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Heterogeneous Information Technology in a Business Environment: Challenges, Literature Review and Gaps

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Abstract

The article presents research that addresses increasing modern phenomenon of heterogeneous information technology (IT) in business environment and the impact on IT business value approach. In general, literature and field evidence show that the rate of failure in IT investments is high and, when successful, the achievements often do not meet expectations. The theory and practice also show that heterogeneous IT integration does not resolve this problem; instead, it has another issue, which is the lack of information system architecture and difficulties in setting up an appropriate IT business value approach for the creation and exploitation of IT business value. The approach used in conducting this research is a two-step approach to analyze and understand heterogeneous IT integration and business value approach. The first step consists of statement of problem from the field and the second step consist of collecting and analyzing data from academic literature. The outcomes of the research show that specific architectural management of information systems for heterogeneous IT is necessary for IT business value creation and exploitation, meaning that the way heterogeneous IT is integrated into an organization may define the IT business value approach. The findings also show that some adjustments should be made to existing theories of the IT business value approach to meet heterogeneous IT characteristics.

Keywords: Information Technology, Business Value, Digital Ecosystem, Heterogeneous IT, Ubiquitous IT

1. Introduction

Remaining competitive on the market is a crucial and vital element of an organization's business life. Information technology (IT) has been propelled to the center of this panel of competitive thirst. Therefore, innovation in IT proceeds at a high pace, pushing organizations to adopt heterogeneous information technology, and they find themselves with many different heterogeneous IT environments involving many different actors. This makes it very hard to draw common information system architecture, thereby creating a problem with the information system business value approach.

The heterogeneous IT in all organizations is gaining ground, causing a real problem for IT business value approach because today each organization's information system depends on one or more other organizations' information systems and the fact is that a mixture of

contributions from different systems working together is necessary to produce a given result. Thus, there is an increasing threat of a domino effect, which may be caused by the failure or underperformance of other systems out of the control of a given company or organization.

In general, the literature shows that the rate of failure in IT investments is high and, when successful, organizations perceive poor returns on IT investments. The literature also shows that heterogeneous IT integration does not resolve this problem; instead, it has another issue, which is the lack of information system architecture and difficulties in setting up an appropriate IT business value approach for the creation and exploitation of IT business value.

In this research, heterogeneous IT are analyzed as a collection of isolated technologies, solutions, systems and associated competencies and knowledge required to work together to meet the organization business goals. An analysis is carried out through the ubiquitous IT environments theories and IT business value to demonstrate the need for a specific IT architectural management and understand the business model appropriate to heterogeneous IT, which is necessary to create and exploit IT business value (Musabende & Cotaie, 2016). The outcomes of the research show that specific architectural management of information systems for heterogeneous IT is necessary for IT business value creation and exploitation, meaning that the way heterogeneous IT is integrated into an organization may define IT business value approach. The findings also show that some adjustments should be made to existing frameworks of the IT business value approach to meet heterogeneous IT characteristics.

The paper follows three segments; the first section outlines the challenges of how heterogeneous information technology is approached on practical grounds; the second section describes the existing academic literature review and the last section presents the gaps between the theories and current situation on practical grounds. A summary of limitations of current research is also advanