaper solutions, such as SAP Business One and Microsoft Dynamics (Microsoft 2011; SAP 2011). The SME market is very attractive for small ISVs as well as for the business partners of the formerly mentioned ERP and Customer Relation Management (CRM) developers. This is due to the large number of the SMEs all over the world and especially in Europe (Commission 2010). However, the implementation of strategic information systems like ERP and CRM is a complicated task, particularly in SMEs, where the evaluation of the potential benefits are more uncertain (Levy & Powell 1999). The capability-maturity level of the ISV’s organisation is often inadequate to match with the demands and complex challenges of an IS implementation in an SME environment. Since SMEs are not well informed on the correct IT/IS capabilities of the ISVs and on the broad functionalities of the ERP and CRM software packages in concert with the efforts needed to adapt the software to their specific requirements, a situation of severe information asymmetry occurs, making room for opportunistic market behaviour and moral hazard. SMEs do not have sufficient internal managerial capabilities and practices to recognize the true intentions of ISVs in the market. This is an ideal environment for a ‘lemon’ market, since there is incentive for adverse selection on behalf of the SME, and a potential for opportunistic or even unethical behaviour on behalf of the ISV. The ‘lemon’ problem was initially posed by Nobel Prize winner in economics, Akerlof, in his seminal article of 1970 and showed how a market with unbalanced information or information asymmetry, can eventually completely disappear or offers products with poor quality where bad products (lemons) wipe out the good ones (Akerlof 1970).

It would be ideal to clearly define a SME before going into research where the unit of analysis is the SME. Unfortunately, this is not easy, since there are many characteristics that can identify a SME. A widely accepted working definition of a SME emanates from the 1971 Bolton Committee Report and has both qualitative and quantitative elements (Bolton 1971). The qualitative elements (e.g., the number of employees and the turnover) differ amongst countries. The European Commission took the initiative to
define a SME in terms of microeconomic characteristics, such as turnover (not exceeding €50 million), annual balance sheet total (not exceeding €43 million) and headcount (fewer than 250 persons) (Commission 2003). We used the European definition of a SME in this work.

In this paper, we present the results of an enquiry to the ‘lemon’ problem within a group of 484 Belgium ISVs that target the SME-market. We conducted an examination of the websites of the selected ISVs, looking at how ISVs present their products and services. This was followed by six case studies where CIOs of SMEs were interviewed about the way they perceive the services of the ISVs in an outsourced IS project environment.

In the next section we present a literature overview, relating to the theory of the market for Lemons (LMT). In Section 3, we outline the research methodology used to collect data and to illustrate the proposed framework. We present our results in Section 4, followed by a discussion of the findings. In Section 5, we present the conclusions and a summary of the main points raised by this research.

2. Literature overview

The market for lemons (LMT) is a widespread economic theory developed by Akerlof in his seminal paper of 1970 (Akerlof 1970). According to this theory, there can be incentive for sellers to market poor quality, resulting in a reduction of the average quality and leading to a death spiral and eventually, to complete deterioration of the market. The phenomenon of a lemon market arises in markets where there is information asymmetry between buyer and seller and where the overall quality of the goods and services offered is reflected on the entire group of sellers rather than on individual sellers. Lack of differentiation between the sellers can force high-quality sellers to flee the market because their quality and reputation cannot be rewarded. Akerlof demonstrated his theory with examples from the used car market. Most of the empirical data for bringing evidence to the theory has come from the used car market (Bond 1982). The theory has certainly gained attention in the strand of research on e-commerce, with research topics such as e-markets and auctions (Dewan & Hsu 2004; Lee et al. 2010; Pavlou & Gefen 2004).

Devos et al. developed a nomological network for the LMT, which reveals the constructs and the measures used to validate the theory (Devos et al., 2010). This network is presented in figure 1.

![Figure 1: The nomological network for the Lemon Market theory.](image-url)
contract of the transaction is negotiated. Christozov et al. see information asymmetry as a natural property of any communication process between a sender and a receiver, when both actors have different backgrounds and expertise, use different "jargon" or possess different information regarding the content of the communication session (Christozov, Chukova & Mateev 2009). Due to this information asymmetry, the distribution of information between the transacting parties is unbalanced, resulting in an imperfect market. This puts one party (the seller) at an advantage while placing the other (the buyer) at a disadvantage and makes the choice of a product risky for a prospective buyer (Afzal, Roland & Al-Squri 2009). Information asymmetry depends upon the different capabilities and intellectual levels of the transacting actors and is, therefore, considered as a independent construct for the LMT. Dependent constructs from information asymmetry are trust, adverse selection, and moral hazard.

The concept of trust is subtle, diffuse and elusive. Although there is agreement on the importance of trust there also appears disagreement on a suitable definition of the construct (Bigley & Pearce 1998). Trust is a dependent construct and can be seen as a co-ordinating mechanism based on shared moral values and norm supporting collective co-operation and collaboration within uncertain environments (Reed 2001). Trust is the degree to which one party has confidence in another within the context of a given prospect, decision or collaborative project. Blois gives a number of definitions of trust appearing in frequently quoted papers (Blois 1999). Trust/control relations between organizations can be seen as highly complex structures of social relations and processes which are needed for the generation and maintenance of collective action. The concept of trust is crucial in business interactions that are characterized by mutual dependency combined by with a lack of mutual control. Some researchers argue that trust is also reciprocal. According to Reed: "[...] the essential character of all trust relations is their reciprocal nature. Trust tends to evoke trust, distrust to evoke distrust... As trust shrinks, distrust takes over.' (Reed 2001). The notion of trust is latent present in the seminal article of Åkerlof as dishonesty. Information asymmetry may result in a misunderstanding or even erode existing trust between the participating actors.

Trust is related to reputation. The concept of reputation is commonly used in social life and economy. Wilson (1985) defines reputation as: "a characteristic or attribute ascribed to one person (or organization) by another person (or organization)". Reputation theory indicate that uncertainty about the seller’s honesty will affect the buyers' behavior (Kreps & Wilson 1982). Reputation can be formed by means of ratings by different buyers and can be seen as a measure that brings evidence a posteriori about the missed information or the hidden information and quality of the seller. When there is no proper reputation signaling mechanism on a market, there is incentive for a lemon market where it is preferable to offer low quality products and services (lemons or no participation in the market at all in case of high quality sellers. In both cases the overall perceived quality is going down. According to Yamagishi & Matsuda (2002) reputation can provide an effective solution to the lemons problem when 1) it is shared by all or most traders in the market, 2) traders in fact base their behavior on it, and 3) the market is closed such that the trader who is excluded from it cannot find an alternative market.

The adverse selection is the second dependent construct of information asymmetry and is the process of selecting the wrong seller and consequentially the least product quality. Adverse selection is a pre-contractual condition. Hidden information is sometimes used as a more practical term for the adverse selection. From the buyers point of view there is lack of knowledge on the features of the product or service and the real capabilities of the seller which may result in a wrong decision to select and leading to failure. From the seller’s point of view a wrong selection may result in the buyer’s dissatisfaction and eroding the reputation and consequently a drop of perceived quality.

Moral hazard as the third dependent construct is a post-contractual condition and can arise from the seller’s fraud or incapacity to deliver the real quality of the offering. Hidden action or hidden intention are sometimes used as more practical terms for moral hazard, although we see these terms more as metrics for opportunistic behavior which can arise from moral hazard. We take the moral hazard construct into account because even if the problem of adverse selection is overcome by selecting a good seller with fair quality offerings, post contractually the seller may start to shrink on quality. This can be the case in markets where service offerings are traded. With IS moral hazard happens when a the seller can gamble on a so called vendor lock, in which the buyer is confronted with high switching costs and is forced to use the services of the existing IS vendor. Opportunistic behavior can erode reputation leading to a drop in perceived quality.
A lemon market must be seen as a dynamic process involving positive and negative feedback coming from closed transactions. Like a cybernetic system negative feedback can stop a market becoming a lemon market and eventually stop the death spiral. Positive feedback enforces the lemon market dynamics which drives the good ones out of the market and accelerates the death spiral. New entrants can enter the market and eventually stop the spiral. This can also be done by better informed buyers or more honesty sellers. The market mechanism can eventually be regulated by exogenous triggers like governmental corrective initiatives.

For a market to become a lemon market there are constraints and an igniting condition is needed. The constraints for obtaining a lemon market are: 1) information asymmetry, a condition in which not all relevant information is known to all parties involved so prospective buyers can not accurately assess the value of a product or service before sale is made and sellers can more accurately assess the value of a product or service prior to sale, 2) Sellers have no credible ways of disclosing the real quality to buyers, 3) the seller’s quality is assessed by buyers acting as von Neumann-Morgenstein maximizers of expected utility. The igniting condition for a lemon market is that an incentive exists for the seller to market low quality products and services.

Devos et al also found that Agency Theory (AT) and Prospect Theory (PT) are closely related to the LMT (Devos et al 2010). This is shown in figure 2.

**Figure 2:** The links of the Lemon Market theory with Agency theory, Prospect theory and Trust theory.

AT is a well-known theory, largely used in the strand of research on IS and outsourcing (Dibbern, Goles & Hirschheim 2004). However, problems of behavioural differences in risk-taking are also important in addition to asymmetric information and goal differences. The implementation of a strategic IT artefact is highly risky since the outcomes are only partly verifiable and not always expressible in easily measurable outputs. The likelihood of failure looms large because of the uncertainty of the outcome. This gives rise to entrepreneurial risk, situated initially with the principal. The transfer of that risk to the agent is not straightforward, since both parties exhibit differences in risk behaviour. The principal is assumed to be risk neutral (the entrepreneurial risk) and the agent to be risk averse (Eisenhardt 1989). However, it is also assumed that the principal is risk averse when choosing for a ‘buy’ option. When principals are faced with adverse possibilities there is an overweighting of certainty, also known as the ‘certainty effect’ (Kahneman & Tversky 1979). The PT offers some explanation of this situation. PT was developed by Tversky and Kahneman (Kahneman & Tversky 1979) as a falsification for the Expected Utility Theory (EUT). PT states that decision making is a two-phase process. The first phase is an editing phase, in which a proposal or tender is framed in either a positive or negative way. The actual decision making is done in the second phase, which depends largely on the framing of the proposal. In decision making under risk, where losses loom larger than gains, people tend to search for certainty. Thus, the positive framing of proposals can greatly influence the decision and is assumed to be noticeable in a lemon market. The implementation of a strategic information system is an endeavour with a considerable
amount of risk involved and often leads to a failure (Bartis & Mitev 2008; Goldfinch 2007; Lytinen & Robey 1999). Since most SMEs depend largely on external agents for adoption of IT/IS, a process of selection is conducted. SMEs tend to explore the market by RFPs (Requests for Proposal). Due to information asymmetry, SMEs cannot screen the proposals of ISVs on their real content and quality sufficiently. We argue that the proposals of ISVs are, therefore, usually framed in an extremely positive way to comply with the certainty effect of the SME-principal.

Devos et al. built a framework to explain the outsourced information system failure (OISF) in a typical setting of an SME-principal buying a strategic IT artefact from a ISV-vendor (Devos, Van Landeghem & Deschoolmeester 2009). This framework is shown in Figure 3.

![Figure 3: The framework of an outsourced IS failure (Devos et al. 2009)](image)

The interrelated constructs of the framework are:
- A risk neutral SME-principal with managerial, methodological and technological capabilities and practices for planning, designing and implementing IT artefacts;
- A risk adverse ISV-agent with managerial, methodological and technological capabilities and practices for planning, designing and implementing IT artefacts;
- A market where SME-principals and ISV-agents meet each other;
- A meeting of the minds where SME-principals and ISV-agents establish a contract;
- An IT artefact, which is a human construction, utilitarian and not neutral;
- The use of the IT artefact, including a development and implementation trajectory;
- The impact of the IT artefact, be it direct or indirect, intended or unintended on the organisation. An outsourced information system failure (OISF) is considered to have an impact on the organisation.

3. Research methodology

Our research was focussed on the quest for indications of a lemon market in a setting where a SME-buyer buys a strategic IT artefact (ERP, CRM) from an ISV-seller.
The research methodology consisted of a mixture of two data sources. The first data collection was the screening of the websites of a group of 484 Belgium ISVs that are targeting the SME-market. This was followed by six case studies in which the CIOs of SMEs were interviewed about the way they perceive the services of the ISVs.

The group of ISVs was derived from the business directory ICT TOP 1000, edited and published by Datanews in 2008 (Coenjaerts 2008). The directory contained the 1000 largest IT/IS suppliers and ISVs in Belgium, according to their published revenues in 2007. We extracted a list of 484 ISVs from the directory who were appropriate for our research purposes. Only ISVs or business partners from large software developers, such as Microsoft, Oracle and IBM were selected. Telecom operators and pure equipment vendors were excluded from the list. Our final list contained a total of 484 ISVs.

3.1 Screening of websites

We choose to investigate the nature of the offerings from ISVs in the way they present themselves and their services on their websites. For each screened website, we defined five checkpoints, which were scored on a four-point Likert scale. The values followed the scale: 0 - not present; 1 - minimally present; 2 - moderately present and 3 - maximally present. Detailed criteria were defined for each checkpoint.

The screening was done in two phases. The first phase was individual scoring, prepared by three researchers, each of them scoring independently. In the second phase, the scoring process was redone in a group where all of the individual scores of the researchers were brought together. Via group discussion and stepwise refinement, a group score was given on every checkpoint for all investigated websites. The checkpoints and scoring system are shown in Table 1.

The first checkpoint (CP1) investigates the level of targeting of a specific SME audience by the ISV. The criteria for the score were as follows. Score 0 was given if no trace was found indicating that the ISV is targeting an SME audience. Score 1 was given if traces were found indicating that the ISV is targeting an SME audience, but these traces are not reflected in the mission statements nor in specific product or service offerings. Score 2 was given if traces were found that the ISV is targeting an SME audience in their product or service offerings but not in their mission statements. Finally, score 3 was given if traces were found indicating that the ISV is targeting an SME audience in its mission statements.

Table 1: Checkpoints and scores used to evaluate the websites

<table>
<thead>
<tr>
<th>Nr</th>
<th>Checkpoint</th>
<th>score 0</th>
<th>score 1</th>
<th>score 2</th>
<th>score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP1</td>
<td>Direct focus to SMEs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP2</td>
<td>Positive framing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP3</td>
<td>Negative framing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP4</td>
<td>References</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP5</td>
<td>Use of formal methodology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CP2 and CP3 are derived from the PT and indicate whether the website of the ISV is framing product and service offerings in a positive way (CP2) or a negative way (CP3). Examples of signs of positive framing are the mention of the immediate benefits after the implementation of the IT artefact, without mentioning how these benefits will be measured and the offer of fixed prices for projects without taking into account knowledge of the scope and denying the burden of (organizational) change during the implementation process. Examples of negative framing are the mention of one or more of the numerous risks that comes along with the implementation of a strategic information system and the necessary maturity level of management needed to conduct such complex projects (Schmidt et al. 2001). However, there are no simple and objective rules to define a positive framing nor a negative one. Therefore, we screened the websites in two converging phases and under the supervision of a very experienced researcher and practitioner. We also assumed that within a regular commercial activity, and certainly within a public context, such as a website, the positive framing of products and services is common practice and part of the commercial game by which ISVs present their daily business. However, we noticed that some ISVs tend to slow down on the sales talk in their websites and establish a more serious and well-balanced image of how they conduct these complex and delicate projects.

We attached different scores to CP3 than to CP2. Score 0 was given if no trace was found indicating a positive/negative framing and was identical for both checkpoints. Score 1 was given for CP2 if one trace
(for example, in a sentence, a quote, a header or a paragraph.) of positive framing was found, score 2 for two traces and score 3 for more than two traces. For CP3, score 1 was given if no trace (for example, in a sentence, a quote, a header or a paragraph.) of an IS risk was found; score 2 for one trace and score 3 for more than one trace.

CP4 investigated if the website of the ISV uses references of successful projects conducted with SMEs in the past. Score 0 was given if no trace was found of a sales reference. Score 1 was given if a reference was given without mentioning the nature of the project and a contact person. Score 2 was given if a reference was given that mentions the nature of the project but does not mention a contact person. Score 3 was given if the conditions of score 2 are fulfilled with a mention of the name and address of one or more contact persons. All references have to be to SME organisations.

Finally CP5 investigated the suggestion from the ISV to use a formal project management methodology (PMM) for conducting IS projects. A score 0 was given if no trace was found indicating the use of a PMM; score 1 if the website indicates that an IS project has to be conducted in a controlled environment; score 2 if there are traces on the website telling the user how to conduct an IS project without mentioning an explicit formal PMM; and finally, score 3 was given if the use of a formal PMM is mentioned by name.

3.2 Interviews related to the case studies

As a second source of data collection, we conducted six interviews with CIOs of SMEs who recently finished an outsourced, strategic IT project in their organisation. The questions used in the interviews covered four areas: 1) strategic importance of IT/IS in their organisation, 2) the use of a formal PMM, 3) the success (or failure) of the IT project and 4) the relationship of the organisation with the ISV. In addition to these four areas, we asked questions that were focussed on general company information and on the job content and roles of the interviewees.

The interviews were conducted by two people: the interviewer and a secretary, both of whom are researchers. The interviews were tape recorded for backup reasons, written down and then sent to the interviewees for correction and feedback. The average time for the interviews was two hours.

4. Findings and discussion

The results of the screening of the websites of the ISVs are summarized in Table 2. The scores are given as percentages. In the last column the median is given of the scored checkpoints. From the observations of CP1, we have learned that less than half of the ISVs (38.9%, being the sum of the scores 1, 2 and 3) have a direct focus on SMEs. Only one out of ten ISVs (11.0%) focus only on SMEs and state this in their mission statement. Considering the large number of SMEs in Europe and in Belgium, this indicates that the SME sector is not well serviced by ISVs. It appears that most ISVs do not want to profile themselves as ‘SME-only’ sellers. It was also noticed that large ISVs do not target MEs. Since the list of 484 ISVs contains only the largest ISVs, microenterprises, small businesses, one-man companies and freelancers are not included. Apparently, one can assume from the results that many SMEs are served by the latter organisations.

Table 2: Results of the screening of the websites

<table>
<thead>
<tr>
<th>Checkpoint</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP1  Direct focus to SMEs</td>
<td>61.1%</td>
<td>12.7%</td>
<td>15.2%</td>
<td>11.0%</td>
<td>2</td>
</tr>
<tr>
<td>CP2  Positive framing</td>
<td>37.8%</td>
<td>40.3%</td>
<td>12.7%</td>
<td>9.2%</td>
<td>1</td>
</tr>
<tr>
<td>CP3  Negative framing</td>
<td>96.8%</td>
<td>2.5%</td>
<td>0.7%</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>CP4  References</td>
<td>22.6%</td>
<td>28.6%</td>
<td>14.5%</td>
<td>34.3%</td>
<td>1</td>
</tr>
<tr>
<td>CP5  Use of formal methodology</td>
<td>41.7%</td>
<td>20.5%</td>
<td>20.1%</td>
<td>17.7%</td>
<td>1</td>
</tr>
</tbody>
</table>

For CP2, ‘Positive framing’, the sum of the scores 1, 2 and 3 is 62.2%, indicating that a positive framing of products and services offerings is a common practice within the ISV community. However 37.9% of the websites of the ISVs show no trace of positive framing. This could indicate that large ISVs fled already from the SME market and show themselves on their websites certainly not as Lemons.

Almost one out of ten (9.2%) use an intense form of positive framing in which the commercial message on the website tends to mislead the potential buyer.
Concerning the negative framing, only a very small percentage (3.2%) scored 1 and 2 that indicate that conducting a strategic IS project implies some risks and that an effort on behalf of the customer is needed to succeed. One can expect such a small percentage, keeping in mind that a website is a tool in the marketing strategy of ISVs.

The use of references is common practice with ISVs. 34.3% of the ISVs use references of former projects conducted within SME-organisations, giving detailed information about the customer and the project. These references can be checked almost directly since they include the name of a contact person and the necessary contact information (such as, telephone number or e-mail address). The ‘good’ differentiate themselves here substantially from the ‘lemons’ in the market, on the basis of honest and verifiable information.

The use of a formal PMM is not a common practice in SMEs. Almost half of the ISVs (41.7%) do not even indicate the use of a PMM. The larger the ISV, the more the use of a formal PMM is promoted on the website. Some of the ISVs even centre their services around the use of a formal PMM. For the good, the use of a formal PMM is a necessity, but the lemons do not even mention the concept. This finding corroborates with the expectation that SMEs are mainly served by small companies and freelancers that offer services with low quality and that are mainly focussed on technology (programming, installing, configuring, etc.).

From the interviews in the cases studied, we could deduce that the CIOs consider IT/IS for their organization more important than the CEOs. Thus, the IS function in their organization does not get as much attention by the CEO as other major business processes, such as marketing, manufacturing or sales. Although we used the title of CIO for the interviewees, such a function does not really exist in most SMEs. Our interlocutors were mainly performing some roles or partial roles of CIOs, such as IT project management, and budget and expenditure control. The IT management role of the CIO in a SME can be seen as a temporary role, often combined with the role of operator/programmer. In the latter role, they keep track of the daily IT issues (e.g., backups). The managerial level of the CIOs in a SME can also vary from the strategic level, as the assistant of the CEO and involved in important decision making to the operational level. This is not always straightforward since both levels of competence are needed in SMEs. For strategic IS projects, the managerial skills of the CIO are challenged. However, such complex systems also give rise to the need for more advanced technical skills. Some of the CIOs try to fill in these technical needs by themselves, since this is something the CEO is expecting from his CIO. However, the need for external, specialized IT expertise was expressed by all of the interviewees.

All outsourced IT projects were managed by the CIOs in collaboration with a project leader from the ISV. Four of the six interviewees were not familiar with a PMM to conduct an IT project in their organisation. Only one (of the six) actually used a PMM and only the basic concepts were respected, such as the establishment of a steering committee and the organisation of periodic progress meetings. The CIOs clearly lacked sufficient knowledge to use more of the tools and concepts of a PMM.

All of the interviewees had past experiences with failed IT projects. However, only one of the CIOs had terminated a project before it was finished. The main reason mentioned by CIOs for failure – and then becoming an OISF - was the erroneous proposal the ISV made before the project began. Promises on budget, time and quality were made that could not be kept in reality. During the course of the project, it became clear that all of the ISVs had underestimated the budget and the timing of the project. Some of them even lacked the necessary skills to complete the project. The majority of the CIOs had less severely negative experiences, but made complaints that all ISVs offered proposals that were too optimistic in terms of budget and time needed to implement the IT artefact. One of the CIO’s negotiated a contract with his ISV in which he anticipated problems from a previously failed IT project and included penalties for late deliveries.

Trust between SME and ISV is considered to be one of the most important factors for IT success. Three of the interviewees chose to do business in the future with their ISV on the basis of trust that was carefully built up during a past project. However, the other three CIO’s chose not to work in the future with the ISV who conducted their last IT project. A lack of trust and a feeling of deception were given as reasons.

All of the interviewees had their own way of selecting an ISV, but all of them went to colleagues (and sometimes even to competitors) to ask for real references for the selected ISVs. The interviewees were...
all aware that the market is not transparent and that these checks are necessary to reveal the real capabilities of an ISV.

5. Conclusion

The marketplace where SMEs buy IT is striking for small ISVs acting as business partners of large ERP and CRM systems suppliers, like SAP, Oracle and Microsoft. These companies often set up worldwide marketing campaigns leading to a broad visibility in media, on the web, universities and enterprises but are not so enthusiastic to direct approach an SME market to sell their products with smaller margins. ISVs on the other hand often try to capture parts of the perceived quality of their main supplier. Since most ISVs are also SMEs they work mainly on a domestic market, however they perform on a far less mature capability level than their large ERP and CRM systems suppliers. It is however well known that the implementation of such mission critical software depends profoundly on the technological, functional and managerial skills of the personnel of the ISV and on the commitment of the CEO of the SME to the project rather than on the software itself.

The evidence from this study leads us to the following conclusions. First, we have confirmed the expectation that ISVs and SMEs meet each other on a market that reveals elements of a lemon market. Although many ISVs focus specifically on SMEs, others, mostly larger ISVs, do not. Thus, SMEs are mainly serviced by small ISVs. The more sophisticated the services offered, the larger the ISV organization, implying that a well matured SME organisation is essential to the capture the real value of these services. SMEs partly incite a lemon market by entering the market with less managerial and technical IT capabilities. Lemon-ISVs are attracted to these buyers.

This study has some major limitations. First, data has been collected only in Belgian ISVs. However, Belgium is a country with many SMEs, and is in that sense, quite representative of most of the European countries. Cultural differences could play a role but were not investigated in this research. In addition, government initiatives taken by many European countries to support SMEs could lead to different behaviour of ISVs in the different European domestic markets. In the Benelux and in France, regional governments have already started to introduce ethics charter programmes for ISVs that target the SME market (eTIC 2010).

Another very important issue that should be raised is the size of the organization of the SME. Since Europe, and particularly Belgium, uses a more limited definition of a SME in terms of size of the organisation than the United States, the phenomenon of the lemon market may appear differently on the two continents. We hope that our findings stimulate others to investigate these related research questions.

Second, it is difficult to reveal relevant data that investigates signs of a lemon market. ISVs are not cooperative in sharing information about their (possibly unethical) behaviour in the SME market. We are fully aware that websites possibly offer a biased picture of the services and quality of the ISVs. This is the reason why we decided to use multiple sources of data and to include data from the interviews.

Finally, it could observed that there are indications of a self-cleaning mechanism present in the market within the group of ISVs, leading to a higher degree of quality and also leading to positive filtering from ‘the buy side’. However, the strongest conclusion is that some SMEs are indirectly encouraged by ISVs to withdraw from the finalisation of the software acquisition process due to their inadequate inferior IT capabilities and practices. This indicates that the lemon market for outsourced strategic IS projects is steered by a bidirectional mechanism, contributed to by both the buyer and the seller.

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Coenjaerts, T 2008, 'ICT TOP 1000'.


GIS for Crime Analysis: Geography for Predictive Models

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Abstract: The term crime analysis refers to a concept and to a discipline practiced in the policing community. It includes analysis of more than just a crime, which is why some authors refer to it as public safety analysis. However, over the last few years crime analysis has become a general term that includes a lot of research subcategories: intelligence analysis, criminal investigative analysis, tactical crime analysis, strategic crime analysis, operation analysis and administrative crime analysis. Crime mapping and spatial analysis complements all of them and plays a crucial role in defining new forms of representation and visualization to better understand crime and to respond adequately to the problem of criminality. A new worldwide socio-economical order lead to an increasing number on crime rates and raised the need to find new ways to handle information about criminality. To better understand its causes, local, regional and national security authorities turned to new decision support tools such as Geographic Information Systems (GIS) and other information technologies to find better solutions. To understand the magnitude of all the variables involved it is necessary to spatially capture and correlate them. Only by doing that it’s possible to quantify and qualify some hidden aspects of the phenomena. The city of Lisbon with is new proposed administrative division, reducing from 53 to 24 “freguesias” (minimum administrative division and similar to parish's) implies an enormous degree of uncertainty in the observation and location of criminal data. As the crime is not treated with an exact point, but at the level of parish, it implies that larger parishes are treated by the average crime regardless of place of occurrence. This research combines statistical methods (cluster analysis) and spatial models created with GIS, based on police crime reports. It also details a framework for short-term tactical deployment of police resources in which the objective is the identification of areas where the crime levels are high (enough) to enable accurate predictive models as well as to produce rigorous thematic maps. In recent years police services have engaged on proactive and Intelligence-Led Policing (ILP) methods. This advance was coincident with the recognition of law-enforcement solutions at local level. This paper also engages an approach to ILP as a methodology to provide the necessary tools for Decision Support System (DSS) of police departments.

Keywords: crime analysis, GIS, geostatistics, intelligence-led policing, predictive dissemination, data mining

1. Introduction

Over the last few years a new worldwide socio-economical order lead to an increasing number on crime rates and raised the need to find new ways to handle information about criminality. To better understand its causes, local, regional and national security authorities turned to new decision support tools such as Geographic Information Systems (GIS) and other information technologies to help them in finding better solutions. The spatial attributes of this phenomena implies quantitative and qualitative variables and to understand its magnitude, it is necessary to capture, analyze and correlate them.

Statistics are an important tool in crime analysis and police forces are using it in a more effective way to discover useful information, reduce crime and maximize the use of resources. Statistics help strategic decisions and turn vast amounts of meaningless numbers into a general picture (geographically and temporally identified) of crime events. Geostatistics are also crucial when working with spatial data. That is, only through the use of geostatistics, the true value of information can be extract. By assuming that every crime point has a geographical location (in space) and that every point has a considerable amount of information added to it, we can relate all the individual information (point) with all the others to construct a complete analysis scenario.

The city of Lisbon with is new proposed administrative division; reducing from 53 to 24 parishes (minimum administrative division) implies an enormous degree of uncertainty in the observation and location of criminal data. As the crime is not treated with an exact point, but at the level of parish, it implies that larger parishes are treated by the average crime regardless of place of occurrence.

In recent years police services have engaged on proactive and Intelligence-Led Policing (ILP) methods. This advance was coincident with the recognition of law-enforcement solutions at local level.
This research combines statistical methods (cluster analysis) and spatial models with GIS based on police crime reports. It also details a framework for short-term tactical deployment of police resources in which the objective is the identification of areas where the crime levels are high (enough) to enable accurate predictive models as well as to produce rigorous thematic maps. It is also an approach to “Intelligence-led policing” as a strategic methodology to provide tools for decision support by police departments.

Recent advances on GIS, geostatistics, information dissemination, data mining and predictive models, the study and modeling of crime data to identify patterns has emerged as a new research field. Within the scope of this chapter, some key questions will be addressed:

- Can crime patterns be extrapolated in small areas such as precincts accurately enough for use in deployment, scheduling and evaluation of police effectiveness?
- Can multivariate forecast models predict turning points and other new patterns?
- Is it possible, by using geostatistics tools such as kriging methods, to foresee and predict the occurrence of incidents, beyond the mere descriptive models?

2. Community policing, problem-oriented policing and intelligence-led policing (ILP)

Choosing between different policing approaches is probably far and beyond the control of most policemen as well as crime analysts. But however it is crucial to perceive that all the three have different aims and objectives. Community policing (CP) is more about integration of police and community. Problem-oriented policing (POP) is interested in patterns of events and intelligence-led policing (ILP) is more focused on individuals. In a real scenario it is probable that all of them could be used to obtain the best results when fighting the crime.

Community policing has its origins in the lack of interaction between the police and the community. Definitions of CP appeared in several tactical police documents but according to the United States Community Policing Consortium, a group with links to the International Association of Chiefs of Police (IACP), the Police Executive Research Forum (PERF) and the National Organization of Black Law Enforcement Executives (NOBLE), community policing is a joint collaboration between the police and the community that identifies and solves community problems. Within the concept, all the members of the community become active allies in the effort for the safety and quality of neighborhood living. Mapping crime has been one of the most important trends and has grown considerably over the last few years. Crime data and modeling through Internet is a good example and although there's few public (accessible) examples, they are beginning to appear.

Problem-oriented policing could be described as an approach or process within a police department or agency “...in which formal criminal justice theory, research methods, and comprehensive data collection and analysis procedures are used in systematic way to conduct in-depth examination of, developed, informed responses to, and evaluate crime and disorder problems” (Boba, 2003:2). So, this method is not only about creating maps, not only statistical analysis, not only identify patterns with models, it is “…examining the underlying conditions of both the simple and complex problems…” that modern police has to deal and respond adequately. Because of that, mapping has to overcome the simple process of draw a pin or flag map and evolve to an understanding of structural causes that lead to crime.

Intelligence-led policing originated from the idea that during the late 1980’s and early 1990’s traditional policing was not winning against the growing crime rates. The first stage in the development of ILP was in 1993 with an UK Audit Commission report titled “Helping With Enquires – Tackling Crime Effectively” (Audit Commission, 1993). Intelligence-Led Policing has as a specific “strategic, future-oriented and targeted approach to crime control (Maguire, 2000:316). The main focus is given to a prior analysis supporting decision-making processes. ILP is also more focused on individuals and groups of offenders and law enforcement solutions.

Police forces are always struggling with lack of human resources to reduce crime on their jurisdiction. By analyzing and correlate information from primary sources on criminal environment, it’s possible to achieve higher efficiency levels.
Criminal historical data are analyzed to develop new strategies and actions to reduce crime. It is a very demanding task in terms of technological means and human resources but it is the best strategy to reduce crime because it has an approach, both preventive and repressive.

Figure 1: ILP and crime reduction process (Ratcliffe, 2005)

An ILP model (at its first stage) enables the interpretation of the criminal environment. This is usually performed by an intelligence department and relies on information’s sources both internal and external to the police service.

The obtained information should, in an intelligence-led environment, be passed to people who can actually impact in a positive manner on the criminal environment (decision maker). This requires an intelligence structure to identify and influence the decision-makers. It should be noted that this requires both an ability to identify the decision-makers, as well as to influence their thinking, regarding the types of strategies to achieve better criminal numbers.

ILP strives for greater efficiency in policing, but it has also been accompanied by other efficiency methods, some of which conflict with ILP.

There is a performance culture in many police services which strives to measure every bit of data and it is a concern that the benefits of ILP will be lost in a flood of statistical operations.

One of the major issues is response time. Many police services have now records of the response time to routine calls, and they build response improvement’ protocols that maximize performance. Unfortunately the research evidence is fairly conclusive: improving response times to calls does not reduce the number of crimes.

The intelligence led policing model, is more difficult to implement but is also the most versatile in performance and results.

The following table compares the various models of policing in terms of implementation, resources and results:

Table 1: Strategic aspects of police activity

<table>
<thead>
<tr>
<th>Model of Policing</th>
<th>Implementation difficulty</th>
<th>Human resources</th>
<th>Technology resources</th>
<th>Costs estimate</th>
<th>Geography application</th>
<th>Expected results</th>
<th>Type of Information</th>
<th>Type of actuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighbourhood and community policing</td>
<td>low</td>
<td>high</td>
<td>low</td>
<td>high</td>
<td>Low</td>
<td>low</td>
<td>retrospective</td>
<td>preventive</td>
</tr>
<tr>
<td>Problem oriented policing</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
<td>retrospective</td>
<td>repressive</td>
</tr>
</tbody>
</table>
Intelligence-led policing | high | low | high | medium | High | high | prospective | preventive and repressive

In recent years there has been a move within police services towards a proactive and ILP. That was coincident with the recognition of local policing solutions and the importance of intelligence function at local areas. This paper is also an approach to ILP as a strategic methodology to provide a tool for decisions makers in police departments.

Knowing where the policeman becomes a crucial intervenient provides a better understanding of the intervention protocols anticipating the outcome and effect. Without such a baseline, evaluations are limited as to the purposes and sometimes anticipate consequences to police efforts. Intelligence-led policing is also about being a smart police.

That means increasing the effectiveness and efficiency of police interventions through the use of the right information. Such efforts are data driven (quantitative and qualitative) and analytically rigorous, assuring than appropriate care has been taken to collect, organize and analyze information, prior to action.

This ameliorates the deficiencies of rigid boundaries and moves towards a more dynamic methodology. With this new Lisbon “scenario”, from 53 to 24 parishes and assuming these administrative limits, crime analysis will become more difficult (to evaluate) due to spatial aggregation.

3. Crime mapping today

From a crime mapping analysis perspective, both intelligence-led policing and problem-oriented policing place a central role. Proactive targeting of police resources based on quality analysis for the case of ILP and crime prevention resources for POP. Crime mapping will draw, measure, analyze and interpret what to do, where it should be done, what are the priorities and how to improve results. Mapping will also demonstrate future trends and patterns by modeling space and time.

With the emergence of geographic information technology and its successful use as a tool for crime analysis and forecasting, the study and modeling of historical or current crime data to identify spatial crime patterns has emerged as a new research area. However in Europe, this reality is still recent (Chainey, S. et. al. 2008 & Wilson, R. et. al. 2008). Three key questions can be pointed out:

- Can univariate methods be used as a mean to extrapolate accurate crime patterns in the short-run small areas such as precincts?
- Are they robust enough for use in deployment, scheduling and as counterfactuals for evaluating police effectiveness?
- Can standard crime indicators (used in multivariate forecast models) predict turning points and other new patterns like, for example, a new crime?

For some crime types, aggregation may mask important seasonal variations in smaller areas. For example, university areas may have seasonal patterns in property crimes influenced by the comings and goings of the students and teachers. Also, shopping areas may have peaks on holiday times.

Law enforcement officers have been mapping crime virtually since the time that police agencies were established through the use of push pins and a paper map at the beginning of the 20 Century (Harries, 1999).

By the late 70’s and early 80’s, there was a resurgence of interest in understanding and analyzing the spatial dimension of crime through the characteristics of incident, its location and geographical analysis on incident (Boba, 2009). With the development of GIS in the 90’s, law enforcement officers begun to consider the principles of geography and spatial information using new technologies in order to realize and develop mechanisms to crime prevention and the public safety.

The cartographic representation has some advantages such as: help visual analysis and statistics of crime, aggregate information in spatial matrix, produce thematic maps that help to communicate the results of the analysis (Eck, J. et al. 2005 & Boba, 2009).
Harris (1990:3), states that “the purpose of maps is to communicate information”. The cartographic representation is a tool to communicate information across time and space.

The diffusion of GIS into crime analysis has been a slow process, first due to costs, both hardware and software and then because of its complexity. When discussing the current use of GIS for crime analysis, activities can be divided into current and cutting edge applications (currently used in law enforcement agencies to support crime analysis activities). The use of GIS to support crime analysis activities in police day-to-day operations is a powerful tool for strategic planning (Johnson, 2000).

4. Geographical information systems and crime analysis

With the ever-growing information society the amount of relations established between phenomena has grown exponentially. Technology has provided Humankind with tools to analyze and interpret such relations through software and hardware platforms, namely geographical information systems (GIS).

A geographical information system translates physical elements in the real world (roads, rivers, mountains, buildings) into forms that can be displayed, manipulated and analyzed with, for example, traffic, road accidents, demography, climate changes or for example police information about crimes, arrests or other related information. GIS uses two kinds of data models: vector and raster data.

Vector data represent the basic units of spatial information: points, lines and polygons. A point feature is a discrete location, similar to a pin or flag placed on a paper map. A line feature is represented on a map by a line or a set of lines like roads, rivers or power lines. A polygon feature is a geographic area represented on a map by a multisided figure with a closed set of line segments. Buildings, parks or lakes are just a few examples. Within a GIS environment every element on the map corresponds to a record in an attribute table (row).

In addition to vector data, the other is the raster data model. Raster data is an image. It could be an aerial/satellite photo or a remote sensing picture. The raster image is a grid formed by pixels and depending on its resolution they could be bigger (less resolution) or smaller (higher resolution). Each pixel has an attribute value. The use of these two data models enriches the GIS analysis.

After collecting, editing and validating data, spatial analysis allows the assessment of relations, and patterns between them, and of those with the surrounding space, giving the information an operational value in geographic modelling support decision making.

Since the 1960’s Geographical Information Systems (GIS) have been applied to a vast number of studies and criminality is not an exception. From its first applications in Canada, GIS has become a major instrument for an effective territorial planning. From in-car navigation, retail and commerce location, costumer geo-marketing studies to risk management, construction, weather forecasting, military planning and other application fields, GIS has consistently emerged as a killer application.

However, it was only in the beginning of the 1980’s with the reducing prices of technologies (operating systems, processors, storage capacity, memory and hardware), that GIS saw a significant development on new research fields, such as crime analysis, relocation of police precincts and crime reduction strategies. From the first stage of data collection to monitoring and modeling future scenarios to evaluate how, where and when to react, GIS include a vast number of applications:

- Monitoring citizen’ alerts;
- Identifying areas of criminal activity – crime hotspots and other terminologies;
- Allocation of police infrastructures and policeman;
- Understanding in a more effective way crime distribution over space and time;
- Modeling and prediction of “critical areas” through pattern analysis;
- Monitoring results, resources and infrastructures;
- Application of Internet as a form of communication to better disseminate information about crime statistics, police initiatives and public safety programs, etc.
Much of the work in crime mapping and analysis was carried out in the United States by the Mapping and Analysis for Public Safety (MAPS), formerly known as the National Institute of Justice's Crime Mapping Research Center (CMRC). This work served as a launching platform to the development of crime mapping in other countries like South Africa, Australia and United Kingdom.

The computerization of police records has come with a realization that this material can be used for crime and intelligence analyses (Ratcliffe, 2004). This work permits the recognition of patterns sometimes hidden and often not perceived by the police and authorities.

Researchers have used crime mapping technologies to go beyond exploratory draws of crime and have been engaged in trying to discover the roots and structural causes of crimes. Those drivers are often used to observe long-term strains related to social behaviors.

Geography is also necessary for advances on spatial understanding and consequently “…has contributed to many disciplines where understanding space and place is important, such as with crime” (Ratcliffe, 2004).

With the new administrative divisions of Lisbon, crime analyses will be more difficult due to area aggregation. For example, on certain types of crime, aggregation will probably mask important pattern details. The comparison between the new and the old administrative divisions in Lisbon is important and the use of predictive models can help authorities and provide the necessary results to an effective decision.

To proceed or not with these new administrative divisions is the major question that has to be answered shortly. And the most correct answer will depend upon a rigorous and pertinent research based on data, information, but also knowledge. The comparison between new and old administrative limits is an important exercise to perceive pattern differentiation and has obvious implications on territorial planning and public domain.

The use of geostatistics tools such as predictive models and kriging methods allows, beyond the mere description of phenomena, to foresee and predict the occurrence of incidents.

5. Crime hot-spots – definitions, issues and controversies

The key issue behind the hot-spots policing is the occurrence of a disproportionate number of crimes happens in particular areas in a city. For example, Sherman et al (1989) showed that 3% of addresses accounted for 50% of total crime calls to the police. Police strategies consist in finding and identify areas within the city with unusual amounts of crime to better respond to those specific areas. Traditional responses in hot spots are normally an increased police presence which leads to more arrests (Weisburd and Braga, 2006).

Hot spots are the most common method used in criminal representation. It assumes that past crime locations will persist into the future, however the actual results of this method depends on the time period under review, usually this robust method only produces good results when applied to short time series.

An interesting feature in the detection of hot-spots is its persistence and coincidence over time as shown by Anselin (2000), the hot-spots reflect high levels of crime initially moderate, but over time, usually, this crime will change to more violent types of crimes (e.g. acts of vandalism to crimes of theft). Therefore, should be contained and controlled in time to prevent more serious incidents to people and property in the geographic area covered by the hot-spot.

According to Eck, J. et al. (2005), this method assumes that they must map the locations and not criminal occurrences thus understand why certain settings are more easily criminal occurrences while others appear to inhibit these same events. Ainsworth (2001:88) refers that "A crime hot-spot is usually understood as a location or small area with boundaries clearly identified where there is a concentration of criminal incidents, which exceed the normal for this area, the term can also be used to describe locations that showed an increase in crime a given period of time".

But Ratcliffe and Chainey (2005), state that it doesn’t matter how you determine a crime hotspot, the important feature is the distribution of points within the crime hotspot area. So, the concept of hotspot...
doesn’t always refer to a single point feature, but sometimes it also refers to a polygon feature. And that is crucial to GIS analysis tools. According to the same authors, the distribution can be addressed by three different spatial approaches: dispersed, clustered and hotspot.

Dispersed relates to a type of crime hotspot where crimes are distributed around the whole hotspot area. An example is the location of stolen vehicles inside a shopping area car park. This type can be characterized by an absence of clustering in a significant location.

According to the clustered definition, the hotspot is referred to as a clustered hotspot, although it does not put aside the possibility of crime events at other surrounding locations within the hotspot. The example might be a particular bar or disco that works like a crime catalyst. The majority of times the crime will not occur there but in the proximity.

The hotspot is quite different because it’s a crime hotspot caused by the repeat victimization of a single location. The most common example is a repeated episode of burglaries at a school.

Besides the spatial approach there is also a temporal approach and together they form the hotspot matrix. But due to the lack of historical statistical data, this temporal approach is often dismissed. Not because it’s less important but because from a GIS analysis perspective, time analysis comes after.

6. Descriptive statistics for crime analysis

One of the most important tasks associated with crime analysis is to know data and its particularities. This data is the baseline for an intelligent analysis, however, very little of this data are accurately collected or has the necessary detail.

Understanding the different types of data and their definitions is important because some types of analysis have been designed for particular types of data and may be inappropriate.

Before using a GIS to analyze data, all the information must be geocoded. Geocoding is the process of linking an address with the map coordinates so that the address can be displayed on the map. Normally in crime mapping, the address of a record is geocoded to a line street segment. But it also can be geocoded by different levels of spatial scale or “resolution”, such as to the centroid of a zip code (in vector or raster data models). To obtain the most accurate and complete results, the analysis should rely on the most up to date geographical data. This is sometimes difficult to the rapid growth of urban areas and on less developed countries, illegal constructed areas.

After preprocessing and geocoding all the information, data was analyzed and the dataset consisted in 35549 police records, distributed by 8 variables, according with the following coding:

**Table 2:** Data coding process

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Month</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Hour</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Minute</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Type of crime</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Subtype of crime</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Classification</td>
<td>1</td>
<td>112</td>
</tr>
<tr>
<td>Parish</td>
<td>1</td>
<td>53</td>
</tr>
</tbody>
</table>

According to the Pearson’s’ coefficient correlation matrix, there was no significant correlation between the variables which let us to identify the variables as independent observations.

In terms of overall information, this data represent a small part of the criminal phenomena, since there were only considered crimes reported and recorded by the Public Safety Police (Polícia de Segurança Pública – PSP).
The primary dataset consist of one year of criminal offences for all individual events for 2009 in Lisbon County obtained with authorization from the PSP.

The dataset include all personal and patrimonial offences. The most often studied crime is robbery occurred in public transportation. All the records have a geographic reference to a parish, which permits the classification of the offences and their mapping in a GIS.

Unfortunately the accuracy is not the ideal because we don’t have the points of the occurrences which prevents us from using the georeference point but only the “parish area”.

The histograms below show that the majority of crimes are robbery mainly during the evening.

**Table 3: Person correlation matrix**

<table>
<thead>
<tr>
<th></th>
<th>Day</th>
<th>Month</th>
<th>Hour</th>
<th>Minute</th>
<th>Type</th>
<th>Subtype</th>
<th>Classification</th>
<th>Parish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td>-0.011</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hour</td>
<td>0.008</td>
<td>0.003</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minute</td>
<td>0.007</td>
<td>0.000</td>
<td>-0.019</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>0.050</td>
<td>0.016</td>
<td>0.013</td>
<td>-0.020</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtype</td>
<td>0.004</td>
<td>0.002</td>
<td>0.003</td>
<td>-0.004</td>
<td>0.020</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classification</td>
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<td>0.010</td>
<td>-0.009</td>
<td>-0.008</td>
<td>0.000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Parish</td>
<td>-0.002</td>
<td>0.005</td>
<td>0.007</td>
<td>-0.013</td>
<td>0.012</td>
<td>0.020</td>
<td>0.032</td>
<td>1</td>
</tr>
</tbody>
</table>

6.1 Methodology

Regarding the GIS methodology adopted, it was necessary to prepare the work with a set of layers and create a theme to match the expected distribution of parishes. Thematic maps showing the number of crimes or other metrics were aggregated using color palettes (darker for more crimes and brighter for less).

This method is widely used because it permits the analysis by county, to observe where the crime has been committed. However, although this is also a popular method, it is unlikely that crime is fair by Municipality (e.g. Lisbon) and it can lead to interpretations that do not correspond to reality.

The main reason is because the population density is different in each place. In this case, the use of ratios in the representation of colors would be the wisest choice.

This type of maps creates a jurisdictional conflict between the geographical areas and administrative delimitations (or jurisdictions), when they are different (as is the case of Lisbon).
On crime analysis, maps were initially created to show absolute values (recorded in 2009) by the Public Security Police (PSP) in Lisbon, according to the current structure of 53 parishes and the new structure of 24 parishes. This representation was the result of the geo-referenced crimes recorded in 2009 by 53 existing parishes. To represent the crimes according to the new administrative structure, it was necessary to aggregate data. The parish of Santa Maria dos Olivais, under the new structure will be divided into two parishes, giving rise to a new one, the Oriente.

In order to estimate crime values in these two parishes, it was necessary to divide the total between the old and the new area, multiplying the current area. The result was then subtracted from the old parish with a view to obtaining an estimated average value for this new delimitation.

It should be noted that these data could not be exact because a smaller area may have more or less recorded crimes. However, for research purposes, the method can be used, as long as properly referred.

Figure 3: Parish’s administrative division (actual and planning)

Analyzing crime data by the actual divisions and by the new ones, it seems obvious an increase in numbers (in part due to the aggregation of values recorded in several parishes that lead to new administrative area). Significantly, the low number of crimes in the small villages of the current division changed from the first to the last value class (when aggregated the new administrative division). The data shows a very large criminal density on Oriente, but the empirical knowledge of this area can tell us that most criminal incidents occur in its (old) aggregated neighborhood.

Next, the calculation of criminal density for the parish was made, dividing the total crimes per square Km in area.

Regarding criminal density, the new administrative division gives the perception of a decrease in crime numbers. However, this fact is in part related to the significant increase in the area of some parishes, thus reducing the density of crimes. In order to understand how it would be the spatial representation of crime according to the city’s population, it was created a criminal incidence rate, dividing the number of crimes by the population; the results were expressed in ‰.
The data used for the calculation was from 2001, the Population Census conducted by the National Statistics Institute (INE). It would be appropriate to use more recent values (for example the population in 2009) but it was not possible due to the fact that the census is made every 10 years.
When it comes to an evaluation of numbers, for example criminal incidence rates, the new administrative division gives the perception of a decline. The reduction is in part due to the significant increase in the area of some parishes and their residents, thus reducing the incidence rate of crime in certain districts of the new administrative division.

It is a well known fact that the southern part of the city, corresponding to the downtown district, correspond to an area that has the highest number of crimes, mainly because it is the center of major economic, financial and commercial activities. But also because it’s the main tourism “spot” in the city, which triggers criminal activity.

In order to achieve different perspectives when analyzing the crime results across the city, it was decided to make the sum of the resident population with the mobility of population (population that enter and circulate in the city like daily workers and tourists), in the sense that only by analyzing the criminal statistics according to the resident population of Lisbon, may be to overemphasize the intensity of occurrence. Assuming of course that a large number of resident population plus the other group may lead to higher crime rates. (Machado, et. al. 2007:138).

Figure 6: Ratio of criminal incidence per 1000 inhabitants in Lisbon

Looking at the crime rate with the local population, it is possible to observe the emergence of new parishes with a higher crime rates however, the maximum crime rate is much lower when compared to the representation only by the resident population.

Finally, it was created a spatial index based on crime incidence using spatial statistical tools. This type of operation should be performed at a micro scale of analysis, statistically equal to subsection (Martins, 2010), constituting the highest level of disaggregation corresponding to the block in urban terms (Geirinhas, 2001).

This index was calculated using a Geographic Weighted Regression (GWR) using spatial context of dynamic Gaussian Kernel. This operation uses the square root or log of the variables that are selected for analysis by smoothing the absolute values and approximating the curve of normal distribution in parabolic form, reducing disparities in the distribution (Longley et. al., 2005).
Figure 7: Ratio of criminal incidence per 1000 inhabitants and presents in Lisbon

Figure 8: Spatial index of criminal incidence per 1000 inhabitants (actual and planning)

The result is expressed in standard deviation units, which is repeatedly used as an index of risk (Harries, 1999). GWR provides a local model of the variable or process you are trying to understand.
by fitting a regression equation to every feature in the dataset. GWR constructs a separate equation for every feature in the dataset incorporating the dependent and explanatory variables of features falling within the bandwidth of each target feature.

The shape and extent of the bandwidth is dependent on user input for the Kernel type, Bandwidth method, Distance and Number of neighbors parameters. The dependent variable for the GWR index consisted on the criminal occurrences and as an independent variable it was used as the sum of the resident population with the mobility of population. It should be noted that this type of analysis can be a part of numerous independent variables of socio-economic development in order to identify a more realistic index. For studies with similar scales to parishes it would be appropriate but for larger areas it would be a difficult task for socio-economic values. It is also important to mention that this type of procedure (if used alone without performing a normalization of the variables) may generate incorrect analysis results (Harries, 1999) due to the fact that there are high levels of occurrence in areas with low population and this happens also with a cartographic representation of crime rates.

Looking at the previous representation and using the GWR operation, it seems obvious a reduction of higher values of distribution according to population, mainly in certain areas of the new administrative division.

7. Conclusions

Putting crime data into a GIS and create a map with a clear visualization and purpose is the starting point of many crime analysis. To extract information from data and to transform that information into knowledge is the primary objective of a decision-making process. But to draw a good map is always a challenging task. The importance of data quality is essential to obtain effective results but the precision of spatially referenced data is also crucial.

When faced with new administrative boundaries, a territory is confronted with a new spatial adjustment. And the social and economical dynamics are very fast and unexpected. When it comes to rearrange a mix of variables like policemen on the street, relocation of precincts and a lot of other variables, decisions are difficult.

The final results of this research can be vital to decide an effective police strategy. The decision to proceed with this new administrative scenario is so difficult as to decide about new ways to deal with this new territorial sketch. To decide what bases to consider and what technologies to adopt are also difficult choices.

In recent years, researchers and technicians have made huge progresses in harnessing the analytic capabilities of GIS to track crime patterns over time and then use this information to create predictive models. These advances turned GIS in a valuable tool to assist and support decision-making strategies for the police forces and security services.

Now that many law enforcement agencies have adopted crime mapping and have begun to produce the types of tools mentioned, they want more.

The demands for more sophisticated spatial analytic techniques lead to the research on predictive models to help the prevention of the “next crime”. The crime must be examined in the context of threats and taking into account assessment of the demographic, economic, social and environmental variables that could affect the criminal act. Just seeing the real threats and developing solutions using Geography, GIS and multivariate statistics analysis, we can analyze the current map of criminality.

The advanced spatial analysis came to identify crime patterns and vulnerable areas (in terms of insecurity). This type of research facilitates knowledge in order to take strategic decisions to combat the criminal phenomena. However, only at micro scale, the criminal data can be considered as useful to a strategic planning against crime.

Complementing spatial analysis of crime with the empirical knowledge of the historical and cultural components of a given territory, one may identify the reason for the occurrence of a particular type of crime in a given geographical area and therefore planning and resources in order to prevent and reducing it.
Nowadays, the level of spatial analysis and modeling techniques already permit the development of tactical planning strategies to fight crime. Data gathered in a form of information and properly worked can end up in an effective decision-support tool. And that can only be achieved by a combination of technology and human knowledge.

Univariate methods are limited when we try to understand the criminal occurrences; multivariate options are more reliable, with the inclusion of other variables.

For police daily work this kind of study is necessary to prepare and organize all the resources as well as to implement decisions.

Criminality is very complex and its remarkable dynamic nature is not easy to model with a simple multivariate statistic method. The help of sociologists and other specialized workgroups is also essential to choose the most correct and rigorous statistical models but also crucial to obtain reliable results. Geography gives the spatial coherence and GIS advances explore the true possibilities of spatial analyses.

References

Field Work With Older Users – Challenges in Design and Evaluation of Information Systems

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Abstract: This paper summarises experiences of empirical research carried out to evaluate information and communication technology (ICT)-based services that aim at supporting older people in independent living. Over the course of four years, we have explored several different ICT-based service concepts in field trials. The goal of the field trials has been to expose innovative ICT-based service concepts to the everyday life of older users through the adoption of services in real-life use. As a result, rich data about user experience and the value of the service for different stakeholders has been collected and analysed. Conducting the field trials has exposed practical issues about how to conduct research with older users. In this paper, the experiences are summarised. In addition, a conceptual framework for conducting user experience research is presented in order to understand the research approach that has been used in the individual case studies presented. The findings show that older participants differ from other user groups in several ways. Researchers faced challenges with research procedures during the field trials. These challenges were sometimes caused by their exploratory nature and the limited duration of the field trial; the participants of field trials did not always want to invest in adopting the services as part of their everyday routines, but instead restricted their use to testing technology and related services as objects isolated from their everyday lives. Often, this also led to situations where participants judged the value of the service to “someone else”, and were not willing to adopt it themselves.

Keywords: ambient assisted living, field trials, ageing technology users

1. Introduction

The ongoing change in demographics in Europe has triggered interest towards exploring the potential of information and communication technology (ICT)-based services in supporting the older population in independent living. ICT-based services have become common in everyday life, such as banking, shopping or information services. However, their adoption has been limited among older users. For example, only 28 per cent of European users aged from 55 to 74 use the Internet frequently (Eurostat 2010). Older users do not use online banking services (Pew research, 2010) as frequently as younger users. As digital services are becoming common, it is important that older people adopt ICT-based services into use. According to Bouma et al. (2009) “technology is the driving force behind changes in the daily environment” and if older users do not adopt ICT-based services, they will face problems in managing their everyday lives. According to Czaja et al. (2005), even functional independence in old age is increasingly dependent on the successful adoption of technology.

Future older users will have more computer experience than the current generation and thus, it may be easier for them to use and accept new ICT-based services. However, it does not solve the whole problem. It is inevitable that during the ageing process, challenges to our functional capacity will increase, including general vitality, mobility and motor skills, vision and hearing, and memory (Bouma et al. 2009). These changes will set new requirements, especially for easy learnability and interaction techniques. Also, it is likely that technology will continue to advance more rapidly than people age, which means that the technology of today will be very different from that which we will face when we are old. According to Eisma et al. (2003), it might be difficult for designers to fully understand the impact of age-related impairments to system use, and thus older users should have the opportunities to influence the design themselves. However, there are relatively few examples for older people’s successful involvement in system development (Eisma et al. 2003).

Evaluation is an integral part of the information systems development research process (Nunamaker et al. 1991). However, the evaluation of ICT-based services for older users is a topic that is less acknowledged. This study is inspired by the practical need to understand how to conduct qualitative field trials with older users. Field trials can be used to expose innovative ICT-based service concepts to the everyday lives of older users through the adoption of services in real-life use. This paper discusses how older people responded to field trials, and what we learned while conducting field trials with them. This paper contributes to the field of research by identifying a set of factors that should be
considered in study design, execution and data analysis. Also a conceptual framework for user experience research in field trials is presented in order to understand the research approach that has been used in the individual case studies presented. The findings will help researchers better understand the evaluation of ICT-based services with older users. According to Nunamaker et al. (1991), researchers are expected to provide information about the contextual and environmental conditions of their research to enable other researchers to judge the limitations of the conclusions.

2. Background

This chapter discusses previous research that is relevant for this topic. We have divided relevant research into three topics: (1) older people as technology users, (2) approaches to design, such as user-centred design and gerontechnology, and (3) an information systems approach to evaluation, and how this can be used to justify our evaluation principles in the form of an evaluation framework.

2.1 Older users and technology design

It is inevitable that as part of the ageing process, challenges to our functional capacity will increase. These changes include general vitality, mobility and motor skills, vision and hearing, and memory (Bouma et al. 2009). Thus, older people as ICT and service users have more variability in their physical, sensory, and cognitive functionality compared with younger user groups, and their abilities regarding these functionalities might decline significantly in older age (Gregor et al. 2002). In addition, they have more problems with their cognition and ability to learn new things. Older users often have multiple disabilities which hinder their system use more than just one individual impairment (Gregor et al. 2002). Besides the limitations in functional capacity, there are other things to consider; the needs and aspirations of older users may vary significantly and their ability to use a system might vary when moving from one use context to another (Gregor et al. 2002).

In systems development, the current research tradition promotes user-centred design (UCD) (also known as human-centred design), which is seen as a solution to design technology that is usable and accessible for all users (e.g. Newell et al. 2006). The basic steps of the human-centred design process are to understand and specify the context of use, specify the user requirements, produce design solutions to meet these requirements, and evaluate the designs against requirements (ISO 9241-210). UCD tradition has also been modified to better consider the challenges for older users. As an example, Gregor et al. (2002) have presented a new methodology called User Sensitive Inclusive Design, which aims at designing accessible user interfaces for older people with changing capabilities and needs. Eisma et al. (2003) have introduced the concept of Mutual Inspiration, which aims to make the interaction with older people more effective during the development of technology.

Gerontechnology (GT) is a multidisciplinary field of research which combines the disciplines of human ageing and technology. By definition, it is concerned not only with ageing people and understanding the processes of human ageing, but also about the technological environment where older people live (Bouma et al. 2009). Researchers have defined a GT research agenda which can help designers to identify the problem that they are attempting to solve and understand the use context of the technology better. The GT research agenda, which has been defined by Bouma et al. (2009), includes four goals and five life domains. The combination of these defines an impact matrix, which can be used to categorise technology products and services according to their impact on users’ lives. The four goals of design and research are 1) enhancement and satisfaction, 2) prevention and engagement, 3) compensation and assistance, and 4) care support and care organisation. Basically, these design goals suggest that technology should be designed to help older people to be in control of their own lives, to prevent and to compensate for functional restrictions, and to support the professional caregivers and care organisations. The five life domains are 1) health and self-esteem, 2) housing and daily living, 3) mobility and transport, 4) communication and governance, and 5) work and leisure. The GT impact matrix is presented here, because it illustrates the richness of the research area.

Eisma et al. (2004) have described their experiences of user involvement with older users in ICT development. They state that the details of interactions with older people should be carefully considered. In particular, the purpose of events and the role of the participants should be clearly explained in terms they fully understand, the terminology should be understandable, interactive prototypes or devices should be used whenever possible, and it is encouraged to have group meetings with a social aspect. They also mention that the expected usefulness of the device should
be clearly communicated to the users. Newel et al. (2006) have reported on the experiences of collaboration between academic and industrial partners. Their findings are based on the same project as Eisma (2004). They had faced challenges in persuading industrial partners to work together with older people when designing a portal for older users. In their results Newel et al. (2006) emphasise that time and patience is needed when designing for older users. They state that at the beginning of a project, both developers and clients have felt that the researchers exaggerate the difficulties that older people have in using computers, but their views changed significantly when they got an opportunity to work together with older people.

2.2 Information systems approach to evaluation

From a methodological viewpoint, observing the system use with case studies and field studies can be seen as one phase in the system development research process (Nunamaker et al. 1991). They state that “once the system is built, researchers can test its performance and usability as stated in the requirement definition phase, as well as observe its impacts on individuals, groups or organisations”. In the evaluation, it is important to use a conceptual framework and requirements that have been defined in earlier phases of the study to interpret and evaluate the test results. Nunamaker et al. (1991) present two approaches to evaluation; experimentation and observation. The latter refers to case studies, survey studies and field studies, which are often used when relatively little is known about the research domain (Nunamaker et al. 1991). “Because the research settings are more natural, more holistic insights may be gained and research results are more relevant to the domain under study” (Nunamaker et al. 1991).

Together with survey and laboratory experiment, the case study has been one of the three primary research designs in information systems research (Orlikowski and Baroudi 1991). Compared to the other two, it provides an approach for evaluating systems in real-life settings. The scope of the case study is defined as follows: “A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin 2009). Multiple methods of data collection are used to gather information and “the goal is to obtain a rich set of data surrounding the specific research issue, as well as capturing the contextual complexity” (Benbasat et al. 1987).

In our research, the basic objective of the studies has been to understand the user’s interaction with the technology and evaluate how the technology fits into users’ lives through understanding the user experience. Because user experience is context-dependent, it is recommended to study it in real-life situations (Roto et al. 2009). According to Steen et al. (2008), the field trial is a suitable method for gathering understanding of how people use the service or application in real-life situations, what the practical impacts of the service in the lives of the users are, how it should be improved and what its market value is. The basic data collection methods of case study research, such as pre and post-study interviews and observation can be used in the field trials. There are also many modern techniques that can be used to collect data in situ, some described, for example, by Consolvo et al. (2007).

2.3 Evaluation framework

This study analyses and discusses researchers’ experiences about evaluating user experience, technology adoption and impacts of new services with older users. In order to understand the findings, it is important to understand the research approach used in the background of most of the individual case studies.

The basic objective of the studies has been to understand the user’s interaction with the technology and evaluate how the technology fits into users’ lives. An holistic user experience approach is a suitable method for this, because it provides a generic framework for understanding technology use without narrowing down the research interests too much. There are many definitions of user experience (see e.g. Battarbee 2004, Hassenzahl and Tractinsky 2006, ISO 9241-210). Many of these definitions recognise three aspects that contribute to user experience: 1) the characteristics of the user, 2) the characteristics of the system, and 3) the use context. As user experience is a very context-dependent variable, the user experience approach allows researchers to select research parameters or areas of interest that match their practical need to solve the research question. In our studies, we have focused on the following parameters: ease of adoption, ease of use and perceived value.
A system’s ease of adoption is defined here as the system’s ability to be taken into use by end-users, i.e. how easily it can be integrated into users’ lives and adopted into continuous use. The adoption of new technology has often been recognised as being especially challenging for older users. Ease of adoption should be studied in its natural environment, i.e. where the users usually use the device (e.g. in their homes or office). In this way, it is possible to gather data about the users, the technology, its use environment and the actual use situation. When ease of adoption is studied, the focus is on how well the system integrates into users’ existing attitudes and behaviour. If the users need to change their attitudes, behaviour and practices (e.g. in order to take medicines more safely), the focus is on how well the system supports the behaviour change.

Ease of use of technology can be assessed by evaluating its usability. Usability is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 9241-11). Usability was recognised as being important, especially when the applications used were targeted for impaired users (e.g. the visually impaired), or the users were not familiar with using computing devices. Nielsen’s (1993) definition of usability includes multiple components: learnability, efficiency, memorability, errors and satisfaction. When usability is studied, the focus is on how well the users are able to learn to use the system, how well they are able to use it after the introduction phase and what kind of difficulties they face during use. In addition, users’ perceived ease of use might be of interest. This can be defined as “the degree to which a person believes that using a particular system would be free from effort” (Davis 1989).

We define value as something that is composed of the perceived, subjective experience of the user in interaction with the service and technology (Isomursu et al. 2010), therefore we use the term perceived value. The value is not determined by the functionalities of the service, but instead by the perceived benefit the user gets by using the service and the positive consequences and impact related to user’s own meaningful goals in life (Isomursu et al. 2010). Perceived value is determined by the end-user’s subjective evaluation of the technology’s advantages and related costs when he or she is using the technology in a certain use context. According to Kaasinen (2005), perceived value emphasises the definition of key features of the product instead of having a collection of useful features without providing enough value to a user as a whole. When perceived value is studied, the focus is on user’s expectations, and experienced benefits and costs.

3. Research methods

This chapter describes the individual case studies as well as the data collection methods of this study.

3.1 Description of the individual studies

Researchers’ experiences that are analysed and summarised in this paper are based on six case studies. The case studies explored different ICT-supported services targeted at older users, namely meal delivery services, grocery ordering services, wellness management, wayfinding, medicine management and video-assisted communication. In each of these case studies a new ICT-based service concept was developed and evaluated with older users. In addition, four researchers have previous experience from user research with younger users.

In the first case study, meal delivery services, a group of nine meal delivery service customers adopted a mobile service that provided them with a possibility to choose the meal they would receive the following day. The trial lasted from three to eight weeks, depending on the user’s starting time and rehabilitation periods or hospital stays. The trial setup and outcome is explained in more detail in Häikiö et al. (2007).

In the second case study, grocery ordering services, sixteen older people were provided with the opportunity to order groceries to their homes by touching NFC tag-equipped product cards using their mobile phones. The results are described in detail in Häikiö et al. (2010).

In the third case study, wellness management, introduced a daily life management service with a touch screen computer offering a calendar, exercise support, phone, games, diary and a web browser. The user group consisted of seven older users who each used the service for several months. The results are described in more detail in Muuraiskangas et al. (2010) and Muuraiskangas et al. (2011).
The fourth case study, *wayfinding*, evaluated a prototype for wayfinding support for older people both inside and outside within close proximity of a nursing home. The nine participants were given navigation aids using three modalities; visual, audio, and tactile. The results are described in more detail in Sorri et al. (2011).

The fifth case study, *medicine management*, introduced three different kinds of services for older users. First, an NFC-enabled PDA for medicine information retrieval was studied with eight older participants (more details in Isomursu et al. 2009 and Ervasti et al. 2011). Second, a PC-based application with a touch-to-speech user interface for visually impaired older users for identifying and consuming medication-related information was studied (more details in Harjumaa et al. 2011). The field trial was iterative, and involved a total of eight users at different phases of iterative trials. Third, an application for attaching audio information to everyday items, such as food containers and medicine packages, using a mobile phone and NFC-tags was studied with ten visually impaired users, including both older and younger users (more details in Konttila et al. 2012).

The sixth case study, *video-assisted communication*, explores an ongoing field trial which started in December 2010 and is planned to end in January 2012. In this context, a video-communication service is introduced for older users and their carers who are using the respite care services of a private service provider.

The common denominator for all the case studies was that the services were designed for older users and they aimed to provide information about user experience, adoption and impacts of new ICT-supported service concepts in real-world conditions.

**Table 1**: Classification of services evaluated in the case studies with the impact matrix of gerontechnology (GT) (matrix adopted from Bouma et al. 2009)

<table>
<thead>
<tr>
<th>LIFE DOMAIN</th>
<th>GOAL</th>
<th>Enrichment Satisfaction</th>
<th>Prevention Engagement</th>
<th>Compensation Assistance</th>
<th>Care support Care organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Health</td>
<td></td>
<td>Meal delivery, Grocery ordering</td>
<td>Medicine management</td>
<td>Wayfinding</td>
</tr>
<tr>
<td></td>
<td>Self-esteem</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Housing Daily living</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mobility Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication Governance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work Leisure</td>
<td></td>
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</tbody>
</table>

### 3.2 Data collection

The researchers’ experiences have developed over the course of four years from the research work of observing and interviewing older people, and planning and supervising the research work itself. For the purpose of this paper, we collected and analysed the experiences of six researchers who had been involved in the case studies.

The lead author of this paper has been the researcher responsible for data collection and analysis of fourth and fifth case studies. The second author has been the scientific supervisor of five of the six case studies. To complement their personal experiences, four researchers that were involved with the explored case studies were interviewed. The interviews were semi-structured theme interviews, where the following themes were discussed:

- Experiences of evaluating services with older users
- Practical issues that were considered before and during the study
- Description on how the user experience, adoption and impact were studied
- Challenges with the user, usage context and technology
- What the interviewees think they learned while conducting research with older users

The researchers interviewed were aged between 26 and 37. Table 2 summarises the background researchers whose experience contributes to findings of this paper.
Table 2: Summary of contributors

<table>
<thead>
<tr>
<th>Interview no</th>
<th>Gender</th>
<th>Age</th>
<th>Participation in analysed case studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>27</td>
<td>Medicine management</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>26</td>
<td>Wellness management, medicine management</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>27</td>
<td>Medicine management, wayfinding, video-assisted communication</td>
</tr>
<tr>
<td>4</td>
<td>Male</td>
<td>37</td>
<td>Meal delivery service, grocery ordering service, medicine management</td>
</tr>
<tr>
<td>First author</td>
<td>Female</td>
<td>30</td>
<td>Medicine management, video-assisted communication</td>
</tr>
<tr>
<td>Supervisor</td>
<td>Female</td>
<td>41</td>
<td>Medicine management, wayfinding, video-assisted communication, meal delivery service, grocery ordering service</td>
</tr>
</tbody>
</table>

4. Findings

In the following subchapters, we will discuss and summarise our experiences from conducting field trials with older users. We recognised two types of findings: (1) issues arising from characteristics of older users as a user group, and (2) issues arising from the research methods.

4.1 Older participants as a user group

Researchers who had previous experience of carrying out user research with younger users stated that older people differ from other user groups. Below, we discuss the observations the researchers made in working with older users.

4.1.1 Attitudes toward participating in research

In many research projects, researchers had experienced difficulties in recruiting older participants for the trials. Sometimes, older users refused immediately when they heard that participating would require them to use a mobile phone or computer without yet knowing what they would actually do with them. Also, we noted that the physical and health condition of the user had a significant influence on their willingness to participate: if they felt their physical or health condition was problematic, they often said they do not want anything extra in their lives, and did not want to participate. Sometimes the health conditions of a spouse also caused users to drop out of the research.

Because of the issues described above, we assume that voluntary participants often have more positive attitudes toward technology than the average older person does. Therefore, the results of studies carried out with voluntary older users may not be valid in a wider context. On the other hand, the positive attitude towards technology in general is likely to be one of the prerequisites of being an early adopter of technology supported services. Therefore, the voluntary users probably represent the users who would likely be early adopters of the studied services and related technology well.

Older users who participated in our research were very cooperative and had positive attitudes in general. Some users greeted the research as a welcome disruption and stimulation in their lives. This sometimes meant that the researcher visiting the home of a user needed to be prepared for social interaction, having coffee with them and discussing the news or personal issues. For these reasons, the interviews or other data collection exercises that required visiting older users at their home required generally more time than the researchers were used to with younger users.

4.1.2 Learning to use the technology

In all the case studies, the older users have learned to use new technology surprisingly well, even if they might have first doubted their own skills. We observed that many users were really happy when they were able to learn how to use new devices, and could provide useful information for the researchers. Users were often interested about the future of the research project; e.g. how many people have participated in the study and when the technology is going to be on the market.

The researchers felt that the research setting should be somewhat different with older users compared with younger ones. Introducing the new technology and teaching them how to use it has a more important role than with younger users, who are used to using new ICT devices and might take the technology for granted. Also, hands-on training was found to be an absolute necessity in all our cases. In particular, those applications that required learning new interaction mechanisms, such as
using a touch screen or NFC-based touch interface, required training where older users were able to try out the gestures and motions needed to accomplish the interaction goals themselves. In some cases, learning by showing, i.e. training where the older user observed someone else using the interfaces, were found to have a negative effect on learning, as the users tried to memorise and repeat the action sequences they had observed instead of interpreting and reasoning from the interface clues available.

4.1.3 Value proposal and perceived value

In many cases, the researchers stated that it was difficult to formulate a value proposal that would accurately predict and define what would bring true value to the lives of older users. The initial expectations of researchers about what value the technology and services could provide were not always correct. As an example, effectiveness and high performance were not often top of the list, because many users wanted to use the time for things that mattered to them. Many older users emphasised usefulness and cost-effectiveness instead. For example, in the medication management case, the researchers expected that increasing safety through supporting correct medication identification and dosage information would be highly valued, but the evaluation proved that the users did not feel they had problems in medicine identification or memorising dosage information, and therefore did not get added value from the service.

Often, the adoption of the service required the participation of care personnel, an informal carer or some other user group in addition to participation from the older users. In these cases, it became evident that it was essential that the service could provide value for all participating in the service process, i.e. value co-creation should be built into the service. For example, if care personnel were not able to create value for themselves, they were not motivated to participate. This created a substantial risk for the successful adoption.

Researchers felt that the attitudes of the older users are really deep-seated and difficult to change. It was very common for older users to consider ICT-supported services something “suitable for younger users”. They often stated that even though they do not need the service personally, it might be useful for someone else. Some of the services we explored were targeted at visually impaired users. Very often the users stated that the service would be beneficial for “someone who has poorer eyesight than me”, even though their eyesight was very poor. On the other hand, they also recognised that adopting a service while they can still see something would be much easier compared to when they had lost all eyesight.

4.1.4 Difficulties with terminology

The researchers found that ICT terminology is not familiar to all older users, and efforts should be directed at introducing the technology with clear, natural language familiar to older people. People might also have differing conceptions and misunderstandings about common technology-related concepts, such as “the Internet”, which has to be taken into account. In addition, some very common words, such as “service” or “application” (all words used as examples here have been translated from the Finnish by the authors) caused confusion, and had to be replaced with a more concrete word, such as “device” even though the target of the evaluation was not the device as a hardware construction, but the application and the service provided with the help of the device and the application.

4.1.5 Evaluating service concepts which have experimental components

As the service concepts we were dealing with were the results of research projects, they always had some experimental components. Sometimes the computing technology used was in a prototype phase, and the devices were integrated from several parts. These prototypes were fully functional, but they were not always aesthetically pleasing, or their appearance did not match the expectations of a fully commercial product. For example, we explored concepts based on the NFC technology. Ideally the NFC reader would be integrated into the mobile phone. However, at the time of the research project, suitable NFC-equipped mobile phones were not commercially available. Therefore, we had to do some testing with a laptop computer attached to an external NFC reader. The technical setup had a clear effect on user experience. For example, the users knew that a PC laptop computer can be used for a much wider range of things, and were disappointed because of the limited functionality we offered during the trial. They also evaluated the price of the service to be high, as they knew laptop
computers are expensive. Their expectations towards pricing had an effect on how useful they perceived the service.

Sometimes the whole service ecosystems required for a fully functional service was not available, or did not yet exist in the field trial, and the researchers had to simulate some parts of the service chain. It was noted that the participants always evaluated the whole research setup, including all hardware and software components and interaction with other individuals involved in the service delivery process, as well as the benefits they got from using the technology and difficulties they had with it. Interpreting the findings requires recognition of all parameters that affected the user experience and experienced value, and then analysing the results bearing those in mind.

4.2 Challenges with research methods

The research projects discussed here mainly involved long-term (several weeks to a number of months) field trials. In all trials, the methods used for data collection were designed to fit the specific conditions of each trial and the specific user group. Here, we discuss the experiences and findings observed with the selected methods and research procedures.

4.2.1 Recruiting users

It was usually difficult to recruit users who met certain criteria. The user organisations participating in the research did not always have enough information about their members, e.g. their living situation or the amount of medicine they use. Without prior information, the contact person at the user organisation has to know the criteria defined by the researchers and then contact each member and ask if they fulfill the criteria, and if yes, whether they are willing to participate in the research. Our experiences indicate that the role of care personnel was crucial in recruiting users. They already had an existing relationship, so the carer could evaluate the need for the service and willingness to participate, and the older person trusted the carer more than researchers that they had never met before.

It is a common problem that the health condition of the user changed during the field trial, which resulted in drop-outs or periods when the user was unable to use the service because of hospitalisation, for example.

A very common obstacle in recruiting users was that the users themselves did not think that they would belong to the target group of ICT-supported services. The first response from the majority of users was "Why are you asking me to participate? I am sure there must be people who are younger/smarter/more fluent with technology/with even worse eyesight/etc. than me you could ask.".

4.2.2 Collecting data about subjective experiences

It was a common procedure in the examined research projects that data about subjective user experiences was collected (1) at the beginning of the study using interviews and observations of first impressions and the process of learning to use the technology and service, and (2) interviews and discussions supported by storytelling after the research period. However, as the field trials typically lasted for a rather long period, usually a number of months, the researchers felt that data about user experiences evoked during the trial would be valuable. Storytelling at the end of the trial was found to be an excellent method for collecting information about subjective experiences, but the researchers had a feeling that it was rather selective, too.

Collecting information about user experience during use was seen as complicated. First, integrating data collection instruments into the everyday lives of older users was problematic. The user groups involved in the trials did not often have computers for reporting their experiences through web-questionnaires, or they were not familiar enough with computers to do that. We also had practical difficulties in paper-based methods, as some users had problems with hand-eye coordination, and writing with a pen was not easy for them. In addition, some service concepts were specifically targeted at visually impaired older users, who were not able to write with a pen. Second, we did not succeed in designing research instruments that could capture and present the essence of expressing subjective experiences for our users. For example, in one of the service field trials, the method chosen for collecting user experiences that arose during the field trial was a paper diary. The diary was very simple, and it asked the user to choose one of the smiley faces to describe if the experience
was pleasant or not, and provided an opportunity for written feedback or an explanation. Severe challenges with the paper-based diary were observed. Most users did not use it at all during the trial period. Our findings indicate that many had trouble understanding what experiences or events they should report in a paper diary. This is also supported by analysing the diaries of those users who used it. The content analysis shows that the users had difficulties in expressing their feelings or experiences towards the technology or the service. This became visible, for example, in diaries where users used the diary to describe if they were happy with the food they received.

The best methods for collecting data about subjective user experience during the field trial were based on observations or discussions where researchers visited the user and were able to observe the actual usage, and discussed their experiences with them. In some cases, these discussions were evoked by technical problems that triggered the user to call the researcher, who then visited the user, helped them to solve the problem and at the same time, discussed their subjective experiences. In addition, observations made by people that were closely interacting with the older users were valuable. For example, nurses or other formal care personnel, or family members of the older user often had discussions about subjective experiences and observed the use and were able to provide their interpretation of the experiences of the older user. In one case where we were observing older users with severe memory impairments, we had to rely almost completely on the interpretation of the care personnel, as the symptoms of the memory impairment both hindered their capabilities of expressing their experiences in a discussion, and had a strong effect on their behaviour. For example, the researcher who observed the usage of video-assisted services with people with severe memory impairments was not able to observe, recognise or interpret the responses of the users as well as the trained nurses who were responsible for the daily care of these users.

4.2.3 Quantitative data
Researchers stated that they have had difficulties in asking quantitative questions of older users (noted also in earlier studies, e.g. Eisma et al. 2004). It was observed that sometimes the older interviewees answered by randomly choosing some of the alternatives given by the researcher, even if it seemed clear to the researcher that the users had not understood the questions. This was a particularly difficult problem in research projects that involved repeating field trials in several countries, and for the sake of comparability across trials, quantitative questions were preferred.

4.2.4 Methods based on group activity
As many older people have decreased hearing ability, group situations (e.g. focus groups) were sometimes challenging, as the participants had difficulty in following each other. In addition, some researchers had observed that group situations did not encourage participants to express and discuss their personal age-related limitations. In some cases, we observed that participating in group activity emphasised differences in the living or health conditions of the users. For example, in one case the participants included several couples and one person who had lost her spouse, and the group activity seemed to make her more conscious of her loneliness.

In some cases, the older users who participated in research-related group activities bonded with each other as a group during the research period. This facilitated spontaneous interaction between users. Informal, face-to-face meetings where experiences were discussed were found to be an especially effective method for supporting interaction between users. However, care must be taken when designing these meetings, as we observed in some that the need and will for interaction was not as strong for all participants, and some might feel overwhelmed with contact requests of others.

Group-based methods were also found to be suitable, for example, in observing and collecting data about experiences of the primary user of the service (i.e. the older user) and his or her close friends and relatives. For example, group interviews or discussions where the spouse and grown-up children of the older user were present often turned out to be very rich in detail. The presence of familiar people stimulated discussions and insight that would have been difficult to elicit by a researcher who was a stranger to the user.

4.2.5 Informed consent process
Almost without exception, the researchers found that describing the research details necessary for signing an informed consent form has required them to explain the research details verbally in
discussion with the user. This was clearly necessary in cases where blind or visually impaired users were involved. However, with other older users verbal discussion was usually a preferred method over written descriptions of the research conditions. In some cases, a written description of the details of the research was presented to the users, but the researchers and nursing professionals involved in user recruitment noticed that the long, detailed written informed consent form scared some users away, and led to their refusal to take part in the research.

4.2.6 Sensitivity towards the changing conditions

It was not unusual that researchers had to change plans if the situation was not opportune for a meeting scheduled for an interview or other data collection meeting. As an example, if the participants were tired, their family members were not present, or participants seemed insecure or unwilling to participate, the meeting had to be rescheduled or cancelled. Sometimes, the participants became too tired to continue, and the interview had to be stopped and continued later. This requires sensitivity and constant evaluation of the situation by the researcher.

Researchers faced situations where the users thought about dropping out of the trial, even though everything seemed to be going fine. Sometimes it seemed that they just needed some assurance that they were doing fine and their contribution to the research was valuable. However, the researchers reported situations where they were not absolutely sure if they were giving that assurance or if they were pressurising the users. In these cases, the researchers usually proposed that the user should think about the issue for a while (e.g. a day) and then the researcher would come back to the issue. In addition, the users were always reminded that they were free to drop out if they wished to do so. It was quite common that the users were not sure if they were using the service as expected, so it could be a good idea to build some kind of feedback loop in during the research process to assure users that everything is OK and their contribution is valuable.

4.2.7 Integrating the service into the everyday life of the older user

A successful field trial requires that the users genuinely adopt the service into their everyday lives. In many field trials, we observed that the users did not really adopt the service and did not use it in their normal lives, but rather “tested” the technology as a separate object that had no role in their own lives. For example, in the case where we provided visually impaired users a mobile application that could be used for audio tagging objects in their home, many users used the application to write information on the tags, but seldom used the application for reading the tags. This indicates a usage pattern where the user just tries the functionality of the tagging application, but does not use it for actually recognising objects in their everyday lives.

One field trial, that one dealing with the meal ordering service, was a clear exception. All users adopted it and used it in their daily lives. None of the users dropped out during the trial. One explanatory factor for this might be that the service interface was clearly integrated into a more comprehensive service chain with other actors, i.e. the meal delivery kitchen and logistical process of delivering meals. Therefore, the users might have been more aware of the impact of their actions on other people, and therefore complied with the expected usage pattern. The compliance was much lower in field trials where the service use was solitary, i.e. it did not trigger any actions for other people or other actors in the service chain.

An interesting finding in some cases was that even though the users themselves reported that they did not use the service much, the log files actually indicated quite frequent use. We do not have a clear explanation for this behaviour. This became especially evident in the case of medication management. In this particular case, one explanatory factor might be that the users did not want the care personnel to know they experienced problems with medication management, as this could mean that the care personnel would take over the management of their medication, thus leading to reduced independence. Other reasons could be understating their own contribution; for example, assuming that the researchers expected even more frequent use, or that their evaluation of the service or expressions of experiences did not match the expectations of the researchers.

5. Discussion

This study was inspired by the practical need to know how to conduct qualitative field trials with older users. The approach was explorative and concentrated on analysing the older people’s responses to qualitative field trials from the researcher’s point of view. The findings show that there are many things
that could be considered before the trial and in the design, execution and data analysis. We summarise the most important findings in Table 3.

**Table 3: Summary of our learning**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the study</strong></td>
<td>Special care should be directed towards ensuring that the service value proposal matches the value expectations of older users. Our experience shows that a researcher or a designer’s perspective of value may not reliably predict value expectations of older users. If help from the caregivers is required, ensure that the service provides value for them. Our experiences show that without perceived value, the caregiver’s contribution for successful adoption is jeopardised.</td>
</tr>
<tr>
<td></td>
<td>Be creative in recruiting users, and use the help of peers and social networks of older users in recruitment.</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td>Be prepared for drop-outs. Some participants might drop out because of their health condition or changes in living conditions.</td>
</tr>
<tr>
<td></td>
<td>Pay attention to the design of data collection instruments that integrate well with the everyday lives of the users. Use the help of people who interact with the users in everyday life to collect observations about usage.</td>
</tr>
<tr>
<td></td>
<td>Make sure the informed consent procedure does not overwhelm the users, and provides all necessary information. Spend time discussing and explaining the content of informed consent, if possible.</td>
</tr>
<tr>
<td><strong>During the study</strong></td>
<td>Use hands-on training to introduce the technology and collect information about ease of use.</td>
</tr>
<tr>
<td></td>
<td>Investigate the possibility of using care personnel, family or other people in frequent contact with the older user in data collection and interpretation of the findings.</td>
</tr>
<tr>
<td></td>
<td>Give constant and frequent feedback to the users about how the trial is progressing.</td>
</tr>
<tr>
<td><strong>Data analysis</strong></td>
<td>Recognise that various context parameters may influence the results (e.g. the Hawthorne effect).</td>
</tr>
</tbody>
</table>

Many of these findings have also been reported in earlier studies. Kayser-Jones and Koenig (1994) reported that in some cases, the participants may participate because of the social interaction it provides them with, which might have an effect on the results. It has also been found that personal visits from researchers keep users interested and help them to develop loyalty to the project (Eisma et al. 2004). Older people can be reluctant to complain or to criticise products (Eisma et al. 2003). Lindley et al. (2008) pointed out that many new technologies are often based on quite simple assumptions, and a more complex reality is faced in the deployment of technology.

### 6. Conclusion

Today, a great deal of effort is directed at developing ICT services to increase the well-being of older people. To properly evaluate their impact, one needs to evaluate how the older people interact with the technology, what value it brings to them, and how well they are able to adopt it into their everyday lives.

User research always requires sensitivity to recognise and respond to the personal characteristics and the needs of the users. As ICT has traditionally been developed for adult users, the methods and practices for working with more wide-ranging user groups are still emerging. We hope that these findings are valuable both for researchers and companies developing new services for this emerging and challenging market.

The findings presented in this article describe the experiences of the researchers who have worked closely with older people in field trials that are targeted at technology evaluation. The objective of the findings is to explore how to conduct field trials with older users, and thus to improve the study design, the execution of field trials and the data analysis. Our goal is that this would lead to more valid evaluation and better ICT-based services for older users. Even if many limitations have been identified and suggestions for improvements have been made, it should be noted that it does not mean that working with older people is not worthwhile. On the contrary, we have discovered that field trials are essential in two roles. First, they provide design feedback that cannot be obtained in
laboratory conditions or without the involvement of all user groups. Second, the value proposal for all stakeholders cannot be validated without true implementation of the service concept and first-person experience of value. Therefore, we think that field trials are necessary in developing services for older users.

Acknowledgements

The research presented in this paper was funded by VTT Technical Research Centre of Finland, TEKES and Ambient Assisted Living (AAL) Joint Programme (the HearMeFeelMe and WeCare projects). We would also like to acknowledge the valuable contribution of the older users who took part in the field trials, the formal and informal caretakers who supported us in this research, and the researchers who conducted the field trials and took part in the interviews.

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Management of Information Systems Outsourcing: Evaluation of Lessons Learned From a Boundary Spanning Perspective

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Abstract: Even if outsourcing is a well-researched phenomenon, it can be stated that evaluation studies on IS outsourcing relationships are scarce. From a description of two IS outsourcing relationship cases, a set of lessons learned are presented. A boundary spanning perspective is then used when evaluating these lessons learned in the client-supplier outsourcing relationships and thereby adding a “new” theoretical perspective on outsourcing relationships. The evaluation is concluded in a set of propositions that present the boundary spanning perspective of the lessons learned. The aim of these propositions is to act as both a guiding tool for how to further develop boundary spanning roles in outsourcing relationships and to act as a base for future research on outsourcing relationships.

Keywords: boundary spanning, IS outsourcing, relationships management

1. Introduction

Outsourcing of various firm processes has been increasing and still increases (Beasley, Bradford, & Dehning, 2009). Lacity and Willcocks (2001) claim that organisations have realised the benefits of outsourcing such as the ability to focus on core competencies, achieving reductions in human resource costs and flexibility in tapping into technical expertise when needed. At the same time, access to global markets and commercial exploitation are mentioned as strategic drivers for outsourcing (Beverakis, Dick, & Cecez-Kecmanovic, 2009) and maturity in the outsourcing market resulting in outsourcing to a high extent becoming part of firms’ strategic initiatives (Ravi, 2008). It can be stated that outsourcing has been especially evident in the area of Information Systems and Information Technologies (IS/IT). A survey published by KPMG (2007) showed that 99% of the firms surveyed planned to maintain or increase their current IS/IT outsourcing level. Gonzales, Gasco and Llopis (2010) reported a global market growth with an average of 6.3% in the year 2008. In this research, IS outsourcing refers to a relationship where a firm contracts out or sells IS assets, people and/or activities to a supplier. The supplier provides and manages these assets and services for monetary returns over an agreed time period (Kern, 1997). Although IS outsourcing has experienced a dramatic growth, it can be stated that reports on lack of success make it interesting to study conditions determining successful outsourcing. To reach successful outcomes, the necessity of having better management practices has been pointed out (Gonzales et al., 2010; King & Torkzadeh, 2008). However, it is unclear what these “better management practices” in a client–supplier relationship should deal with. As stated by Lacity, Khan, Yan and Willcocks (2010), there is a need for more research with a relationship perspective in IS outsourcing research. IS outsourcing relationships face numerous challenges in developing and delivering software services across firm boundaries. Given the critical role that IS outsourcing relationships play in integrating business and technical knowledge at the client-supplier boundary, it is important to understand the challenges that they face and to identify mechanisms that enable firms to overcome these barriers to effectiveness.

In this paper, lessons learned from an investigation of two IS outsourcing relationships are shortly presented. It can be claimed there exists a need of having better management practices to have success in IS outsourcing. However, as stated above, it is unclear what this better management should consist of. To be able to say something about this, we evaluate lessons learned from a boundary spanning perspective. The evaluation of lessons learned assist us when suggesting propositions on how to deal with challenges that the identified lessons learned suggested. This research aims at contributing to the knowledge base on management of IS outsourcing by addressing management of IS outsourcing in a client–supplier relationship from a boundary spanning perspective. The research describes two IS outsourcing cases that differ in activity outsourced, IS development versus IS maintenance and operation, and IS relationship composition. From evaluating the lessons learned, we go
beyond just telling the story and give a richer description of how identified challenges could be dealt with in search of a better management practice in IS outsourcing relationships.

The remainder is structured as follows. The next section first presents the research design and thereafter the two cases of IS outsourcing relationships. The presentation focuses on features of each case, such as the activity outsourced and the relationship. Section 2 then ends with presenting challenges and lessons learned from the two cases. In section 3, the boundary spanning perspective is presented and this perspective is used to analyse lessons learned. The section ends with a set of propositions for the management of IS outsourcing relationships. The propositions are discussed and are connected to the presented lessons learned. The final section presents some conclusions and suggests further research in the area of IS outsourcing relationships.

2. The IS outsourcing relationships and the lessons learned

In this paper, we describe two IS outsourcing relationships: case DevMen and case MainOp, see Figure 1. Case DevMen focuses outsourcing of IS development (ISD), whereas case MainOp focuses outsourcing of IS maintenance and operation. Empirical data for these cases has been collected through semi-structured interviews with representatives from the client firm, the supplier firm and the supplier’s offshore site. In total, 35 interviews were conducted from June 2010 until early 2011 – 20 interviews for case DevMen and 15 interviews for case MainOp. The interviewees represented the business level, process level and systems level of included firms. Among those interviewed were business unit managers, heads of customer management, line managers, one ICT manager, one system manager, system designers, one service desk manager and IT/IS specialists. Each interview lasted between 1½ to 2½ hours. In addition to the interviews, documents describing the outsourcing relationships have been included. These documents have primarily been used for verifying statements from the interviewees but also as complementary sources to the interviews, which is in line with what Yin (2009) describes as data triangulation.

The lessons learned, presented below, come from a qualitative data analysis inspired by the technique of open coding (Strauss & Corbin, 1990). The data generated by interviews and documents were examined and coded by focusing on the interviewees’ experienced challenges associated with their respective outsourcing relationship. Data quotes were coded, ordered in units, rearranged and then categorised in themes. The results are thus grounded in data rather than imposed by theory.

Both the client firm and the supplier firm are firms within telecommunication equipment and services. They have experience with outsourcing and have both national and international outsourcing relationships. The supplier firm, the focal firm in the research, has a well-developed outsourcing process, which contributes a common way of working with outsourcing. The following descriptions focus on activities outsourced and features of the outsourcing relationships. Due to confidentiality, the firms included are not mentioned by their real names.

Figure 1: The DevMen and MainOp case – organisations and roles
The IS outsourcing relationship, the DevMen case, is built upon three parties, i.e. the client firm, the supplier firm and the supplier’s offshore site. The client firm and the supplier firm are located in Sweden, whereas the supplier’s offshore site is located in the Czech Republic. The DevMen case involves two phases: first the IS outsourcing and then the “offshore insourcing”. The MainOp case involves the “offshore insourcing”. This means that there is an overlap of the cases when it comes to involved parties as shown in Figure 1, however, the two cases deals with two different systems/activities outsourced.

In the DevMen case, the client decided in 2002 to outsource management, maintenance, development and support of one of its IS. This specific IS is a correction and maintenance system, which is employed by the client’s end-users and the client’s clients for trouble reporting on the client’s products and equipment. It is stated to be a business critical IS and it has to be available 24 hours a day, 7 days a week.

Until early 2009, the outsourcing relationship was represented by two parties: the client firm and the supplier firm’s onshore site in Sweden (the IS outsourcing in Figure 1 – the DevMen case). In 2009, the supplier received requirements on cost reductions, which resulted in maintenance, development and support being outsourced to the supplier’s offshore site in the Czech Republic, also involving the “offshore insourcing” in Figure 1.

Offshore insourcing is defined by Bergkvist and Fredriksson (2008) as a special case of outsourcing when the supplier/client outsources work to an affiliated firm. However, the IS management was kept at the supplier’s onshore site. As a result, the relationship increased to include three parties, the client, the supplier’s onshore site and the supplier’s offshore site. This specific IS outsourcing arrangement is referred to as two-stage offshoring (Holmström Olsson, Conchúir, Ågerfalk, & Fitzgerald, 2008), i.e. offshoring through domestic suppliers with offshore employees. The DevMen case focuses on issues related to outsourcing the development of the IS. To manage development related issues, interfaces were established between the client and the supplier’s onshore site and between the supplier’s onshore site and the supplier’s offshore site, used as communication channel(s), creating a single point of contact for specific competence areas.

These interfaces are used on a daily basis, as development activities are conducted in an agile way of working, where the management team and the development team meet virtually each morning during the daily stand-up meeting (see e.g., Kniberg, 2007). Almost every team member at the supplier’s onshore site communicates now and then with the IS owner. The communication relates to, for example, end-users’ and client’s requirements and requirement analysis.

The relationship case, MainOp, involves the “offshore insourcing” as shown in Figure 1. The supplier is located in Sweden and the supplier’s offshore site is located in the Czech Republic.

The MainOp case includes the maintenance and operation of a part of the supplier’s technical infrastructure. The technical infrastructure can be described as a business specific support process, which is divided into three parts: first line support, second line support and third line support. First line support solves more simple and routine based errands such as password problems. Second line support manages infrastructural problems related to servers and workstations for example. Complex problems and changes, such as further development of the technical infrastructure, are managed by the third line. The third line also helps end-users with the set up of IT environments for specific projects. Thus, the first and second lines manage more routine based IS operations and the third line manages more specialised maintenance work. In the autumn of 2009, it was decided that the first and second lines should be outsourced to the supplier’s offshore site in the Czech Republic. Among the reasons mentioned were: a harmonised way of delivering services, reduction of costs, better utilisation of capacity and better service follow up. The main reason for going offshore was that the affiliated firm already had processes established for the kind of business required. Consequently, necessary competence was available immediately.

To manage the support process, interfaces between the onshore and offshore site were created. In addition, interfaces at the offshore site were also created between different competence areas at the second line, as well as between the helpdesk (first line) and different competence areas at the second line.
2.1 IS Outsourcing relationships: Challenges and lessons learned

Outsourcing, particularly offshore, brings geographical limitations, cultural differences, time differences and difficulties in verbal communication. This is described by Edwards and Sridhar (2005) as reasons for why unstructured and business specific activities, such as requirement analysis, are recommended not to be offshored. In the DevMen case, these were stated as reasons for keeping IS management at the onshore site. This resulted in activities such as requirement analysis and systems management still being managed at the onshore site. Relating this to what the literature recommends, this was an appropriate decision. Reasons for keeping IS management onshore could be explained by for example the complexity of the IS and the members’ deep knowledge on the client’s business processes and way of working (Vlaar et al 2008). A system manager at the supplier’s onshore site described the complexity by saying:

“It is not only about knowing the product and its code but also about processes and the client’s way of working. [...] The product is complex and it is difficult to understand what it is really used for.”

This is confirmed by a system designer at the supplier’s offshore site who stated “it was difficult to understand the IS from the beginning.” The designer continued “It is hard to learn the system and to find code quickly. Some parts are difficult and you have to read much documentation to learn how the system works.”

The result from this was that the onshore members had to write detailed requirement specifications and requirement analyses before they were handed over to the offshore site. The explanation for keeping IS management onshore can also be related to the close and informal business relationship between the client and the supplier’s onshore members. The IS owner at the client firm described the relationship:

“It is completely perfect, I do not think you can have a better relationship. We trust each other and we always try to fulfill each other’s requirements and wishes.”

An unreserved client–supplier relationship, the onshore members’ deep IS knowledge, and the difficulty of outsourcing business knowledge are thus reasons for keeping IS management onshore, i.e. in the same country as the client. This story illustrates the difficulty of outsourcing business specific activities and business knowledge. A lesson learned from the DevMen case is that when outsourcing business specific activities that require deep business knowledge, these activities should be kept in-house or onshore.

The decision in the DevMen case of moving maintenance, development and support to the supplier’s offshore site resulted in two teams geographically dispersed from each other, one team in Sweden and one in the Czech Republic. The onshore site team members spoke of the importance of having a leader at the offshore site that felt great responsibility towards the client and the outsourced product. The system manager at the onshore site explained:

“You must have a strong person [at the offshore site]. If the team does not have a leading figure it will be extremely difficult.”

Even though team members at the offshore site rarely spoke with the client, they mentioned a feeling of responsibility for the product. The team members relied on their leader and they had confidence in their leader. This was not just a result of the style of leadership but also a result of technical knowledge; their leader could answer most of their questions. A system designer at the supplier’s offshore site described the importance of a leading figure as:

“It is important to have someone who is really skilled in the offshore site; somebody with technical skills, developing skills and also communication skills.”

A strong leader was mainly mentioned as an advantage, however the onshore team experienced some challenges connected to having a strong leader at the offshore site. One challenge was experienced during the daily morning meetings. Each team member at the onshore and offshore site should say something in relation to: what has been done since yesterday, plans for today and problems that prevent future work (Kniberg, 2007). In reality the leader of the offshore site became the offshore team members’ spokesman. The line manager at the supplier’s onshore stated:

“During Scrum meetings the idea is that everyone should say something. This was very difficult. It felt as if we had to point. It became better and better but it was difficult. They wanted to speak through their leader.”
This was experienced as a problem since the onshore team had difficulties in assessing the continuous work at the offshore site. The team members kept a low profile and the system manager at the onshore site pointed out: “Often we had to pull out information about status and their feeling, if everything was ok or not.” The offshore team members’ silence could be a result of having a strong leader but it could also be explained as a cultural matter. Czech management culture is recognised by a hierarchical approach. The line manager at the supplier’s onshore site experienced “that it was extremely hierarchical, the leader was guru and the other did not dare to say anything.” A system designer at the offshore site explained their silence and the Swedes desire to talk as a cultural difference by saying:

“One cultural difference is that Swedish work climate is more open and friendly and people are more involved in discussions and meetings. We do not ask so many questions which is also visible during Scrum meetings. Here we discuss problems before the Scrum meeting and then take a note or mention it during the Scrum meeting.”

From this, two things could be learned. First, the importance of having a leader at the offshore site, a person that has the ability to guide the receiving team in the right direction. This research shows that problems may follow with having a strong leadership. However, it is assumed that the advantages outweigh the disadvantages. Second it is important to be aware of each other’s cultural differences in order to better understand different ways of working and behaviours.

The “offshore insourcing” in the DevMen case resulted in the outsourcing relationship consisting of three parties. The supplier’s onshore site and offshore site should however act as one towards the client. The line manager at the supplier’s onshore site mentioned the importance of creating a team and a feeling of ‘we’ instead of ‘we and them’:

“Our main focus was on how we should perform work: we should work with scrum, we should meet. We should be a team with good communication. We should work together and meet face-to-face as often as possible.”

Besides the possibility to meet face-to-face during the knowledge transfer, the agile way of working was mentioned as contributing to a team feeling. Agile methods promote daily meetings and short development cycles (Lindstrom & Jeffries, 2004), which have facilitated the activity of getting to know each other. One system designer at the offshore site mentioned strengths with the relationship: “We respect each other, the relationship is friendly and we try to respond to each other as soon as possible.” A lesson learned from the DevMen case then is that agile methodologies, such as Scrum, are preferable when development is conducted by geographically dispersed teams.

In the MainOp case, members at the third line support mentioned the problem with work tasks (tickets) going ping-pong between the second and third lines. The ICT manager at the supplier’s onshore site described this by giving the following example:

Say that a ticket passes the first and second line and arrives to us at the third line. We look at it and assess it as a ticket that should have been managed at the first or second line. As a result, we send it back with a note saying something like: this you ought to have managed. And then the ticket comes back to us with the message: but we have not received any instructions.

The underlying cause for this problem with sending work tasks back and forth is believed to be related to the non-existence of clear and written specifications for what should be solved at the second and third line respectively. The Unix specialist at the supplier’s onshore site requested “an explicit definition of which services should be transferred and which should be kept onshore.” When support concerns a business specific infrastructure, as in this case, the importance of instructions becomes even clearer, as pointed out by both the second and third line. The Unix specialist at the offshore site described the technical infrastructure as being one of the biggest and strangest he had ever worked with. The specialist’s words were: “Because it is not standardized, because it was built during many years by only a few persons. They have done it by themselves and everybody had everything in their minds.” This makes instructions necessary for knowing what should be solved at the second and third line. From this, two things could be learned. First, it is essential that actors at both the sending firm (in case MainOp the sending firm is the same as the supplier’s onshore site) and the offshore site have a common understanding of what each party is intended to manage. Second, the business processes and the set up of technical infrastructures need to be documented so that the offshore site can manage their part of the agreement. This is particularly important when the outsourced activity is tailor-
built. Consequently, it is recommended that an outsourcing knowledge transfer should include work packages for documentation, the creation of formalised instructions and hands-on training.

Other challenges in the MainOp case are related to differences in ways of working. The supplier’s offshore site, which manages first and second line support, is referred to as a factory, supporting several clients. This means that the work processes have similarities with industrialised, routine based work. The first and second lines support a range of different clients but how it is done does not differ. The outsourcing coordinator at the supplier’s offshore site summarised the challenge of different ways of working as:

“The way of working in Sweden is very, very different from way of working here in [the offshore site]. Basically it is about that in Sweden the support was in a very customer oriented way, very tailored way, it was not so much based on processes, it was based basically on a very close relationship towards the customer and there was a dedicated team for the support. This is something that we do not have in [the offshore site]. This is a big service center, and it is a very process and rigid directed way of working, strictly based on processes. It is more like a factory so to say. I guess that a lot of people in Sweden were surprised how we work and how we organize our work. So this is more or less the big difference between the [offshore site] factory approach and this very customer oriented approach in Sweden. This was the main challenge during the outsourcing preparations”.

From this it can be stated that IS outsourcing should be preceded by an examination of involved parties’ way of working so that differences not will be a surprise when outsourcing becomes actual.

During outsourcing, the need of communication channels came apparent. Team members at the third line of support experienced the necessity for single point of contact to facilitate the communication between the second and third lines of support. The Unix specialist at the supplier’s onshore site said:

“Channels of communication are important for knowing with whom to communicate. It does not have to be a personal relation but communication must be easy. For example if I want to share information with a group of people I can use this communication channel. Then I know that the information has received the other ones. The communication channel can be informal or formal; the main thing is that communication is easy”.

Through a single point of contact, it becomes possible to share information between different teams through one person. Thus, communication channels, such as a single point of contact, are believed to facilitate problems related to information and knowledge sharing. However, the team members at the first and second lines of support did not mention any problems connected to communication and information sharing. Explanations are related to the fact that they received answers to most of their questions and if they did not, unmanaged tickets were passed on to another competence area or to the third line. From this, it can be stated that communication channels for information and knowledge sharing are important in outsourcing relationships.

Another finding from the MainOp case is that employees from the third and second line differ in their mentality towards their client, i.e. the end-users. It is stated that third line support always strives for satisfied end-users and that is why they help the second line when needed: if they did not, the end-user would suffer. For the second line, on the other hand, the end-users are quite unknown and that is why their motivation is related to the business agreement rather than to satisfied end-users. The outsourcing coordinator at the supplier’s offshore site explained it as: “We miss this very close relationship with the customer. […] We really make it work based on service level agreements.” Thus, people at the second line do their work according to what is written in the business agreement. One explanation for this is that the second line supports a lot of different clients and end-users. From this it, can be recommended that expectations should be discussed during outsourcing preparations to avoid misunderstandings later on. One lesson learned from the MainOp case is that not only representatives from the business level should be part of the preparations, but also representatives from the system level and process level, to be able to learn more about each other.

Lessons learned from the DevMen and the MainOp cases are summarised in Table 1. They are then discussed from a boundary spanning perspective in the next section.
Table 1: Summary of lessons learned from the DevMen and MainOp cases

<table>
<thead>
<tr>
<th>Lessons learned</th>
<th>Main source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Keep IS activities that require deep business knowledge in-house or onshore</td>
<td>DevMen case</td>
</tr>
<tr>
<td>2. Make sure to have a strong leader at the offshore site</td>
<td>DevMen case</td>
</tr>
<tr>
<td>3. Learn about differences in organisational culture during IS outsourcing prepa-</td>
<td>DevMen case</td>
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<td>ration</td>
<td></td>
</tr>
<tr>
<td>4. Adopt agile ways of working to facilitate cooperation and the feeling of</td>
<td>DevMen case</td>
</tr>
<tr>
<td>working as one team in geographically dispersed teams</td>
<td></td>
</tr>
<tr>
<td>5. Make sure that actors at both the onshore site and the offshore site have a</td>
<td>MainOp case</td>
</tr>
<tr>
<td>common understanding of each party’s expectations and responsibilities ac-</td>
<td></td>
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<tr>
<td>cording to the IS outsourcing agreement</td>
<td></td>
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<tr>
<td>6. When outsourcing tailor-built IS, detailed IS specifications should be included</td>
<td>MainOp case</td>
</tr>
<tr>
<td>as part of the knowledge transfer</td>
<td></td>
</tr>
<tr>
<td>7. IS outsourcing should be preceded by an examination of involved parties’ way</td>
<td>MainOp case</td>
</tr>
<tr>
<td>of working</td>
<td></td>
</tr>
<tr>
<td>8. Established communication channels for information and knowledge sharing</td>
<td>MainOp case</td>
</tr>
<tr>
<td>are crucial during IS outsourcing relationships</td>
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</tr>
</tbody>
</table>

3. Evaluation of lessons learned from a boundary spanning perspective

In this section we evaluate the lessons learned from a boundary spanning perspective and compare these to literature on outsourcing. The results of the evaluation are some concluding propositions which are discussed in the final conclusion section. The boundary spanning perspective has a potential in describing outsourcing relationships as described by Du and Pan (2010). They define boundary spanners as someone who operates at the periphery of an organisation. This is similar to the definition given by Das Aundhe, George, and Hirschheim (2011). They describe boundaries as a defining characteristic of organizations, and that the linkage between the organization and its environment is operated by boundary roles in the form of individuals that could be called boundary spanners. According to Aldrich and Herker (1977) there are basically two functions performed by boundary roles: information processing and external representation. The information processing role is described as dealing with information overload. The basic thought about the information processing function is that it should be able to select information acting as both filters and facilitators. As stated by Aldrich and Herker (1977), the information processing function of a boundary role decides an organisation’s ability to adapt to environmental contingencies. However, it is dependent on the expertise of the boundary role incumbents and the success in selecting, transmitting, and interpreting information. The external representation function is then related to how an organisation responds to environmental influence (Aldrich & Herker, 1977). Aldrich and Herker (1977) describe three different ways for dealing with environmental constraints and contingencies: first, by an internal structural differentiation match patterns of relevant information; second, by gaining power over relevant elements in the environment, and from that manipulating it so that it conforms to the organisation’s needs; and third, a compromise position which means a modal pattern of use of boundary personnel. In summary, it can be said that individuals’ technical and communicative abilities constitute the organisation’s boundary-spanning capability (Du & Pan, 2010).

It can be stated that IS outsourcing relationships face numerous challenges in developing and delivering software services across firm boundaries. This is especially the case in the context of information systems development. Fisk, Berente, and Lytinen (2010) state that a persistent problem in the IS development context is the different parties’ different knowledge. They also state that this boundary problem hinders project success and they claim that boundary spanning significantly affects IS development success. Das Aundhe, George, and Hirschheim (2011) report that studies on characteristics on boundary spanners demonstrate it to be very difficult to build inter-organizational relationships in the absence of boundary spanners. According to Levina and Vaast (2008), the boundaries are related to lack of shared economic, intellectual, social, and symbolic resources. To deal with these boundaries, it can be said that boundary spanners are necessary, but it can also be said that they need to be developed to deal with a specific set of tasks. This is described in a set of propositions that aims at shaping future research but also as guidance for how to think about IS outsourcing relationships. The rest of the text connects lessons learned to suggested propositions. The connections are then showed in Table 2.

The first lesson (Lesson 1) states that organizations should “Keep IS activities that require deep business knowledge in-house or onshore”. To some extent this could be compared to the discussion around focusing on core competence when deciding on outsource or not (Johansson, 2007) as well
as what to outsource (Aalders, 2001; Dewire, 2001; Kakabadse & Kakabadse, 2002). However, from the findings of the case it is quite clear that the outsourced activities were not part of their core competence. Despite that the empirical data suggested that outsourcing from the knowledge perspective could be problematic, which indicates that knowledge exchange on activities that require deep business knowledge is of importance, even if the activity not could be seen as a core competence. From this proposition 1 could be formulated in the following way, **Proposition 1:** IS activities that require frequent face to face interaction and deep business knowledge should be kept in-house if the boundary spanner role that deals with the information overload not are present at either of the organisations in the IS outsourcing relationship.

From the reading of proposition 1 it can be concluded that if there exist boundary spanners at both the client and the supplier site then activities which requires deep business knowledge could be outsourced. However, analysing this from lesson number 2: “Make sure to have a strong leader at the offshore site” as well as lesson number 4: “Adopt agile ways of working to facilitate cooperation and the feeling of working as one team in geographically dispersed teams”, the following can be claimed. The boundary spanners at both sides have an important role in providing both sides with relevant information. To do so they need to be able to deal with an information overload situation. However, to deal with the information overload there is a need to decide on what information the different actors in the relationship are dependent on, which, if not totally clear, according to Shao and David (2007), could be one reason to remain onshore. On way of dealing with the huge amount of information that needs to be exchanged could according to Kussmaul (2010) be to adopt an agile way of working, however, this also means that the boundary spanners need to support new ways of working. This discussion can therefore be summarized in **Proposition 2:** An extensive boundary spanner role is crucial when developing new and immature outsourcing relationships with non-established processes for ways of working.

This can then be related to the statement by Holmström Olsson et al (2008) who state that when establishing new offshore relationships, designers need to be trained extensively. But, also statements by Kussmaul (2010) who concludes that an outsourcing relationship should start with a small distributed team that grow over time. This could be seen as one way of learning about differences between the client and the supplier organization. This is in line with lesson 3 that state: “Learn about differences in organisational culture during IS outsourcing preparation”. One reason for why it is necessary to learn about each other is that it can be said it is necessary for the success to have an extensive boundary spanner role in place. In other words; to be able to develop this extensive boundary spanner role, it can be suggested that there is a need to examine organisational culture in depth and that it should be done before the implementation of the outsourcing as suggested in proposition 3.

**Proposition 3:** The client’s and the supplier’s organisational cultural differences should be examined in the preparation phase of the IS outsourcing relationship. However, a seen in lesson 7: “IS outsourcing should be preceded by an examination of involved parties’ way of working”, it can be said that not only the culture are of importance. Also other types of knowledge gaps between the parties need to be dealt with. According to Gregory, Beck, and Prifling (2009) the client needs to invest a large amount of effort to manage the knowledge transfer. Mahnke, Wareham, and Bjorn-Andersen (2008) describe how, what they call offshore middlemen could be used to overcome knowledge transfer problems. The offshore middlemen could definitely be seen as a boundary spanner even if Mahnke, Wareham, and Bjorn-Andersen (2008) describe it as a third-party intermediary that needs to be used when neither the client nor the supplier can develop such capabilities internally. This is in line with lesson 5: “Make sure that actors at both the onshore site and the offshore site have a common understanding of each party’s expectations and responsibilities according to the IS outsourcing agreement”, as well as with lesson 6: “When outsourcing tailor-built IS, detailed IS specifications should be included as part of the knowledge transfer”.

It is stated by for instance Fabriek et al. (2008) that the more cultural alike and the more familiar the client and the supplier are, the more likely it is that the relationship will bring successful outcomes. They state that team members should be introduced on both sides to learn about each other’s way of working, in order to reduce distances related to organisational fundamentals. However, if there are cultural differences, it ought to be of interest to have knowledge about these to be able to deal with them. From this it can be stated that the newer and more immature the relationship is, the more important is the role of boundary spanners, which could be formulated as proposition 4. **Proposition 4:** Boundary spanners have a specific importance when outsourcing relationships are new and imma-
ture. As described in Holmström, Olsson et al. (2008), in new and immature outsourcing relationships, intense communication on a daily basis between both managers and designers is important due to non-established ways of working. This means that it is fruitful to adopt a development methodology that focuses on the team rather than on the techniques. It also means that a common understanding of each party’s expectations and responsibilities according to the contractual agreement is necessary and the boundary spanner plays a crucial role for being able to create a common understanding. Lee et al (1999) state that a prerequisite for managing outsourcing relationships is the client’s and the supplier’s common understanding and a systematic way of working. This is in line with the statement from Ranganathan and Outlay (2009) whom state that a formal approach for workforce transition should be developed early in the outsourcing decision-making process. If not this is done in a proactive way it risks the entire outsourcing success (Johansson, 2007). It can also be related to what Davey and Allgood (2002) recommend about IS: that packaged IS solutions are preferable to tailor-built IS, since packaged systems often are well specified. From this, it can be stated that tailor-built IS should not be outsourced but they can be if boundary spanners have a specific role in making sure that detailed IS specifications are included in the knowledge transfer.

From the analysis of the empirical data and the presented lessons learned so far, the following concluding lesson learned, lesson number 8 was formulated: “Established communication channels for information and knowledge sharing are crucial during IS outsourcing relationships”. This lesson strictly means that the boundary roles are of importance both during the preparation of the outsourcing relationship as well as during the on-going relationship. All of this can be concluded in the final proposition, proposition 5 that states that: Communication channels must be in place to reach desired levels of knowledge exchange quality and for informal communication opportunities. From the boundary spanning perspective analysis it can be said that boundary spanners play an important role in creation of needed communication channels. Table 2 shows the connection between lessons learned and the propositions developed from a boundary spanning perspective. The next and final section presents some conclusions and further research in this area.

Table 2: Connection between lessons learned and suggested propositions

<table>
<thead>
<tr>
<th>Lessons learned</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Keep IS activities that require deep business knowledge in-house or onshore</td>
<td>Proposition 1: IS activities that require frequent face to face interaction and deep business knowledge should be kept in-house if the boundary spanner role that deals with the information overload not are present at either of the organisations in the IS outsourcing relationship.</td>
</tr>
<tr>
<td>2. Make sure to have a strong leader at the offshore site</td>
<td>Proposition 2: An extensive boundary spanner role is crucial when developing new and immature outsourcing relationships with non-established processes for ways of working.</td>
</tr>
<tr>
<td>3. Learn about differences in organisational culture during IS outsourcing preparation</td>
<td>Proposition 3: The client's and the supplier's organisational cultural differences should be examined in the preparation phase of the IS outsourcing relationship.</td>
</tr>
<tr>
<td>4. Adopt agile ways of working to facilitate cooperation and the feeling of working as one team in geographically dispersed teams</td>
<td>Proposition 2: An extensive boundary spanner role is crucial when developing new and immature outsourcing relationships with non-established processes for ways of working.</td>
</tr>
<tr>
<td>5. Make sure that actors at both the onshore site and the offshore site have a common understanding of each party's expectations and responsibilities according to the IS outsourcing agreement</td>
<td>Proposition 4: Boundary spanners have a specific importance when outsourcing relationships are new and immature.</td>
</tr>
<tr>
<td>6. When outsourcing tailor-built IS, detailed IS specifications should be included as part of the knowledge transfer</td>
<td>Proposition 4: Boundary spanners have a specific importance when outsourcing relationships are new and immature.</td>
</tr>
<tr>
<td>7. IS outsourcing should be preceded by an examination of involved parties' way of working</td>
<td>Proposition 4: Boundary spanners have a specific importance when outsourcing relationships are new and immature.</td>
</tr>
<tr>
<td>8. Established communication channels for information and knowledge sharing are crucial during IS outsourcing relationships</td>
<td>Proposition 5: Communication channels must be in place to reach desired levels of knowledge exchange quality and for informal communication opportunities.</td>
</tr>
</tbody>
</table>
4. Conclusions and further research

This research contributes to the knowledge base on the management of IS outsourcing relationships by describing lessons learned from two cases. From this, some propositions are presented that aim to act as both a guiding tool for how to further develop boundary spanner roles in outsourcing relationships and to act as a base for future research on outsourcing relationships.

From the research it can be concluded that boundary spanners at both ends of the relationship play an extremely important role in the context of outsourcing relationships. The evaluation of lessons learned describes that boundary spanners are important to have during the initial preparation of an outsourcing deal as well as during the whole life-cycle of the relationship. The main conclusion from the research is that the success of outsourcing to a high extent builds on organizations’ possibility to understand each other’s culture as well as work processes. In that specific context it can be claimed that the individuals at both side of the relationship that can be identified as boundary spanners are of great importance.

Further research in the direction of how to identify as well as how to develop a boundary spanner role in outsourcing relationship would be needed to be able to give more normative prescriptions on how to further develop successful outsourcing relationships. Results from such research could also be used to give directions on how management of information systems outsourcing could be improved.

References

Gregory, R., Beck, R., & Prifling, M. 2009. Breaching the knowledge transfer blockade in IT offshore outsourcing projects - A case from the financial services industry, 42nd Hawaii International Conference on Systems Sciences: IEEE.
Measuring the Effectiveness of Organizational Knowledge Based Economy

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Abstract: Effective Knowledge Management (KM) is an important process for handling information which is essential for implementing successful projects and making improvement to the knowledge-based economy. KM deals with how knowledge is produced, shared in a secure manner, and used by organizations or individual for the benefit of the economy. Sharing of information and knowledge as well as providing the relevant financial support are among the main success factors for creating innovations, while protecting the Intellectual property (IP) satisfies the requirement for sharing of knowledge fairly and preserving the right of the inventors. In order to achieve an effective KM that contributes to the overall knowledge economy, there should be a proper way to measure it according to well known set of criteria. In this paper an analytical method has been devised based on different performance indicators to verify the availability of useful knowledge which is linked to successful knowledge investment and its business continuity. Unlike other methods that focus on descriptive approach, the proposed analytical method relies on qualitative approach that is based on how the probability of the knowledge factors can occur in a certain environment in relation to the set of goals that have been identified for a certain organization. This new method would allow managers to evaluate the performance of knowledge based economy of different organizations and assist them in identifying the reason for lacking economy growth, and therefore plan for improvement. Another way for measuring the effectiveness of a fair partnership model can rely on a direct method using a statistical survey to collect the statistical data that can help in identifying obstacles in reaching the organization's goals. An example for measuring the effectiveness of fair partnership has been described in this paper by using a survey which has been conducted to evaluate projects that are running in Saudi Arabia in order to understand the difficulties in attracting funds through a Venture Capital program, so the proper solutions can be recommended.

Keywords: knowledge economy, measuring effectiveness, performance indicator, assess of knowledge

1. Introduction

New information that is created by individual or group would become useful knowledge once is shared among other and used to improve the operation of related phenomenon. In this era, the computer technology contributes so heavily to superabundance of information which starts to become part of the solution for knowledge management KM, in a variety of domains. By the mid-1990s, knowledge management initiatives were flourishing because of the wide spread of the Internet. The International Knowledge Management Network (IKMN), begun in Europe in 1989, went online in 1994 and was soon joined by the U.S.-based Knowledge Management Forum and other KM-related groups and publications. In 1994 the IKMN published the results of a knowledge management survey conducted among European firms, and the European Community began offering funding for KM-related projects through the ESPRIT program in 1995. Knowledge is not only about creation of information, but rather about developing certain pattern and distributes it efficiently to selective people. The mechanism of creation of knowledge, storing it, sharing it and dissemination and how to convey them meaningfully to some other person is called knowledge management (KM).

KM relates directly to the effectiveness with which the managed knowledge enables the members of the organization to deal with today's situations and effectively envision and create their future (bel97a 2004).

A sound KM depends on its effective distribution and not only on its efficient production. This can be done through secure Wireless network that has the advantages of flexibility, mobility, easy administration, reducing the information-related risk, and support of security (G. Kbar 2005).

Wireless Local Area Network (WLAN) technology is rapidly becoming a crucial component of computer networks that widely used in the past few years (Jim 2002), (Rob 2001), (Signa 2001), and (Nortel 2001). It provides mobility as well as essential network services where wire-line installation proved impractical. The inclusion of the newer IEEE 802.11g versions of the standard offers a firm basis for high performance wireless LANs. Companies and organizations are investing in wireless
networks at a higher rate to take advantage of mobile, real-time access to information. However, users of wireless technology need to be aware of its performance in terms of coverage, throughput, accessibility and security. The security factor is critical in wireless LAN. There are many research papers discussing how to improve the security of wireless systems to an equivalent or better rate than wired LAN (Nortel 2011), (Lisa 2001), (Schwartau 2001), (Dave 2002), and (Blackwell 2002). Successful collaborative platform strategies provide value for users by improving knowledge sharing. This encourages many enterprises that have been tantalized by the promise of collaborative technologies claiming to offer better innovation to streamlined workflows. However, successful sustainable collaborative platform strategies must be designed, from the ground up, around three major factors, which are usability, impact on end user, and organizational readiness. Collaborative platform success is dependent on user adoption and adoption is based on thoughtful design and forward-thinking enterprise processes (nGenera 2010). A knowledge society is an indication of the ability of society to produce and use of knowledge as well as sharing of knowledge using the proper technology (Paul 2003). Networks encourage sharing of knowledge and play an important role for bringing innovation-specific resources and expertise for entrepreneurial teams to create new opportunities (Rothwell 1991), and (Zaheer 2005). Stakeholders such as government agencies, universities, science parks, suppliers, and competitors have a great influence on innovation (Gibb 1995). In addition, partnership between industry and universities has been considered in many countries as part of national policies to strengthen innovation. Most innovative firms, around 90%, had formal links with universities according to a study done by Wilkinson et al. (1996). Additionally, a significant relationship was found between the introduction of new products and university networking (Freel 2003). Hence, collaboration among universities and industries as well as government agencies, science parks, and investors is highly recommended for successful innovative products. In order to benefit from the innovations through creating or enhancing the characteristics of associated products at science parks, investors need to be encouraged for spending enough funds for the development. This can be done by providing a fair partnership model that intends to identify the role, right, and responsibility of each party as described in (kbar 2011), in addition to providing a good incentive program to attract the Venture Capital (VC) fund to support the project development.

A READINESS ASSESSMENT is a necessary part of 'due diligence' in any serious new initiative, most especially so in corporate business, where a failed initiative is more often than not painfully costly (Ann 2008). With respect to the company's knowledge and KM status, the KeKma-Audit (Ann 2008) READINESS Analysis is designed to determine/show: the Current READINESS State, the Desired READINESS State, the READINESS Gap State (difference between current & desired state), the True READINESS State (what is perceived vs what really is), the Necessary ACTION (what needs to be done to bridge gaps). The method used in KeKma-Audit can be used for determining the organization's readiness not only to implement KM, but also its readiness to be truly a knowledge-based, knowledge driven organization. However, this method focuses on the descriptive questions/answer approach to determine the gap, which cannot be quantified to measure the organization performance. In this paper a new analytical method that is based on how the probability of the knowledge factors can occur in a certain environment has been suggested to quantify the performance of certain organization. This new method would allow managers to evaluate the performance of knowledge based economy of different nations or organizations and assist them in identifying problems and guide them on how to plan for improvement.

2. Measuring the effectiveness of Knowledge Based Economy (KBE)

The World Bank invented a method for assessing the knowledge which is known as "Knowledge Assessment Methodology (KAM)" (WorldBank 2011). This method includes 109 parameters which can be used to assess the core of knowledge-based economy that is associated with economical incentive, education, innovation, and ICT. This method didn't consider the correlation that might exist between the different parameters used in this assessment. In addition, these parameters that are used for measuring the effectiveness are grouped in 8 elements. These elements are economical performance, system of economy, government, innovation system, education system, workers, equal employment opportunities, and ICT. Evaluation of these parameters is subjective and is based somewhere on absolute values, or relative values. In order to complete the assessment of a particular country, it requires to cover the 109 parameters, where many variables have to be considered. These variables include some of the indices such as: annual GDP growth, human development index, poverty index, composite risk rating, capital formation, trade, tariff, IP, export, interest rate, rule and law, regulatory quality, political stability, control of corruption, research, publication, employment, technology, and many other parameters. To simplify the procedure, the World Bank reduces the
grouping into six which are Knowledge Economy Index, Knowledge Index, Economic Incentive, Innovation, Human capital, and ICT. Table 1 presents some of the results given by the KMA 2009 measurement (info.worldbank 2009).

**Table 1**: KEI and KI indexes (KAM) 2009

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country (click on the name to see basic scorecard)</th>
<th>KEI</th>
<th>KI</th>
<th>Economic Incentive</th>
<th>Regime</th>
<th>Innovation</th>
<th>Education</th>
<th>ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Denmark</td>
<td>9.52</td>
<td>9.49</td>
<td>9.61</td>
<td>9.49</td>
<td>9.78</td>
<td>9.21</td>
<td></td>
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<tr>
<td>3</td>
<td>Finland</td>
<td>9.37</td>
<td>9.39</td>
<td>9.31</td>
<td>9.67</td>
<td>9.77</td>
<td>8.73</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Canada</td>
<td>9.17</td>
<td>9.08</td>
<td>9.45</td>
<td>9.44</td>
<td>9.26</td>
<td>8.54</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ireland</td>
<td>9.05</td>
<td>8.98</td>
<td>9.26</td>
<td>9.08</td>
<td>9.14</td>
<td>8.71</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>United States</td>
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<td>9.02</td>
<td>9.04</td>
<td>9.47</td>
<td>8.74</td>
<td>8.83</td>
<td></td>
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<tr>
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<td>9.09</td>
<td>8.79</td>
<td>9.90</td>
<td>7.66</td>
<td>9.66</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Australia</td>
<td>8.97</td>
<td>9.08</td>
<td>8.66</td>
<td>8.88</td>
<td>9.69</td>
<td>8.67</td>
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<tr>
<td>12</td>
<td>Germany</td>
<td>8.96</td>
<td>8.92</td>
<td>9.06</td>
<td>8.94</td>
<td>8.36</td>
<td>9.47</td>
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<tr>
<td>13</td>
<td>Iceland</td>
<td>8.95</td>
<td>8.76</td>
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<td>14</td>
<td>New Zealand</td>
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<td>8.66</td>
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<tr>
<td>15</td>
<td>Austria</td>
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<td>8.78</td>
<td>9.31</td>
<td>9.00</td>
<td>8.48</td>
<td>8.85</td>
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<tr>
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<td>Belgium</td>
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<td>8.87</td>
<td>8.93</td>
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<tr>
<td>17</td>
<td>Luxembourg</td>
<td>8.64</td>
<td>8.37</td>
<td>9.45</td>
<td>9.00</td>
<td>6.61</td>
<td>9.51</td>
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<tr>
<td>18</td>
<td>Taiwan, China</td>
<td>8.45</td>
<td>8.79</td>
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<td>19</td>
<td>Singapore</td>
<td>8.44</td>
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<td>7.81</td>
<td>9.22</td>
<td>8.67</td>
<td>8.00</td>
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</table>

In this paper, to validate the performance of Knowledge based Economy for certain nation, a quantitative Knowledge Base Economy (KBE) assessment methodology has been used to evaluate the outcome based on identified Key Performance Indicators (KPI) as shown in the next subsection. This new method try to simplify the measurement performance procedure based on defining a new set of groups and parameters. By looking at the topic of sustainable nation’s knowledge based economy, we can determine three main indicators which affect the KBE performance those are knowledge, investment, and Business continuity. Each of these elements group is associated with different parameters as will be explained in the subsection 2.1. There are different KPI group that can be used to analyze the performance of the knowledge-based economy. The first KPI can be used to check the probability of having the required useful knowledge, where KPI =100% means a nation would have all the required knowledge factors to build its economy. The second PKI is the ability to invest which can be measured by the different factors as explained in subsection 2.1, where the total PKI of 100% would mean a high success in the project investment. The third KPI is the ability to maintain the success of the business which can be measured by the different factors as explained in subsection 2.1, where the total KPI of 100% would mean of having high business project success continuity. In the subsection 2.1, the description of each performance indicators and their factors which contributes to the overall value of these indicators is included.
2.1 Quantitative KBE assessment methodology

In order to assess the performance of a sustainable nation's knowledge-based economy, there is a need to identify the main indicators that affect the KBE performance, as well as the elements related to them and how they are correlated to each other. There are three main keywords associated with the sustainable KBE: knowledge, investment, and Business continuity. The first main indicator associated with KBE is the required knowledge which determines the level of competency and ability to play an important role for building a strong KBE. The second main indicator is investment, which is needed for developing projects required for the success of KBE. The third main indicator is continuity of business for sustainable KBE. These three indicators (knowledge, investment and business continuity (KIC)) are the one that needs to be measured and evaluated in order to measure the effectiveness of the KBE. Furthermore, the elements associated with each of these indicators have to be identified, as well as the correlation that exists among them. There is direct correlation between the knowledge and investment indicators since it is unlikely that an investment can be done without the existence of knowledge. However, there is less dependency among the first 2 indicators and the business continuity indicator since it mainly depends on entrepreneurship, technology infrastructure, management and leadership. A strong KBE would require an optimum value of the three indicators. Each of these indicators consists of elements or sub-indicators which can be assessed by linking them to the relevant goals of a particular organization. For example, the goals of universities can be linked to the sub-indicators of the knowledge indicator, the goals of the university's science park can be linked to the sub-indicators of the investment indicator, and the goals of business arm of the science park can be linked to the sub-indicators of the business continuity indicator. Linking these goals to elements or sub-indicators would allow us to measure them by in putting weight for each element in order to optimize the KBE creation. First, the elements or sub-indicators that constitute each of the three indicators (knowledge, investment and business continuity KIC) have to be determined. Then, the weight of each sub-indicator would be identified according to the following mechanism. By looking at the relevant goal, we can determine which of the sub-indicator is required to achieve it. Then, we can determine we can find out the repetition and percentage of these sub-indicators, and therefore we can assign weights for these sub-indicators as explained in subsections 2.1.1, 2.1.2, and 2.1.3. The first indicator of successful KBE is the Availability of Useful Knowledge (AUK). The elements associated with AUK are: *core knowledge* that can be linked to the Ability to Discover New Idea (DNI), *valuable knowledge* that is linked to the Characteristic of Additional Value (CAV) which is related to (innovation, quality of research), *recorded knowledge* that is linked to Registering of Information (RI), *applied knowledge* that is linked to Prove of New Information (PNI), *profitable knowledge* that is linked to Protecting of Knowledge (PK), *shared knowledge* that is linked to Absolute Sharing of Information (ASI). In order to quantify the value of knowledge indicator, the effect of AUK's elements on the knowledge indicator has to be assessed, and the percentage or the weight of these elements has to be determined. To determine the percentage of each element in the knowledge indicator, we can refer to the goals that have been identified for a particular national education institution which can contribute to the nation's KBE, and try to match these elements to the goals and then identify the repetition of each element in the defined goals. The second main indicator of successful KBE is investment indicator which directly affects the national growth economy. However, in order to quantify the investment indicator value, the effect of its elements including the knowledge indicator has to be assessed. The elements that affect the value of investment indicator are knowledge, fund, technology infrastructure, skills/experience, and management. The percentages or the values of these elements have to be determined, and their values need to be optimized in order to maximize the overall investment indicator value, that is to be close to 100%. To determine the percentage of each element in the investment indicator, we can refer to the goals of a science park that contributes to the investment success for a particular nation's KBE, and try to match these elements to the goals and then identify the repetition of each element in the defined goals. The third indicator of successful KBE is business continuity. The elements associated with Business Project Continuity (BPC) are: *entrepreneurship* that is linked to Entrepreneurship Ability, *existing of support and technology* that is linked to Developing the Technology Infrastructure, and *leadership management* that is linked to the Management & Leadership Performance.

In order to quantify the knowledge indicator, the investment indicator, and the business continuity indicator for King Saud University programs which contribute to the Kingdom of Saudi Arabia’s KBE, the goals of the university would be used to identify the weight factors of the knowledge sub-indicators, the goals of Riyadh Techno Valley (RTV) science park would be used to identify the weight
factors of the investment sub-indicators, and the goals of Riyadh Valley Company (RVC) would be used to identify the weight factors of the business continuity sub-indicators as shown in Figure 1.

![Knowledge-based economy indicators for King Saud University-KSU](image)

**Figure1**: Knowledge-based economy indicators for King Saud University-KSU

### 2.1.1 Quantifying the knowledge indicator

To determine the percentage of each element in the knowledge indicator, we can refer to the education system for a particular university and schools, and match these elements to their goals as explained below. For instance, let’s analyze the goals of King Saud University that are listed below (ksu 2011), and match them to the elements of the knowledge indicator.

**Goals of (Ksu 2011):**

- Establish excellence in all fields of scholarship and research; (requires core knowledge, and valuable knowledge)
- Maintain a distinctive faculty possessing the highest credentials and abilities; (requires core knowledge, valuable knowledge, applied knowledge, and profitable knowledge)
- Provide graduate students with the best education and opportunities that will enhance their knowledge, skills and relevant experience; (requires core knowledge, and recorded knowledge)
- Building bridges locally, nationally and internationally; (requires shared knowledge, and profitable knowledge)
- Provide a supportive learning environment for faculty, staff and students; (requires core knowledge, and recorded knowledge)
- Ensuring a sustainable environment for the pursuit of excellence; (requires recorded knowledge, core knowledge, profitable knowledge, applied knowledge, and valuable knowledge)
- Establishing flexibility and accountability. (requires applied knowledge, profitable knowledge, and shared knowledge)

By looking at the above example, we can find that the core knowledge is repeated 5 times, valuable knowledge 3 times, recorded knowledge 3 times, profitable knowledge 4 times, and shared knowledge 2 times. Assuming that the weights of the above sub-goals are equally weighted, then by considering the percentage of the 6 elements, the percentage of a particular element becomes equal: element repetition/ total num of elements' repetition X 100. Therefore, the core knowledge or Ability to Discover New Idea (DNI) indicator would be (element repetition/ total num of repetition X 100 = 5/20X100= 25%) of the knowledge indicator. The valuable knowledge or Characteristic of Additional Value (CAV) indicator would be (3/20X100= 15%) of the knowledge indicator. The applied knowledge or Prove of New Information (PNI) indicator would be (3/20X100= 15%) of the knowledge indicator. The profitable knowledge or Protecting of Knowledge (PK) indicator
would be (= 4/20X100= 20%) of the knowledge indicator. The recorded knowledge or Registering of Information (RI) indicator would be (= 3/20X100= 15%) of the knowledge indicator. The shared knowledge or Absolute Sharing of Information (ABI) indicator would be (= 2/20X100= 10%) of the knowledge indicator.

2.1.2 Quantifying the investment indicator

To determine the percentage of each element in the investment indicator, we can refer to the business and research development system for a particular science park that belongs to university, and match these elements to its goals as explained below. For instance, let's analyze the goals of Riyadh Techno Valley of KSU that are listed below (rtv 2011), and match them to the elements of the investment indicator.

Goals of (Rtv 2011):
- Increase the level of interaction between KSU and Saudi knowledge-based industry, business and commerce. (requires management)
- Diversify the employment opportunities for graduates and post graduates. (requires knowledge, and skills)
- Create a site that can be groomed to encourage foreign direct investment in the form of technology-based companies. (requires fund, and technology infrastructure)
- Raise the profile of KSU as modern industry and business facing centre of learning. (requires knowledge)
- Create a source of independent income from KSU from its estate and from investments in technology-Based companies. (requires fund, and management)
- Create an appropriate environment for establishing and developing a school of entrepreneurship. (requires knowledge)

By looking at the above example, we can find that knowledge is repeated 3 times, management 2 times, fund 2 times, skills and technology infrastructure one time. This can be related to percentage of the 5 elements, where the percentage of a particular element equal: element repetition/ total num of repetition X 100. Therefore, the knowledge or Metric Knowledge Investment (MKI) indicator would be (element repetition/ total num of repetition X 100 = 3/9X100= 30%) of the investment indicator, the fund or MKI indicator would be (2/9X100= 25%), the skills/experiences affects the MKI indicator by (1/9X100= 10%), the technology infrastructure affects the MKI indicator by (1/9X100= 10%), and the management affects the MKI indicator by (2/9X100= 25%).

2.1.3 Quantifying the business continuity indicator:

To determine the percentage of each element in the business continuity indicator, we can refer to the business start-up or sustainable investment system for a particular investment arm that belongs to university, and match these elements to its goals as explained below. For instance, let's analyze the goals of Riyadh Valley company of RTV that are listed below (rvc 2011), and match them to the elements of the business continuity indicator.

Goals of (Rvc 2011):
- Establishing a diversified knowledge-based investment to support the kingdom's plans towards a knowledge-based economy. (requires management & leadership)
- Transfer, settlement and development of technology to serve the national economic growth needs. (requires entrepreneurship, management & leadership, and technology infrastructure)
- Growing a solid foundation of investment assets. (requires entrepreneurship, and management & leadership)
- Establishing and growing a network of strategic partnerships & alliances to attract sources of venture and low-risk funds in support of company's initiatives and objectives. (requires management & leadership, entrepreneurship, and technology infrastructure)
- Establishing the ecosystem to attract local and international technology investments and to foster the knowledge-based industries. (requires entrepreneurship, management & leadership, and technology infrastructure)
Supporting technology innovation-based start-ups through incubation services. (requires entrepreneurship, and technology infrastructure)

Investing in the development of human capital in the domains of technology, finance and knowledge investment. (requires management & leadership)

Increasing the adoption of innovation, IP and knowledge economy culture. (requires entrepreneurship, management & leadership, and technology infrastructure)

By looking at the above example, we can find that entrepreneurship is repeated 6 times, management & leadership 7 times, and developing technology infrastructure 5 time. This can be related to percentage of the 3 elements, where the percentage of a particular element equal: element repetition/ total num of repetition X 100. Therefore, the Entrepreneurship or Entrepreneurship Ability (EA) indicator would be (element repetition/ total num of repetition X 100 = 6/18X100= 33%) of the Business Project Continuity (BPC) indicator, the technology infrastructure or Developing the Technology Infrastructure (DTI) indicator would be (5/18X100= 28%), and the Management & Leadership Performance (MLP) indicator affects the BPC indicator by (7/18X100= 39%).

2.2 Key performance indicator’s definitions and values

By referring to the previous section which identifies the main indictors of KBE and theirs elements as well as the values and distribution of these elements that quantify the indicators (Availability of Useful Knowledge, Metric Knowledge Investment, and Business Project Continuity), the following sub sections explain in details the relevance and effect of these elements to the creation of the identified 3 indicators. These indicators are used to measure the effectiveness of a KBE for organization as shown in next section. Each element or sub-indicator has multiple attributes, where finding the weight or value of these attributes can be defined by an expert. For simplicity, the authors in this paper assign values to these attributes associated with different sub-indicator based on their experiences and according to a study that was conducted by experts at KSU.

2.2.1 Availability of Useful Knowledge (AUK) (maximum KPI of 100%)

The following indicators can be used to evaluate the availability of useful knowledge which is a key factor for building a successful Knowledge Based Economy, where AUK=ADNI+CAV+RI+PNI+PK+ASI:

**ADNI**  Ability to Discover New Idea element or sub-indicator (maximum of 25% of the AUK’s KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- Having wide base knowledge, value of 7% (base of education, level of experience of researcher or student, number of contributing to events)
- Having good Education system, value of 8% (curriculum, type of delivery, experience level of instructor, qualification of Instructor)
- Having good Competition program, value of 3% (university competition, national competition, world competition)
- Having good Reward, value of 3% (based on achievement and outcome)
- Gaining experiences, value of 4% (ability to gain experience, availability of opportunity to gain experiences)

**CAV** Characteristic Additional Value (maximum of 15% of the AUK’s KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- Quality of research, value of 5% (ability to publish in conference and journals, internal evaluation of research)
- Ability for innovation and creativity, value of 4% (help and fund, innovation skills, sharing events and learn about innovation)
- Evaluated by high standard organization, value of 3% (evaluated by partners, evaluated by professional people, evaluated by marketing and investment professionals)
- Sharing and partnership, value of 3% (existing of partner with companies, existing of joint research)
RI Registering of Information (maximum of 15% of the AUK's KPI as it has been identified in subsection 2.1.1) that depends on the following attributes:

- **Existing of technology**, value of 3% (existing of technology hardware, software program for aided design and documentation)
- **Willing for documentation**, value of 3%
- **High technology** in laboratories, value of 5%
- **Ability to retrieve information**, value of 4% (easy to access information and publication)

PNI Prove of New Information (maximum of 15% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- **Review of work**, value of 2% (reviewed by professional people, peer review)
- **Ability to Implement a proof of concept**, value 3% (design, pseudo code, algorithm)
- **Ability to simulate**, value of 2% (simulation software)
- **Ability to implement solution**, value of 6% (partial implementation, prototype, functional prototype, advance prototype)
- **Existing of necessary facilities**, value of 2% (equipment, lab, software)

PK Protecting of Knowledge (maximum of 20% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- **Having IP system**, value of 5%
- **Researcher's ability to produce IP**, value of 10%
- **Sharing of profit**, value of 5% (partial, limited)

ASI Absolute Sharing of Information (maximum of 10% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- **Willing to share information**, value of 2%
- **Workshop, conference and journal publication**, value of 4%
- **Seminar and lecture presentation**, value of 2%
- **Discussion & Brainstorm**, value of 2%

### 2.2.2 Metrics of knowledge Investment (MKI) (maximum KPI of 100%)

The following indicators can be used to evaluate the possibility of successful knowledge investment, where MKI=AUK+APF+EI+ARS+GMT:

**AUK** Availability of Useful Knowledge (maximum of 30% of the MKI's KPI) which can be measured as explained before.

**APF** Ability to provide Fund (maximum of 25% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- **Existing of fund**, value of 10% (organization support, government support, Angel fund)
- **Strategy for partnership**, value of 8% (venture capital: trust in research outcome, trust in teamwork, trust in project management, trust in organizational management, other party support, government legislation, investment skills, IP ownership)
- **Variety of funds**, value of 2%
- **Mechanism of acquiring fund**, value of 5% (preparation, strategy, communication)

**EI** Existing Infrastructure (maximum of 10% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- **Services and facility**, value of 3%
- **Equipments, value of 5%**
- **Consultation and support**, value of 2%
ARS Availability of Required Skills (maximum of 10% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- Local skills, value of 3%
- Attract new skills, value of 4% (ability to attract, involve imported skilled people in management)
- Legislation, value of 3%

GMT Good Management Team (maximum of 25% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- Experienced staff, value of 10% (limited experience, academic experience, relevant experience, entrepreneurship skill)
- Ability to learn and training, value of 3%
- Sharing experience, value of 2%
- Right person for right position, value of 10% (accepting position for non local, advertise position, appoint through friendship, not checking qualification)

2.2.3 Business Project Continuity (BPC) (maximum KPI of 100%)

The following indicators can be used to evaluate the possibility of maintaining the continuity and successful business project, where BPC = EA + DTI + MLP:

EA Entrepreneurship Ability (maximum of 33% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- Entrepreneurship skills, value of 18% (courage, wise, making right decision)
- Communication skills, value of 8% (ability to market ideas)
- Exposing to other practices, value of 7% (sharing of events, good listener, reading related article and news)

DTI Developing the Technology Infrastructure (maximum of 28% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- Updated Technology, value of 8%
- Smart technology, value of 8%
- Continuous Access and Business Continuity Plan, value of 12%

MLP Management & Leadership Performance maximum of 39% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- Management skills and qualification, value of 13%
- Having right staff with right expertise, value of 6%
- Execution according to plan, value of 8%
- Monitoring and apply right appraisal, value of 8%
- Training and education, value of 4%

3. Comparing the knowledge-based economy performance between developed and developing countries

Based on the conducted study at Riyadh Techno Valley, and the experiences of people in developed and developing countries, Table 2 presents a comparison between developed and developing countries. This comparison highlights the average performance key indicators in order to measure the availability of useful knowledge AUK. It is clear from this table that AUK in development countries is nearly one third less than developed countries. This indicates that developing countries suffer from building a proper knowledge based economy. These problems are associated with their average education system, low research capability, improper review process, and average Intellectual Properties outcomes. As shown also in Figure 2, developing countries suffer from very low KPIs of base knowledge, ability to produce IP, implement solution and creativity.
In Table 3, a comparison between developed and developing countries based on the average metric of knowledge investment MKI performance indicator is presented. It is clear from this table that low AUK in developing countries as well as problems in providing enough variety funding for technological projects, not completing the technology infrastructure, and inadequate management experiences in these countries would lead to an average indicator for investment in the knowledge based projects. As shown also in Figure 3, developing countries suffer from very low KPIs of variety of funds, legislation, mechanism of acquiring funds, partnership strategy and experienced staffs in addition to the low KPI of the Availability of Useful Knowledge AUK.

In Table 4, a comparison between developed and developing countries based on the Business Continuity Performance (BPC) indicator is presented. It is clear from this table that low value of management & leadership performance, as well as entrepreneurship ability are the main causes for lowering the BPC indicator in developing countries. Where the lack of management skills, and auditing as well as not appointing of relevant people for the right position in developing countries which are common makes the BPC indicator to be low. In addition of slowing the process of implementing the technology infrastructure, it would cause more lowering of BPC indicator for some countries.

**Table 2**: Average performance key indicators for the Availability of Useful Knowledge (AUK) at developed versus developing countries (maximum KPI of 100%)

<table>
<thead>
<tr>
<th>Type of PKI</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to Discover New Idea ADNI (max 25%)</td>
<td>Base knowledge 7%</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Education system 8%</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Competition program 3%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Reward 3%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Experiences 4%</td>
<td>4</td>
</tr>
<tr>
<td>Characteristic Additional Value CAV (max 15%)</td>
<td>Research quality 5%</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Creativity 4%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>High standard 3%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Sharing, partnership 3%</td>
<td>2</td>
</tr>
<tr>
<td>Registering of Information RI (max 15%)</td>
<td>Existing technology 3%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Documentation 3%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Retrieve information 4%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>High technology in laboratories 5%</td>
<td>5</td>
</tr>
<tr>
<td>Prove of New Information PNI (max 15%)</td>
<td>Review process 2%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Proof of concept 3%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Simulation 2%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Implement solution 6%</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Necessary facilities 2%</td>
<td>2</td>
</tr>
<tr>
<td>Protecting of Knowledge PK (max 20%)</td>
<td>Intellectual Properties 5%</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Sharing profit 5%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Ability to produce IP 10%</td>
<td>9</td>
</tr>
<tr>
<td>Absolute of sharing Information ASI (max 10%)</td>
<td>Share information 2%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Knowledge Events 4%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Presentation 2%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Brain storm 2%</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>56</td>
</tr>
</tbody>
</table>

**Table 3**: Average performance key indicators for the Metric Knowledge Investment MKI at developed versus developing countries (maximum MKI of 100%)

<table>
<thead>
<tr>
<th>Type of MKI</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUK</strong> Availability of Useful Knowledge (max 30%)</td>
<td>92*0.3=27.6</td>
<td>56*0.3=16.8</td>
</tr>
<tr>
<td><strong>APF</strong> Ability to provide Fund (max 25%)</td>
<td>Existing of fund 10%</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Partnership Strategy 8%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Variety of funds 2%</td>
<td>2</td>
</tr>
</tbody>
</table>
Mechanism of acquiring fund 5%

Type of MKI               Developed Countries | Developing Countries
-----------------------------------------------
EI Existing Infrastructure (max 10%)          Services and facility 3% | 3 | 2
                                             Equipments 5% | 4 | 4
                                             Consultation and support 2% | 2 | 1
ARS Availability of Required Skills (max 10%) Equipments 3% | 3 | 2
                                             Attract new skills 4% | 3 | 2
                                             Legist elation 3% | 3 | 1.3
GMT Good Management Team (max 25%)          Experienced staff 10% | 9 | 5
                                             Ability to learn and training 3% | 3 | 2
                                             Sharing experience 2% | 2 | 1
                                             Right person for right position 10% | 9 | 6
Total                                      92.6 | 55.7

Table 4: Average performance key indicators for the BPC at developed versus developing countries (maximum BPC of 100%)

<table>
<thead>
<tr>
<th>Type of BPC</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurship Ability (max 33%)</td>
<td>Entrepreneurship skills 18%</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Communication skills 8 %</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Exposing to other practices 7 %</td>
<td>5</td>
</tr>
<tr>
<td>DTI</td>
<td>Updated Technology 8%</td>
<td>8</td>
</tr>
<tr>
<td>Developing the Technology Infrastructure (max 28%)</td>
<td>Smart technology 8%</td>
<td>5</td>
</tr>
<tr>
<td>MLP</td>
<td>Business Continuity Plan 12%</td>
<td>7</td>
</tr>
<tr>
<td>Management &amp; Leadership Performance (max 39%)</td>
<td>Management skills, qualification 13%</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Training and education 4%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Execution according to plan 8%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Monitoring and apply right appraisal 8%</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Having right staff with right expertise 6%</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>49</td>
</tr>
</tbody>
</table>

4. Partnership and Venture Capital (VC) project funding in KSA

In order to identify the problems facing the technological entrepreneurship projects at KSA, a survey has been conducted through contacting companies' managers in Saudi Arabia as shown in Figure 4. According to this survey, the most critical obstacles facing the VC project funding are related to lack of skills (61%), education programs (54%), research capability (51%), and management (37%), which all contributes to lowering the trust among investors and funders. There are other obstacles associated with funding constraints that are caused by the lack of knowledge and good incentive program to attract partners through a fair partnership models. There are some other obstacles associated with acquiring knowledge, existing regulations and confusing procedures and company processes. These results give an indication to the main obstacles facing the development countries, where skills, experiences and knowledge are the main factors in slowing down the creation of knowledge based economy compared to the existence of funding. This will reduce the trust among VC organizations to involve in the partnership and to support the development of technological projects.
5. Conclusion

The concept of knowledge management has been presented, where it shows the importance of effective knowledge sharing using latest technologies and successful collaborative platform strategies. In addition to determining the organization's readiness not only to implement KM, but also its readiness to be truly a knowledge-based, knowledge driven organization. Unlike the descriptive approach used for checking the organization's readiness to identify the gap and try to fill in this gap, a better method using analytical approach has been suggested in this paper. Where, a new method for measuring the effectiveness of national knowledge-based economy has been presented, and is based on quantitative analytical approach. It uses different performance indicators that are associated with the availability of knowledge, the knowledge investment and business project continuity. A comparison between developed and development countries has shown relatively low or average performance indicators, as compared with that of the developed countries, which is due to problems in their education system, average research capabilities and Intellectual Properties, low projects funding and lack of management experiences. The VC funding in development country at Saudi Arabia has been analyzed and the indications has shown a lack of trust in innovation caused by the low level of innovation skills and problems in education programs and management, in addition to other obstacles associated with the regulations and the internal process.

![Figure 2](https://example.com/figure2.png)

**Figure 2:** Key Performance Indicator (KPI) of the Availability of Useful Knowledge (AUK) at developed and development countries
Figure 3: Key Performance Indicator (KPI) of the Metric Knowledge Investment MKI at developed and developing countries

Figure 4: Obstacles and difficulties facing technological entrepreneurship projects at KSA
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Alignment in Enterprise Architecture: A Comparative Analysis of Four Architectural Approaches

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Abstract: As modern organizations struggle with the complexity and dynamicity of their business environments, they increasingly turn to Enterprise Architecture as a means to organize their capabilities. However, adopting Enterprise Architecture is hardly a straightforward matter as the practical guidance available is plagued by disparity in nomenclature as well as content. The purpose of this paper is to take a first step in remedying the dearth of rational appraisal of approaches to Enterprise Architecture by closer examining a handful of guides and frameworks. Our ultimate aim in this paper is to provide knowledge about the various dimensions of enterprise architectures that demand alignment between its constitutionals parts. Therefore the efforts of our study were focused on elucidating the following issue: How are the various forms and aspects of architectural alignment treated by the investigated approaches to Enterprise Architecture? Due to the lack of commonalities between the assorted approaches, an independent metric is required. We therefore utilize the concept of alignment and analyze how the various forms and aspects of architectural alignment are treated by formalized approaches to Enterprise Architecture. This methodology was applied to the Zachman Framework, The Open Group Architecture Framework (TOGAF), the Extended Enterprise Architecture Framework (E2AF) and the Generalised Enterprise Reference Architecture and Methodology (GERAM). Our investigation clearly demonstrates that: 1) Approaches to Enterprise Architecture provide guidance for structural and functional alignment, but not for infological or socio-cultural alignment. 2) The area of contextual alignment is described in a simplistic manner. 3) None of the investigated approaches discuss the mutual interdependence that exists between the various forms of alignment. Our work serves to further the understanding of multi-dimensionality of Enterprise Architecture in general and architectural alignment in particular.

Keywords: enterprise architecture, architectural alignment, Zachman framework, TOGAF, GERAM, E2AF

1. Introduction

The organizations of today are facing a world fraught with uncertainty. Increasingly capricious and demanding consumers necessitate careful consideration into which products or services to offer at any given time. Meanwhile, competition is no longer limited to a geographical region as corporations are able to vie for business on a global market. The traditional modus operandi based on command and control is no longer able to satisfy the needs of the modern enterprise in this brave new world of opportunism and innovation.

It is clear that the modern organization needs a new blueprint in order to stay ahead of the game – or at the very least stay in the game. To this end, much attention has been paid to Enterprise Architecture over the past couple of decades – not just as a means to improve competitiveness, but also to reduce complexity, increase changeability, provide a basis for evaluation etcetera.

A literary review by Schöenherr (2009) clearly shows that the level of interest in Enterprise Architecture is indeed increasing. Although the term architecture was limited to information systems when originally adopted by John Zachman (1987), the concept has since then been expanded to encompass the entire enterprise and interpreted by academia as well as the private and public sectors. The different views on how to approach Enterprise Architecture are often documented and compiled into “guides” or “frameworks” which are intended to instruct practitioners in how to apply this concept to their organization. However, the numerous approaches all present disparate views on what exactly Enterprise Architecture entails and how it is best administered (Rood, 1994; Whitman, Ramachandran & Ketkar, 2001; Sessions, 2007; Schöenherr, 2009). This essentially leaves the practitioner in the dark as the approaches offer virtually no common ground, no common language and no common orientation on which to base a comparison.

The purpose of this paper is to take a first step in remedying the dearth of rational appraisal of approaches to Enterprise Architecture by closer examining a handful of guides and frameworks. Due to the lack of commonalities, we intend to utilize the concept of alignment as a metric. Alignment is
said to describe the condition of IS/IT being in harmony with business needs (Henderson & Venkatraman, 1992). This would not only ensure full utilization of resources, but also drive synergic effects (Luftman, 1996; Papp, 2001) – a situation very much in conformity with the aims of Enterprise Architecture. Succinctly put, we wish to analyze following question: How are the various forms and aspects of architectural alignment treated by the investigated approaches to Enterprise Architecture? In pursuing this line of inquiry, we wish to expand the current stream of research into Enterprise Architecture. Furthermore, we would like to emphasize architectural alignment in particular.

2. Related research

While it is not within the scope of this paper to provide a comprehensive literary review, we have identified certain streams of research into alignment that carry relevance to our own research. Furthermore, we have reviewed alternative avenues to evaluate and contrast architectural approaches in order to illustrate the lack of academic convergence.

2.1 Alignment

With the diffusion and decentralisation of processing power (via the personal computer) in the 1980s, many companies invested heavily in IT without deriving expected benefits. This gave rise to what was often referred to as the productivity paradox (Brynjolfsson, 1993). Henderson and Venkatraman (1992) claimed that part of the reason for this state of affairs was the lack of alignment between IT and business which prompted them to present their Strategic Alignment Model (SAM). SAM was not the first conceptualization of alignment, but it has certainly dominated subsequent research efforts into the field. SAM stresses the importance of integration between business and IT, as well as the need to adapt the internal structure of the enterprise to marketing and strategy. In order to achieve this, the business strategy must be accompanied by an IT strategy. There are a number of subtle differences in how these may influence one another, but Henderson and Venkatraman stress the constancy of business as the driver and IT as the enabler.

While research into alignment to a large degree has followed in the path set by SAM (often referred to as Business-IT alignment), there are several authors that view this model as limited. Ciborra (1997) offers one of the more astringent criticism as he dismisses SAM outright, claiming that lines and shapes on a diagram hold no real bearing on the realities of business. Maes, Rijsenbrij, Truijens & Goedvolk (2000) claim that SAM is overly simplified and ignores the middle ground that ties strategy with operations and business with IT. They therefore expand upon SAM by adding the interim layer structure between strategy and operations as a means to emphasize the importance of architecture in modern enterprises. Furthermore, business and IT represent different professions – each with their own sense of culture and expertise. One must therefore take care to facilitate the exchange of information between the two areas. The importance of fostering inter-departmental communication has also been highlighted by Luftman (2000) as well as Walentowitz, Beimborn, Schroiff and Weitzel (2011).

Baker and Jones (2008) take an interest in sustaining strategic alignment as opposed to merely viewing it as either a process or an end-state. They pursue this line of inquiry through expanding upon SAM by recognizing five different types of alignment needed to fully acknowledge the complexity faced by the modern enterprise. They refer to these types of alignment as business alignment, IT alignment, contextual alignment, structural alignment and strategic alignment. By widening the strategic discourse among stakeholders, the authors theorize that a wider understanding of the enterprise will prove beneficial to sustaining strategic alignment.

Chan and Reich (2007) distinguish between several dimensions of alignment based on an extensive literature review. These are enumerated as the strategic and intellectual dimension, structural dimension, social dimension and cultural dimension. The authors note that research into alignment is heavily biased towards strategy and structure as these dimensions of alignment form a more direct causal link to performance. While social and cultural issues should not be overlooked, they are typically perceived as contextual issues rather than integral components of alignment.

Based on our review, we may draw the following assumptions regarding alignment. First, the concept has been heavily influenced by SAM over the past decade. Therefore, research into alignment has been focused on realising formal business strategies. Second, the scope of alignment is often limited to the duality between IT and business. Even though some authors have highlighted the need for a
more multi-dimensional perspective, the focus is still on extrinsic values such as performance whilst omitting intrinsic values like comprehension and acceptance.

2.2 Approaches to Enterprise Architecture

The past decade has seen several attempts to juxtapose architectural approaches. Given the diverse nature of available frameworks and methodologies, such an undertaking carries with it an inherent difficulty in that one runs the risk of “mixing apples and oranges.” Consequently, the roads travelled are almost as winding and diverse as the approaches they seek to analyze. Please note that we utilize the term architectural approach as a generic term for the assorted frameworks and methodologies that strive to guide the practice of Enterprise Architecture.

A relatively direct analytical technique entails simply mapping one or more approaches(s) onto one another. This avenue has been pursued by Urbaczewski and Mrdalj (2006) as well as Noran (2003). Urbaczewski and Mrdalj analyze several frameworks employed by practitioners by mapping them against one another based on views, abstractions and life cycle. They arrive at the conclusion that the Zachman framework possesses the most comprehensive guidance due to its explicit description on stakeholder viewpoints. Noran follows a narrower – yet profoundly deeper – procedure when he maps the Zachman framework onto GERAM. His analysis is based on enterprise modelling and to what extent the Zachman framework corresponds to the extensive provisions offered by GERAM in that department. His conclusions are limited to ascertaining that although explicit comparisons are difficult, one may make implicit connections based on content rather than nomenclature.

Other juxtapositions have been undertaken based on less direct forms of comparison. Leist and Zellner (2006) also take a specific interest in enterprise modelling – albeit not from the point of any specific architectural approach. Their evaluation is based on the premise that the chief purpose of architecture (the authors do not specify type of architecture) is to reduce perceived complexity and increase comprehensibility. Following this line of reasoning, their analysis is based on the extent to which architectural approaches provide guidance regarding meta-models, procedure models, modelling techniques, participating roles and specification documents. Based on their evaluation, Leist and Zellner conclude that none of the frameworks included in their analysis meet all the desiderata for an architectural approach.

Franke, Höök, König, Lagerström, Närman, Ullberg, Gustafsson and Ekstedt (2009) utilize a meta-framework in order to provide a common platform for evaluating architectural approaches. This framework – designated Enterprise Architecture Framework Framework \(^2\) (EAF\(^2\)) – is based on a selection of several existing architectural approaches. These are put through an iterative cycle of analysis where entities are identified, extracted, defined in general terms and consolidated into the final meta-framework. The authors assert that this meta-framework is a viable means to not only compare architectural approaches, but also combine them as EAF\(^2\) stipulates the provisions and omissions of each approach.

Several authors have adopted external metrics that are inherently independent from the terminology and methodology of any single approach as a means for juxtaposition. Tang, Han and Chen (2004) evaluate several approaches based on what they specify in terms of goals, inputs and outcomes. Based on these metrics, they conclude that the architectural approaches covered in their analysis can be delineated into those that are suitable for Enterprise Architecture, and those that are more suited to Software Architecture. Abdallah and Galal-Edeen (2006) adopt a somewhat similar research methodology, but in addition to goals, inputs and outcomes they add a fourth metric which they aptly designate “other”. The authors refrain from drawing any definitive conclusions beyond stressing the need for adaption to individual needs regardless of which architectural approach one adopts. Odongo, Kang and Ko (2010) take this basic approach even further by establishing eleven separate metrics on which to base an evaluation as well as an algorithm to perform the analysis of architectural approaches. By weighing and subsequently ascribing a numeric value to each metric, the prospective user is then able to aggregate the numbers for each approach analyzed and thus see which one is better suited to one’s needs.

Sessions (2007) provides a practitioner perspective on a few of the more widely adopted architectural approaches. Based on his comprehensive – albeit pragmatic – analysis, the author surmises that none of the approaches are sufficiently comprehensive by themselves. They all feature strengths and weaknesses that may or may not be relevant to the practitioner. Based on this conclusion, Sessions
urges prospective users to develop their own architectural approach in order to meet the specific circumstances facing each enterprise.

Given the diverse avenues pursued and conclusions reached through the various analyses outlined above, it is obvious that there is no clear-cut consensus to be found. We may however highlight two salient points. First, the majority of evaluations adopt a relatively mechanistic perspective and perceive enterprise Architecture as a means to design and govern artefacts rather than consider how they relate to the enterprise as such. Second, most evaluations bring up the need for adapting architectural approaches (as well as the analysis thereof) to the idiosyncrasies of the individual enterprise. What these idiosyncrasies entail is however usually addressed in a perfunctory manner or not at all.

3. Research model

Given the inherent difficulties in the comparison this paper seeks to carry out, we feel that previous efforts to evaluate architectural approaches fail to the requirements of the enterprise as a whole. The same can be said for the bulk of the stream of SAM-based research into alignment. Instead, the most meaningful approach would in our opinion be to analyze architectural approaches to actual organizational needs and practices. Furthermore, we will present an alternate view on alignment that will encompass a wider view of the enterprise than just the business strategies.

As a baseline for our evaluation, this comparison will utilize the MIT1990s framework for organizational research (Morton, 1991). Furthermore, we will expand upon this model using research by Dahlbom (1996), Magoulas and Pessi (1998), and Spanos, Prastacos and Poulmenakou (2002). Our research model defines the realized architecture of an enterprise in five basic areas of interests. They are: (1) the area of goals, objectives and values, (2) the area of enterprise activities and their management, (3) the area of decisional rights and responsibilities, (4) the area of primary stakeholders and lastly, (5) the area of information systems and the corresponding ICT. These resources together define the information infrastructure of the enterprise.

![Diagram of research model](image)

**Figure 1**: Model for research

3.1 The area of enterprise goals, objectives and values

Whereas goals and objectives usually take the shape of a hierarchy, other aspects like values, norms, culture et cetera define the conditions under which this hierarchy is formed. Thus, within the context of informatics, the structure of goals may be either asymmetric hierarchies or symmetric networks since
they are established through negotiations (Hedberg, 1980; Langefors 1975, 1986). Furthermore, the social organization should not limit its concerns to profitability, but must also promote a favourable environment for the individuals that work towards collective goals (Ackoff, 1967; Hedberg, 1980). Failure to do so may lead to dispassionate employees which would certainly impede progress in the long term. The individual must therefore feel that his or her own goals are accommodated by the organization.

3.2 The area of enterprise activities and management

A process may be defined in terms of a group of activities organised in such way as to produce a certain product or service. Thus, any form of process transforms a certain object from a certain state to another desired or expected state. In the same sense the knowledge to do such a thing is called technology (Mackenzie, 1984). Hence, the concepts of process and technology are integrated to each other and the interdependence of the involved activities becomes the subject matter of coordination. In the same sense, several activities of processes may share the same kind of resources. This fact creates another requirement for coordination. The transformation may employ different kinds of tools and may be either structured or unstructured. In any case, every form of process states the requisite for both skills and knowledge. Processes may be described as being of a coordinative, evaluative, innovative or developmental character; which in turn affects their need for functionality, flexibility, efficiency, quality, et cetera.

3.3 The area of decisional rights and responsibilities

Usually, social structure is the result of design rather than cultivation. This is either achieved through the decomposition of enterprise ends into a comprehensible structure of elementary task-based units (Simon, 1962, 1969), or the integration of existing task-based units into a comprehensible structure of authority and responsibilities (Churchman, 1971).

The shape of the social structure depends on the situational characteristics of the environment such as legal and ethical responsibility. Therefore, at any moment in time the structure is expected to meet expectations from society while simultaneously satisfy systemic desirability (Checkland, 1981, 1985; Hedberg, 1980; Magoulas & Pessi, 1998). The concept of social structure covers such aspects as the division of work, structures of power, patterns of communication, allocation of authorities and responsibilities, et cetera.

3.4 The area of stakeholders and their knowledge

The stakeholders are the backbone of all organizations. They may be executives, employees, support staff, customers, suppliers, shareholders, local communities or other groups concerned with the enterprise. The stakeholders are the source of knowledge and experience as well as conflict due to their individuality. The individuality of the stakeholder may clash with the participatory nature of systems. Lastly, the most significant aspect of stakeholders may be given in terms of collaboration, communication and commitment (Ackoff, 1967; Checkland, 1981).

3.5 The area of information systems and ICT resources

From the perspective of alignment, information systems and Information and Communication Technology (ICT) forms a natural centre as this area permeates all aspects of the enterprise. While information systems today tend to be computerized, the essential feature is its emphasis on proper procedure (Putnam, 1966). If collectively viewed, the information systems architecture (not to be confused with Enterprise Architecture) defines those systems that provide the enterprise with information and services. These may be transactional, relational, informative, decisional or innovative in nature (Magoulas & Pessi, 1998). This area covers activities such as project planning, project management, modelling, architectural design and simulation.

4. Aligning the constitutional parts of an Enterprise Architecture

The concept of alignment has been expressed in several ways. As a result, alignment is treated synonymously to the following ideas: (1) fit, (2) link, (3) harmony, (4) balance, (5) fusion, (6) integration, (7) relationship, (8) compatibility and (9) conformity (see for instance Avison, Jones, Powell & Wilson, 2004). However, within the context of informatics, the concept of alignment is given in terms of harmonious relationships between two areas of interest in general and the enterprise as a
whole in particular. In the latter case, the alignment is called contextual and we discuss it briefly later on.

4.1 A sense of socio-cultural alignment

Socio-cultural alignment is reflected in the harmonious nature of relationships between the areas of information systems and the areas of goals, objectives and values. The crucial assumption here is that information and knowledge is the glue that holds business and/or social communities together (Magoulas & Pessi, 1998). Such alignment can be defined as:

\[
\text{Stakeholders Expectation (Time)} = \text{Delivered contributions (Time)}
\]

The notion is to determine how shared values, mutual goal-commitments and collaborative behaviour are addressed within the enterprise. The soundness of the socio-cultural alignment may be expressed and assessed in terms of cultural feasibility, i.e. shared values and priorities, social feasibility, co-determination, shared visions, shared goals as well as continuity of mutual commitments. Furthermore, it is of profound interest to determine the manner in which the organization settles upon its common goals.

4.2 A sense of functional alignment

Functional alignment is a state of harmonious relationships between the area of information systems and the area of activities and processes. The fundamental assumption here is that information and knowledge are critical and in many cases strategic resources (Magoulas and Pessi, 1998). Such an alignment can be defined in the following manner:

\[
\text{Required information capabilities (Time)} = \text{Available information capabilities (Time)}
\]

The equation represents the essentials of Galbraith's (1973, 1977) contingency theory, and essentially expresses the necessity for the enterprise to satisfy its need for information in a timely manner.

Any form of informational activity performed by the systems may be seen as a non-separated part of an enterprise activity. In several approaches, enterprise processes are treated as the "creator" as well as "user" of information. In other words, while the quality of information systems depends on the quality of enterprise processes, the quality of enterprise processes depends on the quality of information systems.

The dimension of functional alignment ultimately boils down to issues of coordinated development, i.e. how the development of the information systems has been synchronized with the development of enterprise processes. The soundness of functional alignment should therefore be based on process effectiveness; support, flexibility, inter-dependency, quality improvement, degree of required co-ordination, degree of required synchronisation and economy.

4.3 A sense of structural alignment

Structural alignment defines and integrates the area of information systems with the area of power, i.e. sources of authorities and responsibilities. The crucial assumption here is that information and knowledge are significant sources of power (Magoulas & Pessi, 1998). Therefore the concept of “Information Politics” used by Davenport (1997) reflects the very same issues as structural alignment. In any case, structural alignment concerns the harmonious relationships between the structure of power and the information systems. Such alignment can be defined as:

\[
\text{Established structure} = \text{Accepted structure}
\]

A balanced equation means that the established structure is accepted by the stakeholders of the enterprise. A misaligned structure can manifest itself in terms of conflicts, alienation, absenteeism, etcetera (Hedberg, 1980; Davenport, 1997). However, this form of alignment is impacted by the requisites of comprehensibility. A lack of comprehensibility leads to inability to manage both processes and information. Therefore, rather than technological sophistication, the requisite of simplicity (and efficiency) of processes should dominate the structuring of the enterprise.
Furthermore, the structure of information-flows should map the boundaries of responsibilities. Unclear, complex and incomprehensible information structures lead to loss of manageability. There is a broad consensus regarding the various models that promote or inhibit the structural alignment. Among the more commonly referenced are: Business monarchy, IT-utopia, federalism, feudalism, dualism and anarchism (Davenport, 1997; Ross, Weill & Robertson, 2006; Boddy, 2009).

4.4 A sense of infological alignment

Infological alignment reflects the harmonious relationships between the area of information systems and the area of the individual stakeholders. The basic assumption in this case is that information is knowledge communicated through our language (Langefors, 1975, 1986).

Infological alignment expresses the requisites for locality, comprehensibility and meaningfulness. Cognitive distance, working styles, decision styles, communicative styles and perspectives can be seen as significant factors for the actors’ willingness to use and accept the information systems. Such alignment can be expressed as:

**Required information = Provided information + extra information**

However, information is knowledge communicated through the use of data. Accordingly, infology comprises different approaches to further sound communication. Yet communicating information outside its natural (local) boundaries can be problematic (Langefors, 1975, 1986; Hugoson, 1989, 1990; Magoulas & Pessi, 1998). In many cases the communication of information requires additional information. Furthermore, the value of information and information systems depend entirely on the effects that these tools have on the individual and his social surrounding.

Not all kinds of information can be universally communicated. The globalisation of information should receive specific treatment and should be established through negotiation (Hugoson, 1989). Information systems should support the learning processes that take place within the functions of the organisation. Hence, standard operating procedures should be avoided as much as possible – especially in dynamic environments. In a situation where information gathering and storage becomes institutionalized, there is a clear risk of encountering what may be referred to as the information paradox. This paradox is characterized by a situation where there is a vast amount of data in the information systems, yet none of it is relevant or useful. Concomitantly, the information that actually is needed is not accessible as it is merely present in the minds of employees or in unsanctioned, “feral” information systems (Houghton & Kerr, 2006).

Lastly, the goodness of infological integration can be measured in terms of infological completeness; that is to say a clear and unequivocal understanding of means and ends. A state of infological alignment can thus be demonstrated when information conforms to the tacit knowledge of actors in terms of validity, functionality and relevance (Langefors, 1975, 1986; Mendelson, 2000; Argyris, 1980; Hewitt, 1986; Ackoff, 1967; Simon, 1962, 1969).

4.5 A sense of contextual alignment

Contextual alignment concerns the harmonious relationships between the enterprise as a whole, its information systems and its external environment. The concerned relationships have only an indirect impact on the information systems and the different areas of interests. These areas may at first glance seem unrelated, but since the flow of information permeates the organization, it is necessary to be mindful of the subtle manner in which different areas influence one another. Contextual alignment also includes the enterprise’s boundaries as well as its interaction with its environment (Tichy, 1983). Although it may be difficult (or even impossible) for the organization to affect any change beyond the limits of its enterprise areas, one should be mindful of opportunities and impediments as they are usually the impetus for organizational change. Such alignment can be defined as:

**Expected enterprise behaviour = Observed enterprise behaviour**

Those factors that relate to the indirect interaction between organizational areas as well as environmental circumstances are critical to attaining contextual alignment.
5. Comparative analysis of approaches

The approaches addressed in this paper are the Zachman Framework, The Open Group Architecture Framework - TOGAF, the Extended Enterprise Architecture Framework – E2AF and the Generalised Enterprise Reference Architecture and Methodology - GERAM. The first and second of these frameworks were elected due to their popularity, E2AF due to its explicit focus on the extended enterprise and GERAM due to its focus on customization.

The Zachman Framework (Zachman, 1987; Sowa & Zachman, 1992) was originally developed by John Zachman and extended to its current scope with the aid of John Sowa. In its inception, the purpose of the framework was to steer organizations away from the widespread practice of viewing the enterprise through static and disconnected models.

The Open Group Architecture Framework (The Open Group, 2009) was originally released in 1995. At the time, it was based upon TAFIM, a framework for information management developed by the United States Department of Defense. Currently in its ninth revision, TOGAF has gradually expanded its scope from strict management of IT towards a broader business orientation.

The Generalised Enterprise Reference Architecture and Methodology (Bernus & Nemes, 1994; IFIP-IFAC Task force on Architectures for Enterprise Integration, 2003) is the product of the IFAC/IFIP Task Force on Architectures for Enterprise Integration, founded in 1990. GERAM is designed so that the practitioner is able to combine different frameworks or methodologies in order to custom design a new architecture. Consequently, it is an extensive standard that includes meticulous descriptions of reference architectures, modeling languages, techniques and tools.

The Extended Enterprise Architecture Framework was created by Jaap Schekkerman in 2001. Rather than any unified documentation, E2AF is documented in several separate documents that are incremented in a piecemeal fashion. E2AF assumes a holistic approach to architecture, stating that an enterprise that is to function as a whole must be designed as a whole (Schekkerman 2006:b). Strong emphasis is also placed on contextual awareness and stresses constant awareness of threats and opportunities in the environment (Schekkerman 2006:a, 2006:c).

The study at hand has been conducted using the best, first-hand literary sources available. It is however possible that some documentation regarding these approaches is unavailable due to reasons pertaining to intellectual property or fragmented documentation.

The tables below express the manner in which the investigated approaches address the various forms of alignment. “Clear” denotes the presence of explicit guidance regarding architectural alignment whereas “unclear” denotes the absence or lack of salience.

5.1 Socio-cultural alignment

A state of socio-cultural alignment reflects the harmonious contribution of the information systems & ICT to the ever changing expectations of internal as well as external stakeholders of the enterprise. In many cases, the lack of socio-cultural guidelines can be attributed to the underlying paradigms of the investigated approaches. That is to say, some approaches presuppose that information resources should be treated as independent of organization and culture.

Table 1: Results of analysis vis-à-vis socio-cultural alignment

<table>
<thead>
<tr>
<th></th>
<th>ZACHMAN</th>
<th>TOGAF</th>
<th>GERAM</th>
<th>E2AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Clear</td>
<td>Insufficient guidance regarding relationship between IS and objectives of planner and owner.</td>
<td>Insufficient details offered regarding concept “enterprise benefits”.</td>
<td>Advocates satisfaction of collective needs of the extended enterprise, but offers little practical guidance.</td>
</tr>
<tr>
<td>Unclear</td>
<td>Insufficient guidance regarding relationship between IS and objectives of planner and owner.</td>
<td>Insufficient details offered regarding concept “enterprise benefits”.</td>
<td>Alignment based on requirements of IT and rather than objectives of business.</td>
<td></td>
</tr>
</tbody>
</table>
5.2 Functional alignment

The functional alignment concerns the harmonious contribution of available information systems & ICT capabilities to the information, service, transactions, and relations required by either the business processes or business units of the enterprise. Lack of clarity is often based on the fact that architectural approaches refer to the architecture as a singular information system that serves the whole enterprise and its surroundings. Another cause for concern is the fact that the investigated approaches tend to describe the processes and activities in isolation rather than their relationships to other areas of the enterprise.

Table 2: Results of analysis vis-à-vis functional alignment

<table>
<thead>
<tr>
<th>ZACHMAN</th>
<th>TOGAF</th>
<th>GERAM</th>
<th>E2AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Alignment ensured by operational contracts between customers of and providers.</td>
<td>Harmonization between required IS services and provided IS services.</td>
<td>Alignment between business processes &amp; IS ensured through basic principles.</td>
</tr>
<tr>
<td>Unclear</td>
<td>Insufficient guidance regarding business processes and the area of IS &amp; ICT.</td>
<td>Insufficient guidance on how services are integrated into business processes and subsequently implemented.</td>
<td>Insufficient practical guidance regarding the modelling of the various entities of an enterprise.</td>
</tr>
</tbody>
</table>

5.3 Structural alignment

Structural alignment reflects a situation where information systems & ICT capabilities are characterized by a clear, comprehensible, and accepted form of authority and responsibility. Unclear guidance regarding structural alignment is often derived from the propensity of approaches to describe responsibilities in themselves rather than in relationship to area of information systems. Another source of potential misgivings is the paradigm underlying each one of investigated approaches. Much like with socio-cultural issues, some approaches presuppose that information resources should be treated as independent of organization and structure.

Table 3: Results of analysis vis-à-vis structural alignment

<table>
<thead>
<tr>
<th>ZACHMAN</th>
<th>TOGAF</th>
<th>GERAM</th>
<th>E2AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Based on governance contracts, IT responsibility, data trustees, ownership of common applications.</td>
<td>Clear view of responsibilities &amp; roles of functional areas.</td>
<td>Offers guidance based on level of influence of concerned stakeholders.</td>
</tr>
<tr>
<td>Unclear</td>
<td>Insufficient or missing guidance regarding the areas of authority and responsibilities with the areas of IS &amp; ICT.</td>
<td>Insufficient guidance regarding the relationship between the area of responsibility and the business objectives.</td>
<td>Insufficient guidance regarding harmonization of operations with capabilities of IS &amp; ICT.</td>
</tr>
</tbody>
</table>

5.4 Infological alignment

Infological alignment concerns the sound use of available information systems & ICT capabilities to satisfy the required informational, transactional and relational needs of human stakeholders. In many cases, infological ambiguity can be a presumption by architectural approaches that facts are always facts. By assuming this position, issues like cognitive distance and occupational proficiencies are in effect ignored.
Table 4: Results of analysis vis-à-vis infological alignment

<table>
<thead>
<tr>
<th></th>
<th>ZACHMAN</th>
<th>TOGAF</th>
<th>GERAM</th>
<th>E2AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclear</td>
<td>Insufficient guidance regarding how information requisites such as quality, availability, comparability, consistency, etc. are treated.</td>
<td>Insufficient guidance on how to avoid information paradox and still promote sharing and availability of data.</td>
<td>Insufficient guidance on how to align stakeholders to IS &amp; ICT.</td>
<td>Collective understanding advocated through communication between internal and external stakeholders.</td>
</tr>
</tbody>
</table>

5.5 Contextual alignment

The most essential property of contextual alignment is given in terms of harmony between the external and internal environments of the enterprise. Since the enterprise is unable to directly control its environment, it is only natural for architectural approaches to focus on guidance concerning internal assets. Contextual harmony fills in the blanks with regards to the plurality of legal regulations, rules of intellectual property and political issues that surround the enterprise.

Table 5: Results of analysis vis-à-vis contextual alignment

<table>
<thead>
<tr>
<th></th>
<th>ZACHMAN</th>
<th>TOGAF</th>
<th>GERAM</th>
<th>E2AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Alignment between EA and governance established through operational and governance contracts. Stipulates enterprise conformance with regulations, laws and intellectual property.</td>
<td>Securing architectural alignment between areas of enterprise by crossing functional barriers. Integration and interoperability between the heterogeneous environments of enterprise.</td>
<td>Advocates economic, legal, ethical and discretionary viewpoints. Strong emphasis on external partners.</td>
<td></td>
</tr>
<tr>
<td>Unclear</td>
<td>Insufficient guidance regarding how IS relates to the enterprise and its surrounding environment. Unclear guidance as to how the parts of the architecture fit together. Unsatisfactory guidance regarding how the architecture differentiates between physical possibilities and system rules.</td>
<td>Framework does not cover issues of alignment between business &amp; IT strategy. Insufficient guidance regarding how the alignment between EA and enterprise mission is established. Scarcely guidance regarding how the alignment between EA and its implementation is managed.</td>
<td>Insufficient guidance regarding how the role of IS promotes the responsiveness of the enterprise to environmental changes.</td>
<td>Lack of guidance regarding how to manage conflicting expectations and viewpoints of partners.</td>
</tr>
</tbody>
</table>
6. Discussion

The common denominator of any enterprise architecture is given in terms of various forms of sound alignment between its constitutional parts. Thus, without alignment any sense of architecture disappears. Hence, the ultimate aim of our efforts was to improve the existing body of knowledge regarding architectural alignment and how it is treated by a handful of architectural approaches: Zachman framework, TOGAF, GERAM and E2AF. Each one provides a collection of concepts, principles, guidelines and/or values that is intended to support any effort in the process of designing, developing implementing and evaluating an enterprise architecture that is capable of maintaining alignment between its constitutional parts. Thus, our focus has been to clarify how each one of the investigated approaches treats the issues associated with alignment. We will now briefly discuss the manner and extent to which the investigated approaches offer guidance on socio-cultural, functional, structural, infological, and contextual alignment.

Our investigation into the socio-cultural dimension shows that none of the architectural approaches covered in this paper provide clear guidance with regards to socio-cultural alignment.

Our analysis of the functional issues indicates that three of the four approaches – TOGAF, GERAM and E2AF – offer clear guidance on the different aspects of functional alignment. However, the Zachman framework offers little support and may therefore be considered unsatisfactory in terms of attaining architectural alignment.

Moving on to the structural dimension, our evaluation suggests that the situation is to a large extent the same. That is to say, three of the four approaches - TOGAF, GERAM and E2AF – offer strong practical support on attaining structural alignment. Again, the Zachman framework is lacking in guidance for structural issues.

The analysis of the infological dimension shows that only one of the investigated approaches – E2AF – offers suitable guidance with regards to infological alignment. The support offered by the three remaining approaches – Zachman framework, TOGAF and GERAM – is either doubtful or brief with few clear guidelines.

Finally, the analysis of the contextual dimension shows that three of the investigated approaches – TOGAF, GERAM, and E2AF – provide comprehensive, albeit somewhat simplistic, support regarding contextual alignment. Again, the Zachman framework does not provide any discernible guidelines. It does bear mentioning that among the architectural approaches evaluated; only E2AF offers what may be considered a somewhat nuanced view of contextual issues. By and large, the environment is simply seen as a source of requirements such as legal restrictions and contractual obligations. This is perhaps no great surprise given the sheer complexity of our world at large. However, given that the “outside world” is the source for many of the challenges faced by modern enterprises, one would assume that some manner of guidance would be in order.

It is prudent to point out that this evaluation rooted in the Scandinavian school of informatics which carries with it explicit consideration of hard (mechanistic) & soft (humanistic) aspects of systems thinking. This also extends to our view of organizational design in general and alignment of Enterprise Architecture in particular. Practical examples of architectures that align hard and soft aspects of the enterprise can also be found within international companies such as Xerox (Howard, 1992).

Set against a delineation of Enterprise Architecture into hard and soft aspects, we can discern that the architectural approaches which we have analyzed seem to gravitate towards the hard aspects of architectural design. Hence, these approaches offer a great deal of guidance regarding enterprise activities and formal responsibilities. This provides a stark contrast to the soft aspects of architectural design where very little practical support is offered. It is not within the scope of this article to formulate advice or guidelines to practitioners, but we would suggest caution against underestimating the humanistic aspects of architectural design. Stakeholder discontentment, lack of comprehension and a myopic focus on requirements rather than goals may prove equally (if not more) crippling compared to poor process management or unclear responsibilities.
7. Conclusions

The primary aim of this paper has been to ascertain how the various forms and aspects of architectural alignment are treated by formalized approaches to Enterprise Architecture. This issue has been investigated with respect to socio-cultural, functional, structural, infological and contextual alignment. Our study has provided us with the following conclusions:

Firstly, our investigation clearly demonstrates that approaches to Enterprise Architecture provide guidance for structural and functional alignment, but less so for infological or socio-cultural alignment. A possible explanation may be that investigated approaches follow a paradigm that demands the independence of information and information systems from cognitive, organizational and technological aspects (as explained by Branchseau & Wetherbe, 1986). Another feasible interpretation is that investigated approaches are derived from a tradition of engineering design rather than architectural design. This would account for the focus on requirements and constraints found in the "hard" aspects of the enterprise, rather than the "softer" aspects such as goals and decision making that characterizes architectural design.

Secondly, the area of contextual alignment is described by all investigated approaches as being relatively simplistic and stable. Some forms of contextual alignment are established through contractual agreements while others are dictated through laws and regulations. This is presumably in response to the heterogeneity inherent to most environments.

Finally, none of the investigated approaches discuss the mutual interdependence that exists between the various forms of alignment. However, the architectural patterns of the enterprise are the result of organizational forces rather than rationality. This follows previous research by Mintzberg (1989).

References


Requirements Elicitation for the Technology Conception of a Community Information System for the Indigenous Microenterprise: A Contextual Multi-Analysis Approach on Business and Community Requirements of Batik Making

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Abstract: Batik is a traditional art form whose charm lies in its power of storytelling. Batik making is practiced by various indigenous communities in Asia and Africa and has evolved into a socio-economic uplift existing as a cottage industry. The Malaysian batik industry was revived by the government intervention to emphasize batik as a cultural identity and also to improve the livelihood of batik producers where the majority operates as indigenous microenterprises. However, the batik making tasks and the management of batik microenterprises are currently not supported by the use of ICT. To facilitate batik microenterprises ICT adoption we proposed the development of ICT-based information systems that emphasize the cultural context of batik production. In our work we argued that the facilitation of batik microenterprises ICT adoption can happen by developing an ICT-based information system that emphasize the cultural context of batik production. We argued that a technology conception needs to consider the ecological aspect of batik production that comprises of resources, technology and geography to understand barriers and opportunities of technology. To support our argument, we conducted a batik microenterprise business requirements elicitation to formulate the technology conception for an ICT-based information system. We adopted the framework that considers a cultural diversified practice and focus on the cultural context as a business requirement for ICT adoption. We conducted a contextual inquiry using multi-activity inquiries that include site visits, face-to-face and focus group interviews with an informal batik making community of practice. Our participants are representatives of batik advocators, entrepreneurs, practitioners and apprentices. We strategize the focus group inquiry in a workshop setting using verbal and visual cues to navigate the chaotic and fragmented storytelling of group members. From the contextual multi-analysis conducted we discovered that the technological conception for batik microenterprise is incomplete if we only address the usual business productivity requirements. Our findings reveal that the concern for batik aesthetics and the fear of batik cultural erosion should not be overlooked as these concerns are equally imperative as business productivity. In addition we also discovered that a social structure dimension is an important input to understand the primary and secondary actors within a technological conception. This concept will be useful in defining roles within future socio-technical systems that will be created to support business and knowledge activities of indigenous microenterprise. We formulated this technology conception as core elements of the community information system requirement specification for the batik microenterprise. Our work will contribute to the literature on systems engineering of ICT-based information systems for indigenous or cultural influenced business.

Keywords: community informatics, requirements engineering, microenterprise, technology adoption, indigenous business, socio-technical system

1. Introduction

Batik is an indigenous cultural artefact that is influenced by the creativity of a single or collective human actions inspired by natural surroundings. Batik is predominant in various indigenous communities in South East Asia, Africa, India and China. The charm of batik lies in its power of pictorial storytelling where batik motifs depict nature as well as everyday lives and practices. Batik making has evolved into a socio-economic uplift within indigenous communities and has long existed as a cottage industry. In Malaysia, the batik industry has been revived by the government intervention in support of the industry. Besides emphasizing batik as a cultural identity, the Malaysian government is also interested in improving the livelihood of batik producers where the majority operates their trade as microenterprises. The Malaysian Ministry of International Trade and Industry has emphasized on the necessity of enhancing domestic capabilities and competitiveness of manufacturers of batik by facilitating the utilisation of ICT and new technologies in the design, production and marketing of batik. The interest to promote and increase the production of batik is currently hampered by use of traditional methods of batik making like hand painting and block printing. Currently the management of batik microenterprises is also not supported by the use of ICT. This situation prevails as batik makers are concerned with issues of the disruption of the craft’s cultural heritage and acts of design theft when batik designs are published. The unique situation of batik making as an indigenous business is a strong motivating factor to explore on the ICT adoption of batik microenterprise to gain
an insight on to improve their operational efficiencies and market positioning. Here, we present our technology conception approach for batik microenterprises practices from the framework of socio-technical systems. We scope our work on the elicitation of business requirements for batik microenterprise business management. Realizing that batik making involves a cultural heritage influence, we focus on the demand of rational and affective attitude towards batik making in the elicitation. We argue that the approach of contextual inquiry can help us gain better understanding of the batik making situation before attempting to look into possible socio-technical systems solutions. Our paper covers a broad literature review of microenterprise and batik making, technology adoption and socio-technical systems issues. We then report on the contextual inquiry work that we conducted to elicit business requirements of batik making and our findings highlighted pertinent issues in business and ICT strategy alignment.

2. Literature review
This section covers a review on pertinent issues of the Malaysian batik industry, ICT adoption and microenterprise, ICT-based work systems and elicitation methods.

2.1 The batik making enterprise
The Malaysian batik industry is clustered under the creative industry and is divided into small and medium enterprises (SMEs) and the cottage industry which operates as microenterprises (Wan Teh 1997). However, based on Porter's industry cluster (Porter 1990) batik will be placed as a handicraft industry and categorized as a historic know-how-based cluster. Within this cluster, the batik business knowledge is based on the traditional activities that survived over the years through the inheritance phenomenon across generations spurned by a mentoring process knowledge transfer traditions. Batik microenterprise business model is about producing batik traditionally for the local market and batik microenterprise are known for the expertise in batik making technique and design creativity. In Malaysia there is no official differentiation between batik manufacturers and batik artist as they both belong to one nationwide community of batik makers. Batik has been endorsed as a cultural heritage entity by UNESCO in 2009. The knowledge asset is one of the preservation entities. Batik exists as the object of traditions that inherits traits of traditional knowledge and preservation, imperative to the community memory. As a handicraft product, batik reflects the cultural aspect of the batik making community and is subjected to the batik makers' prioritized agenda. The batik maker is comprehended to have both an artist and a designer attitude within the batik making task model. A batik maker is a person who assumes the role as an artist, a designer and a promoter to make batik for cultural and business endeavour. The versatility of the role playing is due to the craftsmen model of business as microenterprises and livelihood strategies. As the role of batik maker is to “make” batik, this demands both rational and affective attitude towards the artefact and its making. The attitude of an artist features of adhering to self-driven task model, having artistic sense and life enrichment objective. On the other hand the designer attitude emphasized on engineering process driven task model, having the technical sense and creative sensibility as attitude towards product development.

Our synthesized understanding of the Malaysian batik maker is illustrated in Figure 1 and is derived from formal sources of batik maker definitions from Jamal (1994), Ismail (1997) and Elamvazuthi and Morris (2000). An elaboration of the synthesized understanding refers to the duality of creative design which described designing as a rational and a non-rational process (Schön, 1983) and between reflective practice and technical rationality (Schön, 1983). In addition the dual faceted attitudes in batik making can be described from the need perspectives which influence the cognitive reasoning of the batik maker. Maslow’s (1943) hierarchy of needs is the theoretical basis of understanding levels of need. The artist as a romanticist need is to create for self-actualization. The satisfaction gained from the batik artefact is beyond economical purpose in contrary to the need to develop a product for market acceptance. The designer as a rationalist emphasized on the engineering process driven task model, having technical sense and creative sensibility as attitude towards product development. However the transcendental, proximity, aesthetics and serendipity characterizing elements of both attitudes are presence within the artist and designer task models to provide the philosophical component of the batik design artefact.
2.2 ICT adoption, community informatics, socio-technical systems and knowledge systems

The adoption and diffusion of ICT throughout a productive system assumes a core position in the new economy and has spurred numerous ICT adoption research conducted from different approaches. Generally, there are three approaches to ICT adoption: the diffusion approach, the adoption approach and the domestication process (Manueli, et al 2007).

2.2.1 The diffusion approach

In the diffusion approach, the Roger's Diffusion of Innovation (DOI) theory is used to explain the role of the media and interpersonal contact in providing information that influences a person's opinion and judgment of the technology that leads to the adoption of the technology. DOI theory is used to view the adoption stages and factors leading to adoption. From the DOI theory, the Rogers' Innovation-Decision Process model is used to gain further understanding of the adoption process related to issue of access. ICT adoption by SMEs is studied in many settings. In the Italian industries, Atzeni and Carboni (2006) revealed that weak ICT penetration is due to the size of industry, the lower reorganization of work practices and the sectoral specialization. For the Malaysian SMEs, Khong and Eze (2008) confirmed the factors of DOI theory and added two other factors which are ICT security and costs. For SMEs in Poland, Spain, Portugal and the United States, Arendt (2008) highlighted that the impact of the lack of access to ICT is less important when compared to the lack of proper knowledge, education and skilled owner-managers and employees within the enterprise. This indicates that the issue of ICT non-adoption cannot be solved simply by the provision of ICT access.

ICT adoption studies also scope into adoption by rural poor focusing on the barrier to ICT adoption from the digital divide perspective. Barriers often cited are factors of limited physical access, socio-economic and socio-personal factors and low education level of potential adopters (Foley et al 2002). However, when addressing ICT adoption in community development, issues of technology compatibility is more important than issues of access. Helmersen (2006) criticised the approach of ICT adoption that forces Western technologies on the poor in developing and third world nations and stressed the need to have a deep local insight that attempt to understand the cultural context that facilitates ICT adoption. Similarly, Kivunike, et al (2009) studied the facilitating and inhibiting factors of ICT adoption by the rural poor in Uganda from a demand-oriented perspective. They too highlighted the importance of understanding the contextual factors that influence ICT adoption. They then suggested that strategies of ICT adoption should move beyond the provision to facilitate adoption and the use of ICT by the rural poor by considering factors such as maintenance costs, quality of services, ICT skills and creating awareness of potential benefits in the rural communities.
Community ICT adoption has evolved into a new discipline known as community informatics (CI) and is related to the discipline known as development informatics or ICT4D. Led by Gurstein (2008), research on CI explored into various methods of research inquiry and practice. Moor (2009) conceived different aspects of community informatics research to consist of contexts/values, cases, process/methodology, and systems and is illustrated in Figure 2.

![Figure 2: Pillars of community informatics research (sources: Moor 2009)](image)

Moor (2009) also highlighted two important CI research contexts: community-centred development and community knowledge sharing through the development of socio-technical systems such as knowledge management systems (KMS).

### 2.2.2 The adoption approach

The adoption approach explains the adoption decision of users applying different individual and social decision making theories. The adoption literature began with the technology acceptance model (TAM) which was first presented by Davis in 1975. Since then TAM has been validated in numerous technology settings and is heavily cited in the literature. TAM is used to determine adoption influencing factors in IT systems both in the voluntary and mandatory used systems and adoption is reflected in the overall user acceptance. Key constructs of TAM are perceived usefulness and perceived ease of use of IT systems and have been used to determine the acceptance of the technology. However in TAM, personal control factors like behavioural accounts are not taken into consideration. TAM is also used with the Delone and McLean IS Success Model to determine the influence of systems quality and information quality of the IT systems on the success and failures of IT systems. Further extension of TAM will be the Information Technology Adoption Model (ITAM) by Dixon (1999) that seeks to refine the IT requirements of the information systems that influences IT adoption leading to the development of the IT adoption framework that includes the interaction between individuals, technology and tasks (FITT framework). The FITT framework focuses on the significance of the optimal interaction (fit) of individual user, technology, and task attributes. Now the fit between the attributes is seen to be more important than the individual attributes themselves. For example, IT skills of the users are not sufficient for the success of an introduction. The IT skills must match the requirements by the IT software.

### 2.2.3 The domestication process

Domestication is described as the process of technology adoption into everyday life and originates from other disciplines such as anthropology, consumption studies and media studies. Domesticating
ICT involves a process of bringing new forms of ICT into the home (Chen and Zhang 2009) and involves the integration of technologies into social relationships and structures. The domestication framework has four concurrent phases: the appropriation, the objectification, the incorporation and the conversion. This approach of adoption considers the context in which ICT is experienced by the people using them. Conceptual context distinctions are applied to approach where three important distinct contexts are identified. The first is the work and leisure context, the second will be the end-users that belong or do not belong to a demographic group and the third is the private and the public.

2.3 Microenterprise, information systems and socio-technical systems

Researches on ICT adoption by SMEs attempt to determine whether ICT adopted throughout the production process can produce positive outcomes related to operational efficiencies, increased revenues and better market positioning. Alter (2002), defined an information systems framework that outline nine elements that can be used to analyze the professional context to address issues of productivity and sustainability. However, the challenge of microenterprise ICT adoption is multi-dimensional where human factor is a central issue (Duncombe and Molla 2009). Kamal, et al (2010) raises the issues of affordability, awareness, management capabilities and the lack of ICT infrastructure which are not addressed in the earlier information systems framework such as Alter's framework. Duncombe and Molla (2009) who presented four archetypes of information systems formalization amongst SMEs in Botswana, pointed out the importance of looking into the systemic approach when considering the adoption of information systems in SMEs. A firmer assertion was made by Hoffman, et al (2009) who argued that information systems can be viewed from the socio-technical systems perspective to include cultural phenomena approach that will help researchers comprehend the application of works systems outside the professional work context. They further elaborated on the macrocognition approach to help comprehend information systems robustness, resilience and adaptiveness.

A micro-perspective of microenterprise ICT adoption can be viewed from the theoretical lens of socio-technical systems (STS). STS is a social system sitting upon a technical base and comprises of the technology, the people and their personal communication and tasks, views, organizational structures, co-operation and others (Whitworth 2008). Here an STS perspective will shed some light on factors to work on promoting microenterprise ICT adoption. This view is aligned to earlier findings of Tschiersch and Schael (2003) who stated that as industry gets shaped by technology through the process of production automation, computer-supported information and co-operation networks, the reliance will no longer be on mere technical systems but rather on STS. Three technology related dimensions of STS are namely, the workplace, the group work and the network. In the workplace dimension, the concern will be on the actual use of technology within the working process. According to Tschiersch and Schael (2003), from the human centered perspective, the most complex aspect of human work takes into consideration the intrinsic need of people to develop themselves further and to experience through their work, challenges, motivation, success and satisfaction. They further added that the design of STS should try to fulfill meaningful and rewarding tasks which also take account of the individuality of the human operator. The approach to design a socio-technical system is to explicitly recognize the technology’s symbiotic relationship with society, and so tries to involve end-users in the creation of the technical products that will affect their lives.

2.4 Business requirements elicitation

The traditional approach of requirements elicitation is mainly centered on hardware and software requirements and is often dominated by technical issues of functionality, connectivity, interoperability and security. Isabirye (2009) highlighted the issue of design-reality gaps between ICT analysts and users which is due to the detachment from the context of a proposed system to be implemented. This follows Heeks (2002) beliefs of the gaps between the system design which is based on the analyst’s perceptions and the reality which is often foreign to the analyst. According to Disse (2001) system requirements are best determined through merging the different viewpoints of the stakeholders involved. Whitworth (2009) presented a comprehensive view of socio-technical requirements that he hierarchically group into physical, information, personal and communal requirements. He suggested that STS which involves community influence and participation should consider personal and communal requirements that he prescribed in his Web Of System Performance (WOSP) model. We interpret this into the necessity of understanding the cultural context of the problem domain of batik making. This implies that the technological conception of an ICT-based information system for batik microenterprise demands a holistic understanding of the problem situation and the current resolution
towards community empowerment with desirable cultural identity development. A contextual inquiry is therefore necessary for the requirements elicitation.

2.5 Contextual inquiry

The contextual inquiry is useful for examining and understanding users and their workplace, tasks, issues and preferences. Within the human computer interaction (HCI) literature, contextual inquiry is commonly-known as the user-centered approach. It is viewed as a synthesis of ethnographic, field research, and participatory design methods that provide designers with grounded and detailed knowledge of user work as a basis for their design (Hotzblatt and Jones 1993). Contextual inquiry studies on the users are made in the context of their work by observing how they perform tasks, the tools they used and the process involved in their work. In HCI, contextual inquiry can be conducted in a laboratory where participants in the inquiry are observed under a usability testing set-up or conducted in an ethnography study set-up or conducted as a focus group workshop (Summers, et al 2004).

Outside the context of HCI studies contextual inquiry is also used in information systems requirements elicitation that apply the soft systems methodology (SSM) as seen in the work of Bednar and Welch (2005a, 2005b, 2005c 2006) and Bednar (2009). Bednar’s work view contextual inquiry as a technique for interpretive modelling of a problem situation in recognition of the importance of context for systemic analysis. In further refinement of the contextual analysis, Bednar (2009) introduced the Strategic Systemic Thinking (SST) framework consisting of three aspects of analysis: the intra-analysis, the inter-analysis and the value-analysis. SST is intended to be iterative, and therefore it is possible to move from one analysis to another repeatedly and in any direction and this is easily aligned with the grounded theory methodology. The researcher acts as the external analyst facilitating the research participants to articulate their worldviews using various methods such as rich pictures, brain-storming, mind-maps, diversity networks, drama transfers, role-playing all of which are supporting creation, visualization and communication of mental models and narratives. The purpose of intra-analysis is to enable the creation of an individual process for structuring a problem (through individual interviews and workshop observation). This analysis aims to create and capture a range of narratives from participating stakeholders by providing an enrichment and visualization process for them. Inter-analysis is the aspect of the inquiry which represents collective reflections of decision-making alternatives (through focus groups). The aim is to have a dialogue and to reflect upon ranges of narratives derived through intra-analysis. The purpose is not to achieve consensus or to establish common ground, but to produce a richer base upon which further inquiry and decision-making could proceed. Grouping of narratives takes place through consideration and discussion of individually produced narratives. Results of these inquiries might be considered to form a knowledge base relating to problem spaces under investigation.

The strength of conducting contextual inquiry in requirements elicitation is the ability to investigate the phenomenon of the processes that involves human interaction that gives an opportunity to recognize individual emergence. This will be useful if the information system is seen as a network of human actors, interacting and communicating using available means (including technological artifacts), and then complexity is recognized through the individual sense-making processes of each actor Bednar (2009).

3. Methodology

We aim to formulate a technological conception of an ICT-based information system for batik microenterprise. We employed the contextual inquiry in accordance with the work of Bednar (2009) in the elicitation of business requirements of batik microenterprise to gain insight on batik making operational efficiency and sustainability. Based on our literature work, our research took into account the importance of community and cultural context of the batik microenterprise. We described our approach in the next sub-section.

3.1 The overall method

The data collection is conducted over a period of six months through different data collecting activities consisting of personal interview with stakeholders, visits to actual business sites and focus group interview before attempting to produce the refinements of the business requirements (Figure 3).
Although the focus of this research is on batik microenterprise the contextual inquiry covers other batik making stakeholders to gain an understanding of the batik making ecosystem. The data collection was done sequentially to allow for re-adjustment and re-alignment of our understanding the batik making context.

### 3.2 Sampling

For the sampling process, an informal categorization of the batik community membership was made based on early discussion with batik academics with reference to the context of batik knowledge transfer mode (Figure 4).

![Figure 4: Batik knowledge transfer mode](image)

The informal categorization consists of the experts group (designers, advocators, advocating designers) and novice group (apprentices) and is used in this study as a duality strategy (individual – collective) is chosen for the unit of analysis and comprises of (1) individual microenterprise/SME and (2) the collective- component of informal batik community of practice made of advocators, designers and apprentice). The overall sampling for the contextual inquiry is done based these different stakeholders and the roles of the actors within these groups are illustrated in Table 1.
Table 1: Hierarchy of batik makers

<table>
<thead>
<tr>
<th>Actor</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice</td>
<td>A novice designer who have less than 5 years experience of practice.</td>
</tr>
<tr>
<td>Designers</td>
<td>A designer with experience more than 5 years in practice and still actively practicing.</td>
</tr>
<tr>
<td>Advocating Designers</td>
<td>A teacher for formal learning who is a textile designer by formal training and practice with more than 10 years practicing experience or teaching or mentoring</td>
</tr>
</tbody>
</table>

3.3 Face-to-face interview

We conducted face-to-face interview with an advocating designer and a practising designer to familiarise with the research context. As we familiarised with the research phenomenon our ability of focusing into areas the respondents considered important is crucial. For example, one of the respondents introduced the conception design by accident/serendipity which means that knowledge is sometimes shared in ad hoc situations and this received further attention in the following interviews. The interviews were recorded and after transcription they were sent to the respondents to be verified.

3.4 Focus group interview

The focus group interview was conducted in a story-telling workshop that allows the participants to share their story and able to express their opinion. The participants consist of representatives from three actor groups shown in Table 1. A facilitator from the research team was involved in the story-telling session. Video recording of the workshop session was done and two assistant researchers transcribed the discussion in the session. The preparation and the conduct of the workshop were done in a careful manner to take great care that the participants’ opinions are respected.

3.4.1 Instrumentations

Two types of instruments were used. The first is the visual cues which are digitized images of batik artefacts. Artefact digitization sessions were done during the early stage of the research before focus groups session. The visual cues are used similarly like technology probe to trigger stories and boundaries for the storytelling session. Verbal cues are used by the facilitator to align stories with the research questions formulated prior to the workshops. The verbal cues used are shown in Table 2.

Table 2: Verbal cues

<table>
<thead>
<tr>
<th>Objective</th>
<th>Cues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain Knowledge Acquisition</td>
<td>Tell us your life story of making batik:</td>
</tr>
<tr>
<td></td>
<td>How you do learn to make batik? How do you get involve in batik making?</td>
</tr>
<tr>
<td></td>
<td>What are your social network, social responsibility as a batik maker?</td>
</tr>
<tr>
<td></td>
<td>How can we identify traditional and contemporary batik?</td>
</tr>
<tr>
<td>Applied Design Knowledge Visualization</td>
<td>Describe your experience to produce a batik product from planning to finish product:</td>
</tr>
<tr>
<td></td>
<td>How do you know what to produce?</td>
</tr>
<tr>
<td>Aesthetic Knowledge Visualization</td>
<td>Describe stages of idea development until sketches of design</td>
</tr>
<tr>
<td></td>
<td>How do you know your product has aesthetics value realized?</td>
</tr>
<tr>
<td></td>
<td>How do you judge batik aesthetics?</td>
</tr>
</tbody>
</table>

3.4.2 Procedures

The activities of the focus group interview are described in Table 3.

Table 3: Focus group activities

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Each focus group workshop was conducted with 12 selected participants who are group according to their actor’s role.</td>
</tr>
<tr>
<td>Timeframe (150 minutes)</td>
<td><em>Introduction. (5 minutes):</em> The facilitator explained the research-driven story to the group and provided everyone with paper and pens. The timing was controlled to avoid unnecessary delay. <em>Case Story Session (5 – 10 minutes):</em> The workshop participants spent time before the session writing their story based on their experience of a particular theme. As the story is being told, participants were told to note details of the story and ideas for questions and not to interrupt, and to respect confidentiality. The observer for each group took notes. <em>Conversational &amp; Informal Dialogue (25 – 30 minutes)</em></td>
</tr>
</tbody>
</table>
The listeners write down their immediate reflections on the story: similarity/difference of the story with own story. Then they share their reflections within the group, one at a time with no interruptions. The observer for each group took notes.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Ethics &amp; Protocol</td>
<td><strong>Promotes Emergence Not Forcing:</strong> Critical, asking and answering probing questions about the subject matter in order to do it better not to force emergence.</td>
</tr>
<tr>
<td></td>
<td><strong>Promotes Caring:</strong> Ensure that our questions and our answers are generated in a climate of respect for the values.</td>
</tr>
<tr>
<td></td>
<td><strong>Promotes Confidentiality:</strong> Respecting the storytellers who are taking the risks to share their experiences. Video Recording is done with permission from participants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Provision of Visual Cues</th>
<th>Verbal Cues: Motif Origin Design Element Technique Unity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visual cues are used to trigger stories and boundaries for the storytelling session. Verbal cues are used by facilitator to align stories with the research questions formulated prior to the workshops.</td>
</tr>
</tbody>
</table>

| Video Recording                  | Video Recording is done with permission from participants                                                                                   |

3.5 Actual site visit

We visit two batik microenterprise sites to make live observation of the batik making realities. We also conducted informal interview with the batik maker. The live observations verify processes of batik making for each technique to gain inside knowledge of actual practices and to gain real life experience in batik making for comparison with stories acquired from interviews and focus group sessions.

4. Analysis and findings

A micro analysis was conducted where content of the transcripts from the personal and focus group interview were coded to make sense of data to facilitate the emergence of open codes using the In Vivo Coding by Atlas TI. As the process is tedious, we took care to avoid the tendency of over-conceptualizing. The open codes for this study were derived from multiple sources of data allowing a precise differentiation among categories. The contextual analysis attempted to model the problem situation using text from data corpus using reflective coding matrix. The content analysis attempts to triangulate the empirical data with secondary data from literature. Observations made during the site visit also supported the contextual analysis and these observation forms evidence of multiple sources of data.

Two important discoveries emerged. The first is the business reliance on batik makers’ tacit knowledge gained from personal experience, batik mentor storytelling and non-textual references such as photographs and images from books and other repositories of knowledge that includes batik collection.

The second is the concern for the business sustainability in the globalization era related to the concept of batik cultural erosion. This stems from batik makers resort for discontinuity of batik cultural rules in order to survive the socioeconomic impact of business globalization. The discontinuity of traditional aesthetics attributes category of concept is characterized by a number of properties, processes and dimensions reflecting individual and contextual causal themes which either singularly or in combination provided a foundation for cultural erosion situation. Themes emerged as singular definitional concepts and on a causally or implicationally linked. The discontinuity category of
concepts has a relationship with the core categories modelling community-based information system as a requirement. We further enumerate three dimensions that cover competency deficit, isolated strategies and diverse level of need shown in Figure 5. The rest of this section presents the dimensions and related elements.

**Figure 5:** Dimensions of batik makers’ position

### 4.1 Competency deficit

As illustrated in Figure 5, the lack of cultural knowledge and mimetic style is related to the batik maker’s competency dimension. Competency refers to the set of skills related to cultural knowledge and attributes that allow an individual to make batik. There are two types of competency: (1) personal and mimetic. Personal competency relates to individual emotional intelligence while mimetic competency relates to mimetic styles capability and social semiotic.

Personal competency deficit comprised of cognitive and behavioural attributes causing dissenting conducts reflected by themes such as: “copycat syndrome”; “shortcut to market”; “compromised quality” and “shallow in feel”, “forgoing tradition for material gained”, “motif hallucination”, “chaotic arrangement” and “technique disunity”. These themes are resulting trajectories of personal competency deficit which have led to isolated strategies for batik making in addition to livelihood and business drivers: poverty alleviation, and mass production. To gain better understanding of the situation a sensitized interpretation has been done. Drawing from psychological theory of emotional intelligence by Goleman(1998) personal competency embodied a form of intelligence relating to the emotional side of life, such as the ability to recognize and manage one’s own and others’ emotions, to motivate oneself and restrain impulses, and to handle interpersonal relationships effectively. The theory denoted the cluster of abilities relating to the emotional side of life as components of emotional intelligence: knowing our own emotions, managing our own emotions, motivating ourselves, recognizing the emotions of others, and handling relationships. As for learning capability it is claimed that potentials for learning the practical skills are based on the five elements: self-awareness, motivation, self-regulation, empathy, and adeptness in relationships. Participants have pointed out that due to livelihood condition batik makers have adversities (hardship) to deal with. As a result personal competency development has been neglected to survive a better income and living conditions (fire fighting phenomenon). Table 4.2 below maps an array of adversities theme which interprets the state of personal competency deficit in batik making task associated with Golemans’ traits of personal emotional competencies.
Table 4: Adversities theme Interpretations

<table>
<thead>
<tr>
<th>Themes – Adversities</th>
<th>EQ Traits for personal competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional but lack of awareness</td>
<td>LACK OF SELF-AWARENESS</td>
</tr>
<tr>
<td>Personal strength engulf by adversities</td>
<td>Emotional Awareness: recognizing one’s emotions and their effect</td>
</tr>
<tr>
<td>Self-worthiness low</td>
<td>Accurate Self-assessment: knowing one’s strengths and limits</td>
</tr>
<tr>
<td></td>
<td>Self-confidence: A strong sense of one’s self-worth and capabilities</td>
</tr>
<tr>
<td>Feel insecure, self-control dependent on others</td>
<td>LACK OF SELF-REGULATION</td>
</tr>
<tr>
<td>Honesty and integrity secondary, follow the flow to survive</td>
<td>Self-control: Keeping disruptive emotions and impulses in check</td>
</tr>
<tr>
<td>Personal performance determine by following market trend</td>
<td>Trustworthiness: Maintaining standards of honesty and integrity</td>
</tr>
<tr>
<td>Innovation is secondary, livelihood is priority</td>
<td>Conscientiousness: Taking responsibility for personal performance</td>
</tr>
<tr>
<td></td>
<td>Adaptability: Flexibility in handling change</td>
</tr>
<tr>
<td>Lack of initiative to improve</td>
<td>Innovation: Being comfortable with novel ideas, approaches and new information</td>
</tr>
<tr>
<td>Not important to strive for quality</td>
<td></td>
</tr>
<tr>
<td>Out-of-group perception towards quality</td>
<td></td>
</tr>
<tr>
<td>Not willing to increase cost for design improvement</td>
<td></td>
</tr>
</tbody>
</table>

The argument lead by the emerging themes of both competency issues and adversities is the lack of cultural knowledge and mimetic style related to batik maker’s competency dimension is a main concern for business sustainability of batik making. Mimetic as defined by Hofstadter (1976) is “the idea to describe a unit of information residing cognitively and is mutating in human cultural dynamics”. Mimetic has been claimed to be an approach to evolutinal model of cultural knowledge. The workshop participants have also pointed out due to livelihood condition batik makers have adversities to deal with. As a result personal competency development has been neglected as survival process strives for better income and living conditions. The process of survival demands low cost of production and product market availability.

4.2 Isolated strategies

Participants highlighted that isolated strategies results from the lack of understanding of the inherent culture and the overwhelming urge to improve livelihood. Isolated unwritten strategies that govern behaviours to meet those demands, places the batik maker in a difficult position to oblige to the cultural rules (indigenous nature) to fit in the business scenario. Four areas of concern related to these strategies are:

- Efficiency: the optimal method to accomplish batik making task;
- Calculability: quantifiable aesthetics values rather than subjective, establishing mass production, to match quantity with quality and to meet demand at lowest cost of production;
- Predictability: Standardized and uniformity;
- Control: Replacement of human and non-human technologies in batik making.

The isolated strategies dimension declares the plan of actions batik makers formulated for batik making. As identified from intra analysis and verified by inter analysis these isolated strategy themes are: (1) acting not part of community; (2) act to promote non-conformance to community memory and (3) act to promote non-conformance to cultural heritage requirement. Isolated strategies are closely related to individual motivational factors to make batik which can be clustered as creative expression, entrepreneurship and profit generation, cultural heritage preservation and economic and social survival. These motivational factors explain differences in intensity and direction of batik makers’ attitude. The isolated strategies dimension of position in addition to competency was revealed by two factors: social and economic driven.

Social cultural factors include ideology, belief and language represent a perspective of solitary attitude contributing to the discontinuity of traditional aesthetics attributes. Social change emerged as a conceptualisation promoting risk or threat that exists with every batik tradition. There is, primarily, difference between the collective and individual culture. This differential illustrates how the cultural attributes of individual in terms of issues of cognition and dissenting behaviours provide impetus for out-of-group perception and the consequences of isolating strategies. This trajectory provides the
understanding of motivations for discontinuing traditional aesthetics attributes. To illustrate this contention a number of cases are explored during the focus group sessions. The first case of exemplary analysis illustrates two batik designs produced from isolated strategies. Both designs shows traits of traditional discontinuity but fit the customer requirement while maintaining a structural fit with aesthetic need. It was revealed by the designs that both are business artefact made to satisfy modern taste of batik. The isolating strategy of making these designs for modern taste was instigated by the consumer requirements.

The economic motivational factor reveals in one of the batik design exemplary case during the focus group. Not knowing the aesthetics attributes for judging batik aesthetics was found to be the core of dissenting behaviour. Focus group participants voiced out that they know that some batik makers do not have the skill to make batik but are able to sell batik products in large scale. Knowingly bending the rules was identified with a few participants acknowledging that their practices were not in accordance to the standards but their motivations lay within the immediate needs of the customers and opportunities to make profit. The livelihood factor is dominant, isolated strategies can arise from not knowing the rule; just accepting the rules; and mentor-apprentice relationships. The isolated strategies contribute to the dissenting phenomenon that the participants voiced out. This isolated strategies revealed by not knowing the aesthetics values of the community, and if the aesthetics values were known, ignoring them can be part of their choice. Participants revealed many isolated batik designers experience the lack of understanding of cultural knowledge.

4.3 Diverse need

The need of a community system is unlikely to be singular. The batik makers have needs and their decisions to make batik depend highly on fulfilment of needs. Batik makers were propelled by the need to address the acuity of the survival situation, either an issue of social, economical or an individualized issue. The diverse need dimension portraying the decision making position can be viewed as follows:

- **Batik Artist**: The experienced artist aims for self-actualization when designing batik to realize paintings or craft work for the collector’s market. On the other hand the new artist aims for acceptance and recognition by the community and to be able to compete in the marketplace. Themes emerging related to need of batik artist are “uniqueness”, “art” and “creation” which are interpreted as Striving towards Self-Actualization;

- **Batik Designer**: The batik designers who have more than 10 years experience express needs of culture heritage preservation while the apprentices are striving to be recognised and accepted. Themes related to their needs are “exclusiveness”, “taste”, “storytelling, “drawn batik” which are deduced as Projecting Self-Esteem and Gaining Self-esteem; and

- **Form Maker**: The form maker needs are inclined to getting paid and realizing batik for consumer market. Themes related to their needs are “clothing need” which is interpreted as Act of Survival.

4.4 Community-based information system model for batik microenterprise

We synthesized our findings to depict a core concept for the technology conception for a community-based information system for a batik microenterprise. Sustainability of batik making is pointing towards batik maker’s competency dimension and adversities. We propose that competency issue due to the lack of cultural knowledge and mimetic style may be addressed by the provision of information systems that provide access to batik documentary and learning system as a complement. In addition, a mentor-apprentice relationship community strategy can help overcome the discontinuity of traditional aesthetics attributes due to the lack of knowledge. From these findings we formulated the core concepts that need to be addressed and captured during requirements elicitation. They are the content requirement (the batik domain knowledge), the cultural requirement (batik community culture) and the context requirement (pertinent or critical issue that pose risk to the batik business survival). In our observation, we discovered that the batik domain knowledge is mainly captured in visual forms either as batik artefacts which are worn or displayed or as images in books or exhibited as museum or gallery exhibits. Batik making knowledge on the other hand is encapsulated in the batik making process and is shared through the mentoring process during batik making itself and/or through story-telling scenarios. Issues influencing the survival or the flourishing of batik can be a barrier to ICT adoption. The fear of cultural erosion of batik amongst batik advocates and batik makers is strengthen by their belief that ICT can propagate the erosion process. We strongly propose that the technology conception must try to remove this fear. Figure 6 illustrate the core concepts that
we have discovered from our analysis and synthesized them as a technology conception for the community-based information system model for batik making.

![Diagram of Technology Conceptualization](image)

**Figure 6**: Core concepts of the technology conceptualization

A technology conception of a community-based information system model for batik microenterprise must not endanger the survival of batik making and must respect the different knowledge and role of the community members. For instance if a technology conception is achieved through a batik digital gallery, it becomes an important system’s requirement that the gallery protects the intellectual right of the batik community member as well as the batik knowledge so that the gallery do not actually contribute towards the cultural erosion of batik. The findings from this work have huge implication on the development of ICT-based information systems for batik microenterprise. Although batik makers were concern with efficiency, they are not willing to sacrifice the indigenous nature of their batik artefacts. An ICT-based information system that only increases their operational efficiency may not be able to help them retain the competency of batik making which is seen to be more crucial. A new set of requirements dictated by the batik domain knowledge cannot be ignored. A relevant ICT-based information system for batik microenterprise will be one that supports the knowledge creation of batik either for an individual or for a community of batik makers.

5. Conclusion

In this paper we have presented our concern for the technology conceptualization required for the development of an ICT-based information system for the batik microenterprise. We attempted a business requirement elicitation work for batik microenterprise by conducting a contextual inquiry aligning it with concern of batik community. We made two important discoveries of batik makers’ concern which influences the batik making business requirements. The first is on the reliance of tacit knowledge of batik making and the second is on the fear of batik cultural erosion which cannot be overcome by the development of production-based information systems that only emphasize efficiency. From our findings, we are suggesting that any attempt to develop an ICT-based information system for batik microenterprise must not ignore these two concerns. Our future work will be on the exploration of future ICT-based information systems for batik microenterprise.

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Enterprise Information Systems of new Generation

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Abstract: In the today's rapidly changing competitive business environment, only flexible and dynamically developing companies are able to meet competition, companies that have managed to reduce costs and improve business efficiency through the introduction of advanced information technologies (IT). The use of information technologies is an essential component of a company's strategy to succeed in a rapidly changing world. Contemporary information technologies make it possible for companies to create information systems for effective communication and mutual understanding among staff members, as well as to support the decision making process at all levels of management. In the future the solutions in the sphere of information technologies, should allow uniting people, information and business processes into an integrated information system as a single complex of technological solutions more effectively. This paper aims at considering the new concept of EIS: transition from traditional internal business process management optimization to the Enterprise Information System which is opened for the all business partners operating in common business interests. Also the main goal of this work is determination of the main tendencies of enterprise information systems development. The paper contains the examples and analysis of the current practices of Enterprise Information Systems (EIS) development and implementation in Russian companies. It is the research based on study and analyzing the contemporary business solutions of the enterprise application software market leaders and the author’s own experience.

Keywords: enterprise information systems, enterprise recourse planning systems, customer relations management systems, supply chain management systems

1. Introduction

Nowadays, in order to make your business competitive and prosperous, it is not enough to rely on one’s bright mind, intuition or luck. Modern business is a complex multicomponent system, one of the primary elements of which are Information and Communication Technologies (ICT). Although each enterprise is unique in its financial and economic activities, there are a number of problems common to all enterprises. These include the management of material and financial resources, procurement, marketing and much more. One possible solution to these problems is the implementation and use of Enterprise Information Systems which have been rapidly developing in recent years. Enterprise Resource Planning systems provide comprehensive management of key aspects of financial, industrial and commercial activity of enterprises. These systems also provide managers with complete and timely information for management decisions and ensure effective data exchange with business partners.

In industrialized countries, despite much more favorable options for ICT application, issues of choice and implementation of modern information systems and tools, that meet market requirements and strategic business objectives, are also in the spotlight. It should also be noted that the focus has shifted towards the development of external information infrastructure of a company and continue to improve the class of intelligent information technologies and knowledge management systems.

Today in the publications on the topic of business efficiency and competitiveness of enterprises, many names and acronyms are mentioned, such as PLM, SCM, CRM, and ERP. These names come after the concepts and management techniques used by successful companies. Interest in them is growing in Russia. Leaders of Russian companies are increasingly turning to the experience of the use of solutions that help integrate the people, information and business processes to effectively manage all areas of business. The term ERP — Enterprise Resource Planning, is one of the key issues in this series of current concepts. What is ERP today, what place it occupies in a number of other corporate information systems, the basic purpose and functionality, the introduction specifics and development trends - these are the main topics examined in this study.

2. New concept of EIS

2.1 Up-to-date tendencies of enterprise information systems development

Recent trends in the development of enterprise information systems are associated with the intention to use information generated within the company, in the external environment to ensure cooperation
with other enterprises, customers and partners. Today we should take into account the new concept of Enterprise Information System: the emphasis is placed on the EIS which is opened for the all partners operating in common business interests instead of on traditional internal business process management optimization (Figure 1). This concept includes five new tendencies:

- **Change the role of ERP system.** Automation the internal business processes as well as external, counteragent relationships: customers, suppliers, banks, tax authorities;
- **The system technologies move towards an openness and transparency.** Internal processes are becoming more open. Information and data about activity of an enterprise can be available for business society member. Use of Web-technologies.
- **Structural changes of system architecture.** Instead of closed monolithic platform – open multilevel applications built on concepts of service-oriented architecture (SOA). Use E-SOA;
- **Expansion of system implementation.** Adaptation for enterprises of different kinds and sizes;
- **Deepen the system functionality.** All enterprise business processes should be automated;

### Figure 1: The main trends of development from traditional ERP to EIS of new generation

There has been a separation of notions: the traditional ERP management framework is called back-office, and external applications, which appeared in the system, front-office. One can distinguish the following five major areas that define the development trends of modern enterprise information systems:

- Deepen the functionality of ERP.
- Develop industry-specific solutions.
- Create new and improve existing modules of B2B (Business-to-Business) processes management.
- Use service-oriented architecture (SOA - Service Oriented Architecture).
- Use new platform solutions.
- Apply technologies for knowledge management.

As a rule, when the functional (system software and hardware) of up-to-day EIS is mentioned, the following components are kept in mind:
- ERP in the usual sense of the term,
- System of Customer Relation Management (CRM)
- Supply Chain Management System (SCM),
- Analytics and decision support, i.e. Business Intelligence (BI),
- Data management system, i.e. Information Management System (IMS), to integrate all components,
- ECommerce and collaboration via the Internet.

So a complex SAP Business Suite incorporates four solutions (Figure 2):
- For Customer Relation Management - SAP CRM;
- For managing Supplier Relation Management - SAP SRM;
- For Product Lifecycle Management - SAP PLM and
- For Supply Chain Management (SAP Supply Chain Management - SAP SCM).

![Figure 2: SAP Business Suite SAP NetWeaver – SAP platform solution](image)

**2.2 eCommerce and collaboration via the internet**

The development of eCommerce and establishment of interactive communication among companies and their partners, suppliers and customers via the Internet, gave rise to shift in the emphasis on B2B sector in the development of the concept of enterprise information systems. Therefore, the ERP systems of new generation receive Web-based architecture, which was a significant difference from the previous generation of EIS. EIS corporate data storage of new generation is designed for use in geographically dispersed Web-based community. EIS can be fully integrated into the Internet and work with data placed not in the proper repository, as well as support the publication or subscription, initiated by the client and communicate with other applications using EAI-adapters (EAI - Enterprise Application Integration) and the language of XML.
The integration of ERP-systems with eCommerce B2B (Business-to-Business) and B2C (Business-to-Customer) is a natural and logical step in the development of enterprise resource planning systems. Creating and maintaining the systems of Internet commerce, especially B2B systems sector, is most effective when those systems are integrated into enterprise-wide business processes and integrated into the ERP-system.

B2B integration at the level of the relationship among ERP-systems suppliers and customers is provided through the following B2B eCommerce, i.e. e-distribution, e-procurement and e-marketplace. As eCommerce sector, B2B allows direct communication between market players - producers and consumers, then we say that eCommerce becomes an element of the integration among ERP-systems of interacting firms. Thus, enterprise information systems of new generation are becoming part of a large, rapidly growing electronic market.

2.3 Software as a Service (SaaS)

Software as a Service (SaaS) or Software on Demand (SoD) is a business model, which offers the software to consumers, in which the supplier develops web-based application, installs it and manages it by giving customers access to software via the Internet. Customers pay not for owning the software itself but for using it (through the API, accessible via the web and frequently used web-services). It is the service and interface that are purchased (user or program interface), i.e. some functionality without a rigid adherence to the method of its implementation.

Although any paid-for web-service can be classified as SaaS, often this term refers to software for business, and, as a rule, software on demand is positioned as a cheaper and simpler alternative to internal corporate systems (back-office).

Along with such obvious advantages, such as economic feasibility, the use of common software core, which allows planning the computing power and reducing the overall amount of resources, there are several constraints that limit the use of this model.

In the first place, these are the problems associated with information security. The possibility of information leakage virtually eliminates the use of the concept of SaaS for mission-critical systems, which are handled as strictly confidential data.

Secondly, the concept of SaaS is ineffective for systems that require a deep individual adaptation for each customer, as well as innovative and customized solutions.

Thirdly, the use of software on demand means being tied to a single developer that hosts the software on its site and carrying out its administration and support.

And finally, the limiting factor is the need for SaaS permanent connection to the high speed Internet. It is worth noting, that with the development of the Internet, the significance of this factor is reduced and in many developed countries it should not be considered.

Currently, in many functional classes of EIS one can find systems that support a SaaS model. For example, for CRM and HCM (Human Capital Management) systems, the concept of SaaS fits particularly well, and is being actively enforced.

3. Enterprise Resource and Relationship Processing

3.1 The CRM concept and its role in the corporate strategy

3.1.1 Evolution of the Customer Relationship Management concept

At present time, it is typical for companies with established client network-oriented services and sales, to have an advanced external information infrastructure. It is generally accepted that CRM technologies are most appropriate for such enterprises. Yet, manufacturing enterprises are also interested in selling their products and can use such technologies as well, although resource planning and improvement of quality naturally are of a high priority.
The CRM concept is based on the CSRP (Customer Synchronized Resources Planning) methodology that covers the full manufacturing cycle from customized design to guarantee maintenance and after-sale service. CSRP’s major goal is to integrate customers into the enterprise management system, it is a production management paradigm founded on the ERP concept, but focused on customer relations (Figure 3). The CSRP methodology has added external environment to the ERP concept and solutions. With the CSRP technology, information of customers, products and services is an integral part of the basic component of information support for an organization’s operations.

Figure 3: EIS evaluation: from MRP (Material Requirements Planning) to ERP II (Enterprise Resource & Relationship Processing)

Thus, the CSRP concept is a module to plan enterprise operations according to customers’ needs that uses analysed marketing research results as input data. The CRM technology, in its turn, appeared to meet the demand for monitoring trends of customers’ changing needs. This is what makes these technologies different from each other.

The CRM concept has passed several development stages each of which was a technology (system) aimed at improving a certain area of customer relations:

- Contact Management,
- Sales Force Automation,
- Customer Support,
- Quality Management.

Then all the systems were integrated into the CRM concept.

CRM is a blanket term covering all aspects of customer relations from contract monitoring to marketing, efficiency measurement and customer support.

Today there are many definitions for CRM. In terms of IT, it is considered special software to automate and improve business processes in marketing, sales, customer service and support. Procedurally, CRM can be a business process. It’s very concept—customer relationship management—defines major business functions of such systems. According to PricewaterhouseCoopers, “the changing behaviour and expectations of consumers today demands constant monitoring, measuring and managing through a highly effective Customer Relationship Management strategy”. In terms of the enterprise management, it is a front office organization system oriented to proactively find customers’ needs. Unlike ERP systems aimed at improving back office operations, CRM helps improve sales, not production. Such well-known ERP software developers as
SAP AG, Microsoft, Baan have included CRM modules in their complexes and are trying to catch up with Siebel by Oracle that occupies over a half of the CRM software market.

CRM systems are divided into operational, analytic and ability to collaborate.

CRM’s major task is to increase efficiency of business processes aimed at attracting and retaining customers: marketing, sales, service and maintenance.

3.1.2 CRM Concept Implementation Strategy and Major Development Trends

Implementing a client-oriented enterprise strategy, CRM should not be considered simply a tool set. This is because software is just one of the components. First of all, CRM concept implementation is a systemic approach to organizing a company’s operations. To increase business efficiency by implementing a CRM system, the company should start with analysing and, if needed, reengineering its business processes.

Analysts believe that most CRM system implementation projects fail because of insufficient integration of communication channels, no reengineering of processes and inability to offer customers real advantages and benefits.

In general, CRM implementation strategy should be based on the following correlated provisions:

- Client-oriented policy should underlie implementation and further adaptation of the system;
- Technological support is defined by business goals;
- Structure and implementation stages of IT resources are assigned by detailed business problems with time-spaced solutions.

A developed CRM system may include various modules and use information from other applications and databases the company has. Yet, each customer’s value is maximized mostly by three marketing strategy elements: organizing a system of integrated marketing communication channels; developing demand stimulation programs; and creating products according to customers’ needs. Thus, a CRM system’s most important technological components are subsystems to interact with customers and monitor current operations, as well as product databases and analytic modules.

One of the major trends in the CRM concept development is that most CRM products are being considered an additional element to the enterprise information structure, integrated in it, and to fulfil a certain function. Another important point is that CRM should not be approached as simply an IT implementation project. Underestimating the role of correctly organized business processes and altered cultural environment unavoidably fails the implementation. The company should investigate what needs to be done to bring business processes in compliance with CRM principles.

Another CRM development trend in terms of functionality is drifting from operational towards analytic or even collaboration software. Demand for analytic features in CRM systems, such as marketing analytics—consumer profile analysis, customer behaviour simulation modelling, advertising campaign planning, etc.—is growing.

Among the major advantages a company gets from choosing CRM as its major business strategy:

- **Sales volume increase.** An average of 10% annual sales increases per salesperson for the first three years upon implementation. A more efficient sales system that gives salespeople more time to spend with customers, and spend it more efficiently, as well as improves the supervision system.

- **More effective deals.** An average of 5% annually for the first three years upon implementation. With the system (e.g., with the standard client qualification procedure) unwanted deals can be screened at earlier stages.

- **Margin increase.** An average of 1 to 3% per deal for the first three years upon implementation. Customers’ needs are better understood, and are more satisfied. This lowers the demand for extra discounts.
Higher customers’ satisfaction. An average of 3% for the first three years upon implementation. Customers believe the company is willing to solve their specific issues and more attentive to their needs.

Cutting administrative costs of sales and marketing. An average of 10% annually for the first three years upon implementation. First, routine processes are automated. Second, better defined target segments, better understood customers’ needs allow customizing products and services for the segments. There is no need to distribute information of all services to every customer anymore.

3.1.3 CRM Technology in the Information Infrastructure for Distributed Client Network Management

The networks started early in 1980s, to a large extent spontaneously. Now they are becoming a tool to purposefully coordinate efforts of all their participants. Thus, there is an urge to study theoretical principles of their formation and find a set of specific managerial skills needed for their efficient operations by developing a strategy to manage relations with other network participants [Kouchtch, 2002].

The major client network management principles are as follows:

- Systemic approach to customer relationship;
- Constant attraction of new clients and relations with potential ones;
- Project approach to building and developing customer relations;
- Technology aspect in building customer relations, primarily segmenting customers, their needs, potentials and expectations; defining and reconsidering customer status, planning individual work with customers; timely transferring information, which underlies customer relationship and successful operations.

It seems most relevant to consider features of external infrastructure for client network management exemplified by an IT company. The IT market has three kinds of distribution: project-oriented, classic and component.

The project-oriented distribution is based on the VAD (Value Added Distribution) business model. It ensures a developed, flexible and efficient logistic chain, project financing and vertical integration with partners and suppliers, reliable supply chains and strict observance of contract deadlines, and full technical support at every stage of partnership. As a result, every partner's and customer's problems are solved individually, with an opportunity to carry out large-scale, expensive projects.

The classic distribution focuses on wholesale (resellers) and retail companies specializing in IT products with forecast demand. This type of distribution ensures a wide variety of in-stock products by leading manufacturers of computer, network and telecom equipment; thereby resulting in a quick reaction to market price changes. The classic distribution sells hardware and software through wholesale or retail, with distributors supplying equipment that is technologically ready to go to the end-user market. A classic distributor deals with an end product.

The following major distribution schemes can be found in the IT market.

- **Vendor-Distributor-Reseller**
  This is a traditional distribution scheme for the IT industry. A **Vendor** is a supplier of branded products and services under its own trademark (e.g., Intel, Compaq, 3Com). A **Distributor** stores the vendor’s products in its stock, ensures its timely refill, participates in the vendor’s marketing programs and works with partners to promote the vendor’s products. The margin between the vendor's and the distributor’s prices is low and rarely exceeds 5% (3 to 12% depending on products). A **Reseller** buys the vendor’s products from distributor's stock and sells them.

- **OEM Channel**
  OEM (Original Equipment Manufacturer) is a company that uses a vendor’s products as a component of its own product or solution. For example, Compaq manufactures computers under its own trademark and uses Intel’s processors. Intel’s supplies of technologically packed processors are called ‘OEM supplies’ and the channel through which manufacturers sell components to assemblers is called the ‘OEM channel’. The vendors’ pricing policies for OEM partners differs from those for other distribution channels.
System Integrators
System integrators are suppliers of comprehensive solutions that use a vendor’s products to carry out their projects. Big system integrators enjoy direct supplies from vendors (thus, Compaq’s partner Lanit works with it directly).

Retailers
Another distribution channel for a vendor’s products is retailers. Big retailers (such as Vobis and CompUSA) buy directly from the vendors and sell to retail customers.

The Internet plays a significant role in developing distribution. 92% of distributors’ and direct partners’ orders are processed through the Web, and there is only one partner that sends faxes. The Internet has led to quantum leaps in distribution ability. It is a new promotional tool that is available to existing players while at the same time creates new ones. Yet, until the Internet is spread throughout the whole of Russia, sales through distributors is the most efficient.

As mentioned above, service- and sales-oriented companies that are in constant contacts with their customers have an external information infrastructure more developed than the internal one. Thus, CRM is an intermediate technology between companies and their customers that helps improve the external information infrastructure. With CRM, the following steps to form a client network management system can be made and simplified:

- maintaining an extended client database with a history of contacts that allows for classifying and grouping customers;
- getting sales statistics, reports, and sales history;
- interactive customer support, giving them access to certain information they need;
- opportunity to work with customers grouped by region, industry, etc.; work jointly with remote or regional divisions;
- Managing relations with potential clients: collecting initial information, distributing contacts between employees, and monitoring efficiency of initial contact sources.

3.2 Supply Chain Management
SCM (Supply Chain Management) systems are designed for planning, coordination and fulfillment of network-wide supply chain of an enterprise. They allow one to automate and manage all stages of the company supply to control all movement of goods in the company to better meet the demand for the company’s products and significantly reduce the costs of logistics and procurement.

Typically the following areas, on which Supply Chain Management is focused, are identified:

- demand planning;
- supply planning;
- procuring;
- manufacturing;
- storing;
- implementing of orders;
- Transporting.

As part of SCM-systems the following two subsystems can be distinguished:

- SCP (Supply chain planning). In addition to operational planning, SCP-systems allow to carry out strategic planning of supply chain structure, i.e. develop plans for the supply chain, to simulate different situations, to evaluate the level of operations, to compare planned and actual values.
- SCE (Supply Chain Execution) - execution of supply chains in real time.

SCM-systems can move from the concept of a linear supply chain management to the management of an adaptive supply network. In the current EIS, they can improve the competitiveness of
enterprises, providing access to partners data and resources on supply chain and enabling intellectual adaptation to changing market conditions.

3.3 Relationship management with suppliers

Many companies try to reduce costs through proper selection of suppliers. SRM (Supplier Relationship Management) systems are designed to control the entire cycle of supply: from strategic planning to implementation. They allow one to optimize the process of selecting suppliers and shorten procurement cycles. Using the SRM-system, companies can build a stable and effective relationships with suppliers on a long term basis. Combining extensive capabilities for analysis, evaluation and ranking of suppliers, taking into account all of the procurement of goods and services, aligning of strategies and forecasts of the effectiveness of interaction with suppliers through traditional and electronic channels of SRM systems in the EIS next generation, help to identify the best partners, the most relevant to business requirements.

4. Enterprise Information System Development and Implementation in Russian Company

4.1 Singularities

In modern Russia, using information and communication technologies (ICT) in management, including up-to-date methods, tools, and new platform solutions is a key driver of business efficiency. They do this by: helping improve quality of products and services, save labour and material costs, increase productivity, and improve production management. In industrially developed countries, despite a much higher degree of IT penetration in businesses, issues of choice and implementation of modern information systems and IT tools that would meet the market demand and business strategies are also vital. Development of companies' external information infrastructure and improvement of customer and supplier relations management are growing in importance, with intellectual information technologies developing.

It is very difficult to define typical Russian EIS. First of all we should bear in mind that quite frequently under “Russian EIS” we mean the information system which is installed and implemented in Russian company, but developed by such well-known software market leaders as SAP AG, Microsoft, and Oracle (Figure 4).

![Figure 4: Russian ERP Market, 2010 (According to IDC)](image)

1C is one of the largest domestic enterprise management system providers. The company's total revenues are estimated at 18,4 billion roubles in 2010. Over 50% of the company revenues cover the share of its own products. 1C: Enterprise is 1C Company's accounting and ERP software most popular not only in Russia, but also in CIS formed countries. It's targeted towards small to medium business. More than million organizations work with 1C: Enterprise while performing their everyday routines. 1C: Enterprise is directly competitive with SAP and Microsoft Dynamics. In contrast to them 1C: Enterprise has open price policy, better rapid application development and inexpensive solutions. In Russia 1C: Enterprise has wide fully configurable set of applications implementing:
customer relationship management (CRM);
private/public sector accounting and accounting in non-profit organizations;
accounting and reporting for private entrepreneurs;
payroll calculation and HR management;
sales and warehouse;
manufacturing;
financial planning;
report consolidation;
And other.

Most organizations don't run on 1C: Enterprise alone. They use several ERP systems. In the real world all of these systems need to work together.

In comparison with Western Europe the functionality of the Russian ERP is still much less developed. We can explain it of appreciable differences in economic resource-limited on system development. The other specific of the Russian EIS is that quit often companies prefer to implement its own software products which are developed in their own IT department.

Some of the Russian enterprises take advantage of information systems based on principals of SOA (service-oriented architecture) as a set of integrated Web-services.

On the application side, the most frequently implemented ERP modules on the Russian market are financial, logistics and control modules although CRM and BI solutions are also becoming popular. As for ERP services, this market is currently evolving better than the ERP applications market, since many companies, despite drastic cuts in IT spending, continue to allocate budget to maintain the functionality of the core modules of previously implemented ERP solutions. The main goals of implementation of the corporate IT solutions in Russia are automation of accounting, finance and human resource management.

4.2 The Russian ERP market

All major ERP players are already presented on Russian Market. Four companies controlled more than 90% of the Russian ERP market in 2010, SAP accounting for 50.5%, Oracle having 8.2%, Russian 1C having 26% share and Microsoft Dynamics controlling 7.4% of the market (Figure 4). SAP became the market leader in 2006 and continues to expand its market share from 40% to more than 50% within several years. On contrary, Oracle, being on the second place, strongly reduced its market share. The Russian 1C, which in 2006 controlled 12% of the market, is on second position and shows the stable growth. IDC forecasts that 1C will reach the market share (Table 1).

**Table 1: Dynamics and segmentation of ERP market in Russia**

<table>
<thead>
<tr>
<th></th>
<th>2010, %</th>
<th>2009,%</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP</td>
<td>50,5</td>
<td>50,1</td>
<td>0,4</td>
</tr>
<tr>
<td>1C</td>
<td>26</td>
<td>22,3</td>
<td>3,7</td>
</tr>
<tr>
<td>Oracle</td>
<td>8,2</td>
<td>9,6</td>
<td>-1,4</td>
</tr>
<tr>
<td>Microsoft Dynamics</td>
<td>7,4</td>
<td>7,1</td>
<td>0,3</td>
</tr>
<tr>
<td>The rest</td>
<td>7,9</td>
<td>10,9</td>
<td>-3</td>
</tr>
</tbody>
</table>

According to IDC, the leading Russian industries for ERP implementation is continuous production, on the second place is retail, than goes discreet manufacture and energy sector. The major part of market is concentrated in Moscow and St. Petersburg, but there is increasing demand on ERP solutions in other regions, for example in Ural region.

5. Conclusion

At present, business technologies, along with information and communication technologies, overlap more and more closely. In Russia, as well as worldwide IT became a critical element of the chain of the product or service design and profit. Earnings of companies are growing not only due to a
significant cost reduction and management optimization, but also due to the implementation of modern information technologies and systems.

Although each enterprise is unique in its financial and economic activities, there are a number of problems common to all enterprises. These include the management of material and financial resources, procurement, marketing and much more. ERP-systems provide comprehensive management of key aspects of financial, industrial and commercial activity of enterprises. These systems provide managers with complete and timely information for management decisions and ensure effective data exchange with business partners.

Strengthening of integration processes in the business world leads to the fact that companies are now involved in the environment that combines inner sphere of the company’s business, all business partners and customers. In the future the decisions in the sphere of information technologies, should allow integrating people, information and business processes into a unified information system in a single complex of technological solutions more effectively.

More and more Russian companies realize their business need in automation of their processes by implementation of contemporary Enterprise Information Systems and expert forecasts the stable growth of Russian ERP market.

References
Reconstructing the Past for Organizational Accountability

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Abstract: Many organizations have undergone substantial reorganization in the last decade. They re-engineered their business processes and exchanged proprietary, not integrated applications for more standard solutions. Integration of structured data in relational databases has improved documentation of business transactions and increased data quality. But almost 90% of the information that organizations manage is unstructured, cannot easily be integrated into a traditional database. When used for organizational actions and transactions, structured and unstructured information are records. They are meant and used as evidence. Governments, courts and other stakeholders are making increasing demands for the trustworthiness of records. An analysis of literature of the information, organization and archival sciences illustrates that accountability needs the reconstruction of the past. Hypothesis of this paper is that for the reconstruction of the past each organization needs a combination of three mechanisms: enterprise records management, organizational memory and records auditing. Enterprise records management ensures that records meet the quality requirements needed for accountability: integrity, authenticity, controllability and historicity. They ensure records that can be trusted and enhance the possibilities for the reconstruction of the past. The organizational memory ensures that trusted records are preserved for as long as is necessary to comply with accountability regulations. It provides an ICT infrastructure to (indefinitely) store those records and to keep them accessible. Records auditing researches the first two mentioned mechanisms to assess the possibility to reconstruct past organizational actions and transactions. These mechanisms ensure that organizations have a documented understanding of the processing of actions and transactions within business processes; the dissemination of trusted records; the way the organization accounts for the actions and transactions within its business processes; and the reconstruction of actions and transactions from business processes over time. This understanding is crucial for the reconstruction of the past and for organizational accountability.

Keywords: accountability, enterprise records management, organizational memory, records auditing

1. Introduction

Organizations have undergone substantial reorganization in the last decade. They re-engineered their business processes and exchanged proprietary, not integrated applications for more standard ones. The integration of structured data in relational databases has improved documentation of business transactions and increased data quality. But almost 90% of the information that organizations manage is unstructured and cannot easily be integrated into a traditional database. Knowledge workers, who create networks of expertise and engage in peer-to-peer knowledge sharing across organizational boundaries, create this unstructured information. Knowledge work has to do with organization-wide and inter-organizational communication and collaboration. The storage, dissemination and processing of unstructured information require complex and evolving ICT systems. In this changing organizational environment, accountability became a hot item, especially because ICT systems present unique security and durability challenges that pose a threat for information quality (Boudrez, Dekeyser and Dumortier, 2005; Bearman, 2006).

When used for organizational actions and transactions, structured and unstructured information are records. They consist out of text, (moving) images, sound or database records, or combinations thereof. They are critical for business process performance, for without them production almost becomes impossible (Toebak, 2007). They are meant and used as evidence for organizational policies, decisions, products, actions and transactions. Governments, courts and other stakeholders are making increasing demands for the trustworthiness of records. This is part of a long-term trend toward defining what accountability means in a digital era.

The attention for accountability was strengthened when ICT couldn't solve the accountability problems organizations experienced. Concepts as corporate governance and information governance became closely related to organizational accountability. These concepts are synonymously used, but they do not mean the same. Organizational accountability is an objective and has (mostly) an external orientation. Both corporate and information governance are means for reaching that objective and have (mostly) an internal orientation (Porter, 2009).
2. Accountability, ICT and the past

That accountability is a complex concept is a commonplace in literature of organization science. A word that was used rarely a few decades ago has been discussed substantively in the passed decade (Dubnick, 1998; Meijer, 2000). In the process, the concept's scope and its meaning have been extended in many directions (Mulgan, 2000). Historically, accountability is related to accounting and to administrative procedures. Dubnick (2002) asserts that the concept can be traced to the reign of William I the Conqueror. That may be true for the concept's name, but it is incorrect for the concept itself. The concept was already there in old Mesopotamia before spreading to Egypt, Mycenae, and the Persian Empire, continuing through the Hellenistic, Seleucid and Roman periods (Brosius, 2003).

Accountability is the acknowledgement of [1] responsibility for policies, decisions, products, actions, and transactions, and [2] the obligation to report and be answerable for resulting consequences. It concerns the responsibilities actors have under the existing checks and balances. It is an evaluative concept to qualify a state of affairs or the performance of an organization in the (recent) past. Bovens (2006: 9) considers accountability to be a social relation between an actor and a forum, 'in which the actor has an obligation to explain and to justify his or her conduct'. An actor can be either an individual or an organization. When it is an organization, we mostly talk about organizational (or corporate) accountability. The forum is a designated legitimate or accountability forum. Such fora may be shareholders, citizens, professional committees, courts, review bodies, ombudsmen and the like. It even may be a virtual entity, such as 'the general public' or 'society'. A forum will ask an actor to provide insight in the effectiveness of its business processes and the lawfulness or unlawfulness of the transactions within those processes and within its environment. It asks to explain deficiencies in its financial and fiscal situation. Ultimately, the forum may pass judgement on the conduct of the actor. It approves or disapproves an account, denounces a policy, condemns the behaviour and imposes sanctions of some kind. Sanctions can be formalized, like official authorizations, financial rewards, fines, disciplinary measures, civil remedies or penal sanctions, but can also be based on unwritten rules, as in the case of ‘political accountability’. They can also be implicit or informal, such as having to render account in front of television cameras. They can even be the blocking, or amending of decisions by the actor (Strøm, 2003). All this depends on reconstructing the (recent) past.

Mechanisms of accountability are important ways of controlling the conduct of actors. Most actors are part of a coherent complex of arrangements and relationships, mostly with more than one forum. Bovens (2006) considers at least five different types of accountability: political (with fora as elected representatives, political parties, voters and media), legal (with courts), administrative, corporate or organizational (with stakeholders, auditors, and controllers), professional (with professional peers) and social accountability (with interest groups, charities and other stakeholders).

Barata and Cain (2001) prove that accountability without trusted information as evidence of (past) organizational policies, decisions, products, actions and transactions is impossible. The different 'accountability types' need an organizational accountability function to safeguard that evidence. Within that function, corporate governance is an accountability agent. It is the system by which organizations are directed and controlled. It operates systems of control designed to ensure that organizational objectives (e.g., accountability) are met (Porter, 2009). Within corporate governance, information governance establishes opportunities, rules and authorizations for information management (Kooper, Maes and Lindgreen, 2011). Both types of governance are means for reaching the objective of organizational accountability (Porter, 2009). In order to improve accountability, new ICT systems, concepts and methods have been implemented to structure, organize, process and retain [1] the information that is used within organizational processes (records), as well as [2] all the information that is used to document how policies have been designed, decisions made, products manufactured and actions and transactions performed within an organization (meta data).

Ensuring the quality of this information is a very important managerial concern of corporate and information governance. It is also a daunting task. Redman (2004: 22) states convincingly that information quality is an 'unfolding quality disaster' and that 'bad' information is 'the norm' in industry. Records and their corresponding meta data are inaccessible, unavailable, incomplete, irrelevant, untimely, inaccurate, and / or not understandable. Their provenance and contextual environment are (mostly) unknown (Epler, 2006; Groth, 2007). In addition, ICT creates the problem of technological obsolescence, because records and their meta data have a longer lifespan than the configurations in which they are created or managed (Boudrez, Dekeyser and Dumortier, 2005).
Toebak (2007, 2010) states that trusted records and their meta data are indispensable as evidence. They are necessary for making reconstructions of (past) organizational policies, decisions, products, actions and transactions. Those reconstructions depend on the captured, retained and accessible trusted records and meta data of an organization as evidence. Without them, reconstruction of the past becomes problematic. Corrupt records cannot be used as evidence of past happenings. Inaccessible, unavailable, irrelevant, untimely, inaccurate, and / or not understandable records are influencing organizational accountability negatively.

3. Status quo and research subject

Literature on archival, organization, and information science suggests that there are organizational mechanisms that aim at realization of trusted records: enterprise records management (ERM), organizational memory (OM) and records auditing (RA). Most of this literature is concerned with other aspects than the detailed reconstruction of policies, decisions, products, actions and transactions in the organizational past.

Archival science is concerned with the reconstruction of images of organizations in the past. It uses records and meta data of those organizations as evidence for their historical and societal importance. It emphasizes the provenance and the preservation of selected records and their meta data for (re-) use in the future. It is concerned with methods and techniques to appraise and select organizational records for long-term (or indefinite) preservation. Some work has been done on [1] the relationship between records and accountability, and [2] records as evidence of actions and transactions, but its emphasis is not on the reconstruction of the past but on the necessity of trusted records for historical, cultural and democratic accountability. It suggests ERM and RA as mechanisms to realize trusted records; ERM is usually referred to as a ‘record keeping system’ (Bearman, 1993, 1994a, 1994b; Bearman and Sochats, 1996; McKemmish, 1999; Barata and Cain, 2001; Shepherd and Yeo, 2003; Toebak, 2010). In organization science much work has been done on accountability, governance, organizational quality systems, knowledge management, and organizational learning. Most literature emphasizes [1] organizational systems for managing and controlling organizations, [2] assuring process quality and performance, [3] auditing of quality systems and business processes, [4] role and function of knowledge and innovation in organizations, and [5] the way organizations learn from their (past) experiences. It suggests OM as a mechanism to bring to bear on present decisions the ‘stored information from an organization’s history’ (Walsh and Ungson, 1991: 61). There is very little or no attention for [1] the detailed reconstruction of past happenings, [2] the importance of trusted records in this reconstruction (with an exception in Meijer (2000, 2001a, 2001b)), and [3] the auditing of trusted records and their meta data (Walsh and Ungson, 1991; Stein, 1995; Bannon and Kuutti, 1996; Dubnick, 1998, 2002; Nonaka and Konno, 1998; Bovens, 2006; Choo, 2006; Porter, 2009). Information science is concerned with the analysis, collection, classification, manipulation, storage, retrieval and dissemination of information. It studies the [1] application and usage of information, [2] interaction between people, organizations and ICT, [3] designing, implementing, and improving of information systems, [4] creating, improving and maintaining of information infrastructures, and [5] auditing of information systems. There has been much attention for the quality of information and information systems, human-computer interaction, semantic web, IT auditing, information retrieval, and trusted computing. No attention is paid to [1] the detailed reconstruction of the past, and [2] trusted records. It suggests OM and RA as mechanisms. RA is not mentioned as a mechanism, but it can be derived from the business process application of IT audits and information audits (Weick, 1979; Croasdell, 2001; Hanseth, 2002; Holsapple and Jones, 2004; Epler, 2006; Groth, 2007; Wang, Funk, Lee and Pipino, 2001; Bussel and Ector, 2009).

In this paper, I want to analyse if, and how ERM, OM and RA contribute to the realization of trusted records and to the reconstruction of the past, especially to find out whether the hypothesis that organizational accountability can be improved with a combination of these mechanisms, is correct. An approach in which these possible mechanisms are combined has never been considered, probably because they have been developed in different scientific and professional disciplines.
4. Organizational mechanisms for reconstructing the past

4.1 Enterprise records management

4.1.1 Records and ‘records value chain’

Records are sets of related data with a set boundary and with standardized form and structure, meant to be or to be used as evidence for policies, decisions, products, actions and transactions (for they are being processed in business processes) (ISO DIS 15489, 2001). They can be text, (moving) images, sound, database records, technical drawings, or combinations thereof. They are critical for business process performance, for without them production is almost impossible (Toebak, 2010). Meta data linked to records demonstrate and document how those policies, decisions, products, actions and transactions have been performed. Records and their attached meta data make up for almost 90 % of the information in an organization.

Widely supported within literature (Toebak, 2007, 2010; Shepherd and Yeo, 2003) is the definition of ERM in clause 3.16 of ISO / DIS 15489 (2001): ‘the field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records, including the processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records’. According to Bussel and Ector (2009), ERM organizes the ‘records value chain’, the chain that ensures that the ‘value’ of records is used in business processes to improve performance. This chain directly affects the performance of business processes, because records are crucial for production. The ‘records value chain’ includes all records processes, from creation or receipt to capture, storage, processing, distribution, structuring, publication, use, appraisal, selection, disposal, retention, security, auditing and preservation. In literature, this chain is also referred to as the ‘information value chain’ (Davenport, 1993), or as the ‘knowledge chain’ (Holsapple and Jones, 2004). ERM is oriented on records processes, the effects of those processes on business processes, the reconstruction of past policies, products, actions and transactions, and the dimensions and quality requirements of records.

4.1.2 The dimensions of records

Records have two special extra dimensions above the seven dimensions normally associated with information. Those seven dimensions are meticulously analysed in literature, e.g., Päivärinta (2000), Liu (2004) and Francke (2005). Those dimensions are increasing density, decreasing longevity, disappearing uniqueness, easy duplicability, exploding mobility, increasing fluidity and problematic connectivity. For this paper, the two extra dimensions for records are important.

The first extra dimension for records is 'contextuality'. Records only have meaning within a context. That concept has been defined as 'the whole of the relationships that the record has with the activity in which it participates, its creator, and the socio-juridical system in which the creator acts' (Duranti (1997: 60). The concept suggests that knowledge of the context of the action or transaction itself is connected to the records, generated within that action or transaction. Without that knowledge, it is impossible to extract meaning out of records. It is knowledge about the juridical system, in which the organization operates, the structure of the organization and its functions, the procedures by which records are generated and the records collection to which records belong and its internal structure. Groth (2007) suggests that context has three characteristics: (1) it needs accurate documentation, (2) it is in the past, and (3) it is necessary for the tracking and the reconstruction of business processes. The context of records captures a complex social situation in meta data to allow a reconstruction of the past. It is impossible to capture that social situation into definable and distinct objects. It can only be captured in the 'simplified' way of meta data. The second extra dimension is 'fixity'. Brown and Duguid (1996) argue that reading the same text creates a sense of community that is threatened by dimensions as fluidity and connectivity. Latour (1990) impresses the necessity of 'immutable mobiles', which express the combination of immutability and mobility. Levy (2001) and Lynch (1994) emphasize that ‘fixity’ of records is necessary for stability and repeatability of communication. This ‘permanence’ is essential for records. It must be possible to reproduce or reconstruct a record repeatedly, independent of time, with the same data, with the same presentation (layout) and in the same composition as at the time of creation. Records need to be 'fixed', for they are recorded for later consultation and used for the reconstructing of past happenings. Those are the reasons why their users need to trust them.
4.1.3 The quality requirements of records

In this age of organizational chains, e-commerce, inter-organizational data warehouses, computer mediated exchange, cloud computing, and authentic registrations, it is crucial that policies, decisions, products, actions and transactions can be reliably reconstructed in context. Trusted records and trusted meta data are therefore necessary. In information science, there is much work done on the quality of information. Much of that work is focused on aspects as system and software development, software systems, systems development organization and ICT infrastructure (e.g., Wang, Funk, Lee and Pipino, 2009). It is focused on structured information, and more concerned with ICT and its implementation than with records and records quality (Ragowsk i, Licker and Gefen, 2008). No attention is paid to the extra dimensions of records. That may be one of the reasons for the problems with information quality Redman (2004) mentioned.

The focus in ERM is exclusively on the quality requirements of records, their meta data and the 'records value chain'. For records and their meta data, four quality requirements are recognized in ERM: integrity (it must be impossible to wrongly add or delete data), authenticity (they must have the right presentation and data), controllability (they can be tested on reliability) and historicity (they can be reconstructed as an 'immutable mobile'). These requirements realize the fixity of records and enable users to trust them and to use them as evidence. The 'records value chain' ensures that records are correct and complete in spite of all handling that may be necessary (e.g., conversion, compression). The requirements for this chain are identical to those for business processes. They are well-known, namely reliable time of delivery, effectiveness, efficiency, product quality, alignment of needs, product management, and compliant.

This overview of quality features differs from the features mentioned in ISO / DIS 15489 (2001). Within this standard the quality of records and the quality of the 'records value chain' are intermingled. The standard distinguishes features as 'authenticity', 'reliability', 'integrity' and 'usability'. 'Integrity' corresponds to the mentioned concept of integrity, but also exhibits characteristics of historicity. 'Authenticity' corresponds partly with the authenticity concept above, but it refers also partly to the 'records value chain'. 'Reliability' emphasizes controllability, but also the quality of the 'records value chain'. 'Usability' refers to the quality of the 'records value chain'. This intermingling of concepts is the reason why I am not using the features of this standard in this paper. The quality requirements above do realize the features of this standard, but in a more balanced way.

4.1.4 Reconstructing the past and ERM

The deficiencies in records and in ERM that existed before ICT was introduced are still there (Redman, 2004). One of the reasons may be the focus on structured information in information science. In ERM the point is made that the failure to realize the quality requirements of records, the 'records value chain' and their meta data, is a threat to the possibilities to reliably reconstruct the past. Because of that failure, the organizational accountability function cannot be successful. ERM, managing the 'records value chain', ensures that records meet the quality requirements necessary for accountability: integrity, authenticity, controllability and historicity. These requirements ensure records that can be trusted and can be used as evidence. Trusted records improve the possibility of reconstructing past policies, decisions, products, actions and transactions. ERM is process-oriented and has only a limited interest in system development, software systems, and ICT infrastructure. That can be a bottle-neck in protecting the quality requirements of records in digitized environments, for defining preconditions for system development, software systems and ICT infrastructures may not be enough to definitely ensure the quality requirements of records.

4.2 Organizational memory

4.2.1 What is the OM?

Organizations have frames of references, shared beliefs, values, norms, routines, structures, and other physical artefacts that reflect the way they have handled their past experiences. OM (or institutional or corporate memory) may be defined as 'organization's DNA' (Spear and Bowen, 1999). It is a metaphorical concept that describes storage, representation and sharing of knowledge, culture, power, practices and policy. Kim (1993: 43) views OM pragmatically as: 'it includes everything that is contained in an organization that is somehow retrievable. Thus storage files of old invoices are part of that memory. So are copies of letters, spreadsheet data stored in computers, and the latest strategic
plan, as well as what is in the minds of all organizational members'. Its purpose is to reduce the costs of transactions, to enlarge the speed of access to past practices and solutions, to help in decision-making, to share knowledge and to reduce the dependency of individuals. OM is connected with 'organizational learning', the metaphorical ability of organizations to learn from past and current experiences. Crucial for 'learning' are, according to Weick (1979), the use and dissemination of the OM, the accuracy of the memory, and the circumstances in which it was created. To learn, in short, reliable reconstruction of the past is necessary.

4.2.2 Contents, repositories and processes

Four separate types of memory contents are distinguished: information, knowledge, paradigms and skills. Information includes all structured and unstructured information in an organization. Knowledge is made out of mental templates 'that individuals impose on an information environment to give it form and meaning' (Walsh, 1995: 281). Paradigms are organizational beliefs, values and norms and represent the rules about what one should or should not do. Skills are capabilities of people and have a personal quality, rooted in action, commitment, and involvement in a specific context (Stein, 1995).

Repositories imply memory contents. Walsh and Ungson (1991) modelled the OM as a transcendent infrastructure with five 'retention bins' around which the acquisition and preservation of knowledge takes place: people, culture, processes, structure, and workplace. Moorman and Miner (1997) also consider other physical organizational artefacts, like machines, as 'retention bins', because they embody prior learning. In addition, Wijnhoven (1996) recognized ICT systems and their contents as a repository. These repositories have different limitations and opportunities for storing and retaining memory, and differ in speed, reliability, susceptibility to physical degeneration and availability. They are influencing the possibilities to reconstruct the past, for they concern the OM's temporal aspects. These temporal aspects are essential for the reconstruction of the past. Memories are, for lack of a better word, time-functions (Stein, 1995). A durable and reliable infrastructure for the OM will help an organization to seek competitive advantages, develop the organization learning concept, increase autonomy or be accountable (Croasdell, 2001).

Holsapple and Jones (2004) state that knowledge processes of acquisition, selection, generation, assimilation and emission bring past knowledge to bear on present activities. Acquisition is defined as acquiring knowledge from external sources and making it suitable for subsequent use. Selection refers to the activity of identifying needed knowledge within an organization's resources and providing it in an appropriate representation to an activity that needs it. Generation is defined as producing knowledge by either discovery or derivation from existing knowledge. It includes monitoring the external environment and the organization's knowledge resources by invoking selection and / or acquisition as needed, evaluating knowledge in terms of its usability, producing knowledge from existing knowledge, and transferring that for emission and / or assimilation. Assimilation refers to the activities that alter the state of an organization's knowledge by internally distributing and storing acquired, selected, or generated knowledge. Emission refers to the embedding of knowledge into organizational output for release into the environment. It is never stated, but these processes are closely related to the 'records value chain', for knowledge is largely stored within records.

4.2.3 ICT infrastructure and OM

In OM research, there are two main research directions. The first direction stresses the importance of a reliable ICT infrastructure for the development of an OM to enable the continuous storage and manipulation of knowledge of 'good' quality. Much work has been done on 'organization memory information systems', knowledge management systems, hard- and software architectures and software development (Wijnhoven, 1996; Abecker, Decker, Matta and Maurer, 1998). The second direction focuses on the human aspects of the OM as a tool to stimulate 'organizational learning'. This research tries to make the relationship between human knowledge creation and OM more explicit (Nonaka and Konno, 1998). Even in this research direction there is attention for a reliable and durable ICT infrastructure (Croasdell, 2001).

An OM is based on 'the will to preserve, in order to reuse [it] later or the most rapidly' (Ribière and Matta, 1998: 130). The ICT infrastructure of the OM continuously captures and analyses knowledge assets of an organization. It is a collaborative ICT environment where people can query structured and unstructured information in context to retrieve and preserve 'organizational knowledge'. Although within OM-literature records and their meta data are not mentioned, it is clear that they belong to the
knowledge assets of an organization, and that they are recorded, stored, secured and maintained
within the ICT infrastructure of the OM. This ICT infrastructure safeguards the quality requirements of
information over time. Besides reconstructions of the past, the retained records and their meta data
illustrate also, as Bannon and Kuutti (1996) and Ketelaar (1999) stated, how an organization did
choose to act and which experiences it really wanted to remember.

4.2.4 Fragility of the OM

The features of the OM are fragile. They are easily influenced by the restructuring of organizations
(Boudrez, Dekeyser and Dumortier, 2005). There are many unique security and durability challenges
(Bearman, 2006). The many security threats to the OM, like viruses, trojan horses, worms, password
 cracking, denial-of-service attacks, e-mail hacking, impersonation, eavesdropping, packet replay,
packet modification, social engineering, intrusion attacks, network spoofing, etc. are very important
(Hasan, Myagmar, Lee and Yurcik, 2005), but the durability challenges are the most crucial here.
They endanger the trust in a reliable OM.

First, hard- and software configurations are needed for accessing, retrieving and viewing records. As
much information will have a longer lifespan than the configurations in which it was created, a solution
for technological obsolescence should be available. Secondly, the large influx of information that
confronts the infrastructure of the OM requires automated archiving and retrieving functionalities. The
large increase of records needs this infrastructure to be `shared, evolving, open, standardized, and
heterogeneous' (Hanseth, 2002). The ICT infrastructure needs to continuously adapt, transform,
renew and grow. Thirdly, information is of a highly diverse nature. There is a diversity of object types,
operating systems and applications. The handling of this diversity is not self-evident, while at the
same time information can be continuously modified. Fourthly, information can only be reliably used,
when users can interpret it in its original organizational context. Context and information need to be
forever linked to realize access, retrieval and preservation over time and (thus) to allow reconstruction
of the past.

4.2.5 Reconstructing the past and OM

ICT infrastructures are the core of OM research. In OM-literature, durable and reliable infrastructures
are almost considered to be self-evident. This may be incorrect. The temporal dimension of the OM
operates 'memories', time-functions that are used to reconstruct past policies, decisions, products,
actions and transactions. Records and their meta data are never mentioned, but they are part of the
knowledge assets of an organization. A very important contribution of OM is that all organizational
knowledge assets are used for reconstruction of the past. Although organizational accountability is not
mentioned as an aim of OM, it can be the result of using knowledge to reconstruct past happenings.
OM is especially concerned with ‘organizational learning’ when reconstructing past experiences. OM
ensures that information is preserved as long as is necessary. It provides an ICT infrastructure to
 indefinetly store information and to keep it accessible.

4.3 Records auditing

4.3.1 What is RA?

There is little work done on RA. It may be considered as a specialized part of internal (or operational)
auditing. It is independent and is designed to improve an organization's operations. This mechanism
helps organizations accomplish their objectives by bringing a systematic approach to evaluate and
improve the effectiveness and efficiency of business processes (Porter, 2009). It is a systematic
process of planned, logical and purposeful steps and procedures to assess [1] the management and
the quality requirements of records and ‘records value chain’, [2] the functioning of ERM, and [3] the
ICT infrastructure that realizes the OM. RA focuses on both technological as non-technological
systems. A records auditor assesses if the records in the OM are accessible, understandable and
documented, for only then fact finding and reconstruction of past happenings are possible. RA
researches:

- The processing of actions and transactions within business processes;
- The dissemination of trusted records;
4.3.2 RA and knowledge work

Knowledge workers are individuals valued for their ability to act and communicate with knowledge. They solve problems to influence decisions, priorities and strategies, within business processes as well as within the organization in general. Knowledge workers engage in peer-to-peer knowledge sharing across organizational boundaries, forming networks of expertise. Organizations engage in collaboration activities to survive, with on-going alliances of public and private organizational teams to solve problems. Due to the expansion of actions and transactions via the Internet, there has been an increasing demand for knowledge workers. They are continuously confronted with shortcomings in the OM (Coulson-Thomas, 1991), which focus on the relationship between records and performance of business processes (Strong, Lee and Wang, 1997).

From an ICT perspective, knowledge work has to do with high information complexity and a focus on organization-wide and inter-organizational communication in its business processes. The storage, dissemination and processing of records require complex systems for ERM. Knowledge work requires the definition of meta data and the provision of ontologies, user profiles, communication diagrams, knowledge maps and diagrams that show what objects, persons, instruments, roles, communities, rules and outcomes are involved in the main knowledge-related activities. This perspective calls for (1) a systematic, flexible handling of context, (2) intelligent functions to handle the OM, and (3) extended functionality for collaboration. Knowledge work needs RA to safeguard ERM, which is one of the most essential features for knowledge work, and to assess the OM and its infrastructure.

4.3.3 RA's area's

Several areas of RA can be defined (Epler, 2006; Bussel and Ector, 2009). First, the input and output factors of a business process are problematic. Knowledge workers have difficulties with the excessive amount of records. Records are also often processed in structures, versions and file formats that cast doubt on their quality requirements. This creates difficulties in the assessment of the reliability of the OM. Secondly, the 'records value chain', as implemented in organizational practice. RA concentrates on the use of records and checks if that is in accordance with established agreements. The design of business processes often does not match the handling of work, leading to problems in accountability. As a solution, organizations can choose to structure records within the OM according to business processes or to the activities in which knowledge workers perform. Thirdly, the used ICT infrastructure affects shape, characteristics and quality of the OM. ICT aspects are complex interfaces, the 'unfriendliness' of ICT systems, inadequate system performance, few possibilities to control, lack of interactivity, etc.. ICT is hardly tailored to a user's context. Knowledge workers are due to make mistakes, which affect the quality of the records. The potential of ICT to improve the reliability and the durability of records should be used. Fourthly, the workplace of knowledge workers. This is a focus because distractions from colleagues, the administrative processing to be performed, the planning of the work, the overall organizational context, and ergonomics, have an impact on a reliable processing and capture of records in ICT systems. Knowledge workers with a stressful workplace make more 'mistakes' and are more likely to ignore procedures of the 'records value chain'.

4.3.4 Reconstructing the past and RA

In RA ERM and OM are audited to assess the possibility to reliably reconstruct past organizational actions and transactions and to offer consultations on adaptations and alterations for improving ERM and OM. RA assesses the processing of policies, decisions, products, actions and transactions within business processes and the transformation from input to output, the dissemination of trusted records, the way organizations account for the handling of their business processes, and the reconstruction of
policies, decisions, products, actions and transactions over time. RA is a mechanism for organizations to use to ascertain themselves that the available means for reconstructions are in excellent order and ready to be used.

5. Conclusion

In this paper, I analysed the contribution of ERM, OM and RA in realizing trusted records and in reconstructing the past. It is my conclusion that:

[1] ERM safeguards the 'records value chain' and ensures that records and their meta data meet the quality requirements of integrity, authenticity, controllability and historicity and (therefore) can be reliably used in business processes as source of trusted information;

[2] The OM ensures that records and their meta data (as a knowledge asset) are preserved. It provides an ICT infrastructure to (indefinitely) store records and keep them accessible;

[3] RA audits ERM and OM periodically to assess the possibility to reliably reconstruct past actions and transactions.

ERM and OM have a direct contribution to the realization of trusted records and their meta data. RA checks them to verify if it is possible to use them to reconstruct past policies, decisions, products, actions and transactions. Its contribution is indirect. All three mechanisms assist organizations in reconstructing the past and can be used for improving accountability. Theoretically, combining these three mechanisms will certainly improve accountability more than implementing only one of them. ERM and OM are complementary. Combining the process-oriented emphasis of ERM with the infrastructure-oriented emphasis of OM will have positive effects on maintaining trusted records and on reconstructing the past over time. RA will ensure that both mechanisms keep doing what they have to do: creating and maintaining trusted records, against all odds. My hypothesis seems theoretically viable, but still has to be validated in practical case studies.

6. Future work

Governments, courts and other stakeholders are making increasing demands for the trustworthiness, accuracy, and reliability of records. Those demands are creating a need to more clearly define the ‘records value chain’. Research is needed to see if recognition of this ‘chain’ will be a solution for the problems mentioned in this paper. The preservation of records in the OM is critical. There is as yet no preservation strategy that guarantees the preservation of records and their contextual meta data in the long term. It is here that much of the future research should be focused, for the ICT infrastructure is extremely important for preserving records.

Acknowledgements

My thanks to Eric Ketelaar, Peter Horsman, Theo Thomassen, Hans Henseler and Peter Toebak who made valuable suggestions.

References


The Relationship Between Dynamic Business Models and Business Cases

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Abstract: This paper analyses the relationship between two well-known business concepts. It clarifies how business models, as an implementation of a company’s strategy, can be aligned with business cases, as an abstraction of a company’s operations. The relationship is analyzed from a static as well as a dynamic point of view by means of inductive reasoning and literature review. Based on the understanding of the relationship, a continuous business model-business case alignment approach is proposed. Further, managerial guidelines are presented supporting the approach. This paper contributes to research and practice. Both can benefit from the conceptual relationship between two well-known concepts that have hardly been linked so far. Practitioners can apply the proposed alignment approach and the managerial guidelines to review their business. For research, we contribute to the body of knowledge of business model concepts. Researchers can build upon this fruitful ground by validating the proposed concept in empirical settings or by implementing software solutions supporting this approach. Consequently, the agility of companies can be increased when implementing merged or changed business models in the organization and when using business cases to determine if it is time to change the business model.

Keywords: business model, business case, strategy, operations, management, implementation

1. Introduction

Companies are continuously striving for more agility. One of the challenges is the rapid translation of changes in a company’s strategy to its operations and vice versa. For example, after the acquisition of Sun by Oracle, Oracle cut former Sun partners, without notice, from their hardware maintenance renewals business (Kovar 2010). For many of those partners, maintenance renewals were an essential part of economic survival. Therefore, these companies needed a very high degree of agility to be able to adapt their strategy and implement it in changed operations before they would go out of business.

Unfortunately, there is a gap between business strategy and business operations, hampering companies’ agility. Al-Debei & Avison propose to fill this gap with the ‘business model’ (BM), which can be used to “translate the broad strategy into more specific business architectural, co-operational, value propositional, and financial arrangements needed to achieve the strategic goals and objectives of the business” (Al-Debei & Avison 2010, p.370). This study builds upon that claim and aims to show that ‘business cases’ (BC), i.e., the (documented) rationale for executing a project or investment in accordance with the strategy, complement the business model in closing the gap between strategy and operations. The mutual relationships between BM and BC may be taken into account in today’s business practice implicitly, but with some exceptions, e.g., (Casadesus-Masanell & Ricart 2010), they did not receive much attention in the literature. Therefore, this study aims to clarify the relationship between BM and BC, based on literature review and inductive reasoning. Moreover, this study aims to provide a starting point for incorporating this more explicit understanding in organizational processes and software tools supporting those processes. Throughout the study, mergers & acquisitions (M&A) will be used as an example because they often cause disruptive changes in the strategy and operations of companies.

The structure of this paper is as follows. Section 2 provides a background on the BM and BC concepts and the factors causing BMs and BCs to change over time. Section 3 analyzes static similarities between BMs and BCs and dynamic influences of a BM on BCs and vice versa. Section 4 identifies managerial and technical implications for companies and section 5 concludes this paper.

2. Background

2.1 Business models

While several definitions of business models can be found (Morris et al. 2005), Osterwalder et al. (2005) provide the following definition: "A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams."

According to Gordijn et al. (2005), in literature, the notion of ‘business model’ is interpreted in the following ways: (1) as a taxonomy (such as e-shops, malls, auctions) and (2) as a conceptual model of the way we do business. Taxonomies enumerate a finite number of BM types, e.g. (Bambury 1998; Timmers 1998; Weill & Vitale 2002), while a conceptualization of ‘business model’ describes a reference model, allowing to describe an infinite number of BMs, e.g., (Amit & Zott 2001; Gordijn & Akkermans 2003; Mahadevan 2000; Weill & Vitale 2002).

Examples of BM conceptualizations, or ‘ontologies’ (Gruber 1993), are REA, e3-value, and BMO (Andersson et al. 2006), of which BMO is the ontology that is proposed by Osterwalder et al. (2005). Andersson et al. (2006) state that BMO has the widest scope. For that reason, the BMO ontology will be used in this study as an exemplary conceptualization, to be able to relate the BM concept to the BC concept. Table 1 shows the nine BM building blocks (2005).

Table 1: Nine business model building blocks, adopted from (Osterwalder et al. 2005)

<table>
<thead>
<tr>
<th>Business Model Building Block</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Proposition</td>
<td>Gives an overall view of a company’s bundle of products and services.</td>
</tr>
<tr>
<td>Target Customer</td>
<td>Describes the segments of customers a company wants to offer value to.</td>
</tr>
<tr>
<td>Distribution Channel</td>
<td>Describes the various means of the company to get in touch with its customers.</td>
</tr>
<tr>
<td>Relationship</td>
<td>Explains the kind of links a company establishes between itself and its different customer segments.</td>
</tr>
<tr>
<td>Value Configuration</td>
<td>Describes the arrangement of activities and resources.</td>
</tr>
<tr>
<td>Core Competency</td>
<td>Outlines the competencies necessary to execute the company’s business model.</td>
</tr>
<tr>
<td>Partner Network</td>
<td>Portrays the network of cooperative agreements with other companies necessary to efficiently offer and commercialize value.</td>
</tr>
<tr>
<td>Cost Structure</td>
<td>Sums up the monetary consequences of the means employed in the business model.</td>
</tr>
<tr>
<td>Revenue Model</td>
<td>Describes the way a company makes money through a variety of revenue flows.</td>
</tr>
</tbody>
</table>

2.2 Business cases

A BC is a recommendation to decision makers to take a particular course of action for the organisation, supported by an analysis of benefits, costs and risks (...), with an explanation of how it can best be implemented (Gambles 2009). It documents the relevant facts and situational analysis, key metrics, financial analysis, allows different projects with different goals to be compared and contrasted, and serves as a communication tool (Gliedman et al. 2004). BCs can be developed for any type of investment or project, including the investment in the extension of a company’s product and service portfolio. Such BCs may be termed ‘provider perspective BCs’ as the resulting products are then sold to customers who may use ‘customer perspective BCs’ to evaluate their investment. BCs commonly appear as spreadsheets, sometimes accompanied by presentations or explanatory documents. They may be presented by the project leader (BC ‘owner’ or ‘champion’) to senior management, which is responsible for prioritizing BCs and making investment decisions. This way, the BC can be used to decide about investment before project execution (‘ex-ante’), to evaluate progress during project execution, and to determine to which extent the proposed value of the investment has been realized after project execution (‘ex-post’) (J. Ward et al. 1996).

There are many authors who describe the components of a BC, e.g., (Cardin et al. 2007; Gliedman et al. 2004). Although a large variety of components can be included, the common denominator is a set of criteria to evaluate the proposed investment. Those criteria are generally classified as benefits, costs, and risks. To support decision making, a value needs to be assigned to each criterion. The value expresses the estimated future situation, in an absolute manner, or relative to the status quo.
The value can be qualitative, quantitative, financial, or non-financial. To estimate the value, a wide range of methods can be applied, such as benchmarking and pilot projects (J. Ward et al. 2008). With some exceptions (Ross & Beath 2002; J. Ward et al. 2008), the term BC is infrequently used in literature. Rather, scientists study ‘information systems (investment) evaluation’. Farbey et al. (1999a, p.205) define that “as a process that takes place at different points in time or continuously, for searching for and making explicit, quantitatively or qualitatively, all impacts of an IS project”.

2.3 Business model/case dynamics

With a few exceptions (Al-Debei & Avison 2010; Ian MacInnes 2005; Vaccaro & Cohn 2004), most literature has taken a static perspective on business models (Lindner et al. 2010). They are used to describe the value-creating logic of organizations at a certain moment in time. Hereby the implicit assumption is that business models remain steady over time, and that choices are rarely adjusted. However, in reality business models do not persist forever. Organizations often have to review their business models in order to keep in line with changing environments (Afuah & C. Tucci 2003). As a result, de Reuver et al. (2007) argue that business models have to keep up with external changes during all phases from development to exploitation.

Johnson et al. (2008) describe ‘business model innovation’ and five strategic circumstances that often require business model change:

- The opportunity to address through disruptive innovation the needs of large groups of potential customers who are shut out of a market entirely because existing solutions are too expensive or complicated for them.
- The opportunity to capitalize on a brand new technology by wrapping a new business model around it, or the opportunity to leverage a tested technology by bringing it to a whole new market.
- The opportunity to bring a ‘job-to-be-done’ focus where one does not yet exist.
- The need to fend off low-end disrupters.
- The need to respond to a shifting basis of competition.

In a similar way, Weiner et al. (2010) mention strategy, market, technology and regulatory influences on the BM. Moreover, the ‘hype cycle phase’ can be considered as an influencing factor (Fenn & Raskino 2008).

As it takes a tremendous amount of time and effort to realize a BM, it is common sense that a BM, although never completely static, is used for a longer period of time (Demil & Lecocq 2010). This understanding is not as common in the area of BCS, where many companies only use BCS prior to investment (J. Ward et al. 2008), rather than using them as a project realization and evaluation tool. However, some authors understand that a BC can also be useful after the initial investment decision and argue for long time use and organizational learning (Farbey, Land & Targett 1999b; J. Ward et al. 1996).

When a BC is used over a longer period of time, the BC (i.e., the project which the BC represents) becomes subject to similar influences like BMs. E.g., due to changes on the market, the expected revenue for a certain product for which the BC was developed, may start to decline. In addition to such external influences, BCS are subject to company internal factors, among which user involvement, project management, implementation, communication and corporate understanding (Farbey et al. 1993).

An illustrative example for BM/BC dynamics can be drawn from mergers and acquisitions (M&A), where heterogeneous BMs and BCS need to be aligned. Thus, this study will present concepts in that context.

3. Business Models and Business Cases

3.1 Similarities between business models and business cases

According to Brews and Tucci (2003), BM implementation and management include the "translation" of the BM as a plan into more concrete elements, such as a business structure (e.g., departments, units, human resources), business processes (e.g., workflows, responsibilities), and infrastructure and systems (e.g., buildings, ICT). This study assumes that a BC can be seen as a BM implementation,
which raises the question what they have in common. To provide an initial answer, the BM and BC concepts need to be decomposed. Conceptualizations as described in section 2.1 and 2.2 may be used. The BM concept can be decomposed in its nine building blocks, and the BC concept can be seen as a set of criteria for evaluation, possibly classified as benefits, costs, risks. In Table 2, for each of the BM building blocks, some examples of common BC evaluation criteria from the domain of information systems (T.-Y. Chou et al. 2006) are presented.

As a BC can theoretically contain any criterion, a BC does not necessarily contain implementations of all BM building blocks. However, on the basis of Table 2 one could argue that there are many overlaps between the BM and BC concepts. In addition to the similarities between BM and BC, there are differences. For example, BCs often aim to improve ‘competitive advantage’, while Osterwalder et al. (2005) make the following claim about the BM concept: “We excluded all elements related to competition and to business model implementation, which we understand as related to the business model but not as internal part of it.” Other common BC criteria that may not be considered as a part of the BM are strategic alignment, flexibility, and risk. Rather than being explicitly part of the BM, these criteria may be seen as properties of the BM as a whole, or as meta-properties of each of the BM building blocks.

**Table 2: BM building blocks and related IS-specific BC evaluation criteria**

<table>
<thead>
<tr>
<th>Business Model</th>
<th>Business Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value Proposition</strong></td>
<td>A BC can be developed and maintained for each of the company’s products and services. The value proposition then defines the set and scope of BCs. A BC may also be developed to change or extend the company’s value proposition. A portfolio approach may be used to help management evaluate the relative importance of BCs (J. M. Ward 1990). Examples of related IS evaluation criteria are:</td>
</tr>
<tr>
<td></td>
<td>‘Improved product quality’ (Irani 2002)</td>
</tr>
<tr>
<td></td>
<td>‘Provides better products or services to customers’ (Mirani &amp; Lederer 1998)</td>
</tr>
<tr>
<td><strong>Target Customer</strong></td>
<td>Provider perspective BCs describe market segments and customer needs.</td>
</tr>
<tr>
<td></td>
<td>‘Improved market share’ (Irani 2002)</td>
</tr>
<tr>
<td></td>
<td>‘Provides new products or services to customers’ (Mirani &amp; Lederer 1998)</td>
</tr>
<tr>
<td><strong>Distribution Channel</strong></td>
<td>BCs describe means to realize the foreseen benefits. Provider perspective BCs may therefore describe distribution channels. Each channel may incur certain cost and revenue streams.</td>
</tr>
<tr>
<td></td>
<td>‘Reduced delivery lead times’, ‘Improved product traceability’ (Irani 2002)</td>
</tr>
<tr>
<td><strong>Relationship</strong></td>
<td>A provider perspective BC could describe this, often as part of the intangible/strategic benefits.</td>
</tr>
<tr>
<td></td>
<td>‘Improved customer loyalty’ (T.-Y. Chou et al. 2006)</td>
</tr>
<tr>
<td></td>
<td>‘Improves customer relations’ (Mirani &amp; Lederer 1998)</td>
</tr>
<tr>
<td><strong>Value Configuration</strong></td>
<td>The BC describes activities and resources as part of the benefits realization plan. The investment in one specific activity or resource could also be the goal of the BC. BCs may be infeasible due to a lack of resources.</td>
</tr>
<tr>
<td></td>
<td>‘Labour savings’ (Ryan &amp; Harrison 2000)</td>
</tr>
<tr>
<td></td>
<td>‘Reduced inventory’ (Jones &amp; Beatty 1998)</td>
</tr>
<tr>
<td></td>
<td>‘Enhances employee productivity or business efficiency’ (Mirani &amp; Lederer 1998)</td>
</tr>
<tr>
<td><strong>Core Competency</strong></td>
<td>Responsible persons or required competencies may be described in the BC as part of the benefits realization plan.</td>
</tr>
<tr>
<td></td>
<td>‘Whether the CEO has IT knowledge’, ‘Experience in using IS’, ‘Skill of IT staff’ (T.-Y. Chou et al. 2006)</td>
</tr>
<tr>
<td></td>
<td>‘Probability of project completion’ (Bacon 1992; Escobar-Perez 1998)</td>
</tr>
<tr>
<td></td>
<td>‘Leader in new technology’ (Irani 2002)</td>
</tr>
<tr>
<td></td>
<td>‘Enables focus on core in-house operations’ (Mcauley et al. 2002)</td>
</tr>
<tr>
<td><strong>Partner Network</strong></td>
<td>May be described as part of the realization plan. Can be described for the make/buy/partner decision.</td>
</tr>
<tr>
<td></td>
<td>‘Ally with partner’, ‘Improved trading partner relations’ (T.-Y. Chou et al. 2006)</td>
</tr>
<tr>
<td></td>
<td>‘Helps establish useful linkages with other organizations’ (Mirani &amp; Lederer 1998)</td>
</tr>
<tr>
<td><strong>Cost Structure</strong></td>
<td>A BC contains a cost structure or ‘cash flow analysis’. The cost structure in the BM may define upper and lower bounds for the cash flow analysis in the BC. The cost structure may get less attention when it is already certain that the investment needs to be made (Joshi &amp; Pant 2008).</td>
</tr>
<tr>
<td></td>
<td>‘Save money by reducing…’ (Mirani &amp; Lederer 1998)</td>
</tr>
</tbody>
</table>
3.2 Business models affecting business cases

The similarities between BM and BC constitute a static view on the relationship between the two concepts. This static view can be extended with a dynamic view, by analyzing the influence of a change in the BM on BCs and vice versa. Assuming that an M&A usually affects many or all properties of a BM, the challenge is to identify how these changes impact the various BCs of the participating companies. Though the impact heavily depends on the nature and purpose of each BC, Table 3 presents a fictional example of change of each BM building block, as well as the associated impacts on the BCs. To ease the understanding of the relationship, the impact is discussed for each BM building block, every time assuming a change of that building block only while keeping all other building blocks fixed (ceteris paribus). The examples apply to fictional companies A and B, which are merged into company C, thereby also merging their BMs. Thus, the properties of company C’s BM building blocks have transformed compared to the previous BM building blocks of company A and B.

Table 3: Examples of BM change affecting BCs

<table>
<thead>
<tr>
<th>Business Model Building Block (Examples for Change)</th>
<th>Potential impacts on business cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Proposition: Company A has a BC for the development of a new product, which is already part of company B’s portfolio. Thus, company C’s product portfolio contains a redundant product.</td>
<td>Benefits: Decrease if one product attracts the revenues of the other one (cannibalization effects). Costs: Decrease due to company B’s experience in this area (e.g., some mistakes in development can be avoided).</td>
</tr>
<tr>
<td>Target Customer: Company A has a BC for a product that is supposed to address a customer segment which so far has only been focused on by company B. Company C can exploit this customer segment with products from both former companies.</td>
<td>Benefits: Increase due to additional target customers for company A. Costs: Decrease due to existing target customer awareness of company B (e.g., investments in promotion for this target group can be shared by the different products).</td>
</tr>
<tr>
<td>Distribution Channel: Company A has a distribution channel that B does not yet have, but it makes sense to use it for a specific product. In company C, A’s distribution channel can also be used for B’s products.</td>
<td>Benefits: Increase due to additional distribution channels available for company B. Costs: Increase due to additional costs for the usage of the additional distribution channel (e.g., logistics costs).</td>
</tr>
<tr>
<td>Relationship: Company A has a BC for a product that customers are not loyal to. In company C, B’s strong branding, relationship strategy, and customer loyalty can be applied to company A’s product.</td>
<td>Benefits: Increase of company A’s sales as customer loyalty rises with the help of company B. Costs: Increase as company A needs to implement B’s strategy. For instance, they might spend additional time with customers to build trust.</td>
</tr>
<tr>
<td>Value Configuration: Company A has a BC for product development. Company B has resources which could be used for that development. In company C those resources can be used.</td>
<td>Benefits: Increase of company A’s product development efficiency as capabilities of company B’s resources can be used. Costs: Increase due to costs for additional resources (e.g., more alignments needed with all stakeholders).</td>
</tr>
<tr>
<td>Core Competency: Company A and company B have different core competencies. In company C B’s core competencies may be applied to company A’s BCs, if applicable.</td>
<td>Benefits: Increase of company A’s BCs due to positive impact of additional core competencies. Costs: Increase as firm A’s employees need to be trained in B’s core competencies.</td>
</tr>
<tr>
<td>Partner Network: Company A has a BC for a product that does not reflect company B’s partner network. In company C, B’s partner network can be used for company A’s product.</td>
<td>Benefits: Increase of company A’s BC due to strengths of company B’s partner network. Costs: Increase due to costs for interacting with more partners (e.g., communication efforts).</td>
</tr>
</tbody>
</table>
Cost Structure: Company A has a BC for a product that is based on off-shoring. In company C the strategy is changed from off-shoring to near-shoring. The associated cost model in company C is hence different.

Benefits: n/a
Costs: Change due to changing cost structures (e.g., changes in the wage level and the exchange rates will impact the cost structure of the BC).

<table>
<thead>
<tr>
<th>Business Model Building Block (Examples for Change)</th>
<th>Potential impacts on business cases</th>
</tr>
</thead>
</table>
| Revenue Model: Company A has a BC for a product that is based on upfront license fees. In company C the revenue model is changed from license fees to 'pay per usage'. | Benefits: Change in cash flows due to changing revenue structures (e.g., switch from license-based payment to pay per usage results in short-term revenue losses and contributes to more regular cash flows in the long-run).
Costs: n/a |

3.3 Business cases affecting business models

Similar to a BM change affecting BCs, BCs may affect the BM. There are at least two ways in which this is possible. First, the analysis of existing BCs can provide insight in the better performing parts of the business. When merging two companies, the goal is to combine the best of both businesses, but potential synergies are hard to predict and achieve. However, BCs can be used as a basis for synergy analysis on a more operational level. By comparing BCs from both companies, benchmarks and performance rankings can be derived. Based on those rankings, further analyses can be started. While the well performing BCs can identify best practices, the lesser ones can identify those practices that should not be continued. The conclusions from the BC analyses may then trigger an adaptation of the BM.

The second type of effect of BCs on a BM occurs when using BCs to simulate the effects of a certain BM before the BM is implemented in the organization. As Osterwalder et al. (2005) put it: “Simulating and testing business models is a manager’s dream.” For example, in the post-M&A phase the resulting BM is usually subject to analyses and discussions. Often some alternatives are proposed and a decision needs to be made. E.g., if redundant products exist in terms of the BM value configuration, a decision needs to be made if one product should be dropped for the sake of the other or if both products will remain in the portfolio. For example, in PeopleSoft’s takeover by Oracle, the redundant PeopleSoft products remained in the portfolio (Buxmann et al. 2008). Table 4 presents some exemplary conclusions that may be derived from BC analysis and may trigger BM adaptation.

Table 4: Examples of BC analysis affecting the BM

<table>
<thead>
<tr>
<th>Business Model Building Blocks</th>
<th>Exemplary conclusions due to BC analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Proposition</td>
<td>A certain product area offers high ROIs.</td>
</tr>
<tr>
<td>Target Customer</td>
<td>A particular target customer segment creates strong revenues.</td>
</tr>
<tr>
<td>Distribution Channel</td>
<td>Some distribution channels are more efficient, i.e. create the same revenue with less costs.</td>
</tr>
<tr>
<td>Relationship</td>
<td>A particular way how to deal with customers is superior to others.</td>
</tr>
<tr>
<td>Value Configuration</td>
<td>Certain activities and resources outperform other ones in the internal value chain.</td>
</tr>
<tr>
<td>Core Competency</td>
<td>A specific competency of involved colleagues (such as very intensive relationship to the customers) drives performance.</td>
</tr>
<tr>
<td>Partner Network</td>
<td>One dedicated partnership supports a strong performance of a BC.</td>
</tr>
<tr>
<td>Cost Structure</td>
<td>Offshoring parts of product development increases overall costs.</td>
</tr>
<tr>
<td>Revenue Model</td>
<td>Pay-per-use contracts yield better returns on the long run than initial license-based fees.</td>
</tr>
</tbody>
</table>

4. Implications

A better understanding of the static and dynamic relationship between BM and BC will allow companies to become more agile, if they are able to continuously align BM and BCs. This section describes some managerial and technical implications of this understanding, and explains an approach for continuous alignment, which is visualized in Figure 1.
4.1 Managerial implications

There are at least three different triggers for the BM-BC alignment process. The first is a strategic influence, such as an M&A. Most likely, the M&A will cause a change of the BM. If so, the BCs that are affected by the changed BM need to be identified. Therefore, BCs could be ‘tagged’ with the related BM building blocks. For instance, while BCs for product development are strongly related to all BM building blocks, BCs for internal projects may not be related to BM building blocks such as the distribution channel. Next, the performance of the affected BCs and the alignment of the BCs with the BM need to be evaluated. Table 5 provides four high level recommendations on possible actions that could be taken: (1) When the performance of the BC is high and it is well-aligned with the changed BM, the BC (i.e., the projects associated with the BC) should be maintained. (2) When the performance of the BC is low, but it is well-aligned with the changed BM, it should be determined whether the BC may be altered to improve performance. (3) When the performance of the BC is high but it is not aligned with the changed BM, the question arises whether it will be possible to maintain the BC’s performance under the new BM. (4) Finally, when the BC is not performing well and is not aligned with the BM, the BC (and the projects associated with the BC) should probably be stopped.

Table 5: Possible actions after a BM or BC change

<table>
<thead>
<tr>
<th>High performance</th>
<th>Good alignment</th>
<th>Bad alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep/expand BC</td>
<td>After BM change: will performance remain?</td>
<td>After BC change: redesign BM to focus on this area?</td>
</tr>
<tr>
<td>Low performance</td>
<td>Can we improve the performance of the BC?</td>
<td>Kill projects associated with BC</td>
</tr>
</tbody>
</table>
The second trigger for BM-BC alignment is when management wants to simulate a proposed BM. Existing affected BCs need to be identified and re-evaluated, but new BCs may also be developed. As it is a simulation and not an implementation of a BM, the actions in Table 5 only need to be considered theoretically.

The third trigger occurs when management notices that a BC has reached a critical level. E.g., due to unexpected declining sales revenue, the ROI (return on investment) has reached the level of 150%, which is the minimum allowed by senior management. In such a case, critical BCs need to be re-evaluated on their performance and alignment with the BM. The conclusions are similar to those from when a BM change caused the BC re-evaluation, apart from the case of a high performing BC which is not aligned with the BM. In that case, the question needs to be asked whether the BM should be adapted to focus more on such BCs. If so, the dotted arrow in Figure 1 may be followed and the BM will be changed based on the lessons learned from the changed BCs. The changed BM may in turn affect other BCs, which would then need to be re-evaluated, etc. This iterative process continues until management is satisfied with the BM and BCs no longer change in critical ways.

The presented relationships between BM and BC offer many opportunities. By integrating these two concepts, the chasm between strategic management and tactical/operational implementation can be crossed. For instance, the presented concept can support the business-IT alignment of a post-M&A company (Osterwalder & Pigneur 2003). Osterwalder et al. (2005) already 'speculated' that the BM could play an important role in deciding which IT investments are needed for future strategic agility. They propose to cross the nine BM building blocks with Weill and Vitale’s (2002) conceptualization of IT infrastructure services. Similarly, the BM building blocks may be crossed with the BC model, as many IT investments are anyway reflected in BCs. Using the BM-BC relationship as a basis for analysis it could be possible to achieve a better post-M&A alignment between the BM of a company and the IT services provided by the IS department.

4.2 Technical implications

In addition to management support and an organizational implementation, the continuous alignment of BM and BC can benefit from two complementary software tools: a business case framework (BCF) and a business model composer (BMC).

The BCF is used to develop and monitor BCs. First of all, it is a collection of BCs, which should use similar structures and evaluation criteria, in order to make the BCs comparable and their contents suitable for aggregation. Second, the BCF may be connected to business systems, such as an enterprise resource planning system (ERP), receiving up-to-date information, and keeping track of critical levels on selected indicators, e.g., ROI, costs, number of customers, average processing time, etc. When a critical level is reached, i.e., the BC is under- or overperforming, management will be notified.

The BMC is used as a strategic decision support tool to (re)design, monitor and simulate BMs, based on a BM conceptualization, such as BMO (Alexander Osterwalder et al. 2005). It supports the visualization of the business model and the relationship among the various BM building blocks. It allows for the monitoring of key performance indicators and the adaptation of the BM based on those. Finally, the BMC can support the dissemination of the BM (changes) and the cascading of the BM to more operational levels, e.g., by (semi-)automatically configuring IT systems and service compositions managing and controlling business processes.

In spite of these more or less common and useful features of BCFs and BMCs, their full potential will only be reached when they are connected and benefit from each other. For example, when considering a BM adaptation, one over- or under-performing BC will most likely not be sufficient evidence. Rather, the entire portfolio of BCs needs to be considered. Unless a software tool can provide adequate aggregates of values in the BCs, decisions will be hard to make. Another example of complementary use of the tools is when the effects of BM changes on BCs are measured and recorded. When considering future BM changes, past effects on BCs may be taken into account.

5. Conclusion

The agility of companies can be increased when implementing merged or changed business models in the organization and when using business cases to determine if it is time to change the business
model. This study clarifies the relationship between business models, as an implementation of a company’s strategy, and business cases, as an abstraction of a company’s operations. The relationship is analyzed from a static as well as a dynamic point of view by means of inductive reasoning and literature review. The main contribution of this paper is an analysis of the relationship between two common concepts, which is often implicitly used and related in practice, but which had not been described explicitly in literature. Future work should test the validity of the proposed relationship in practice, e.g., in specific industries and in the context of different influencing factors such as M&A. Moreover, it may go into more depth on how managers can implement a continuous BM-BC alignment process in their companies and how software tools can be designed to support this process.

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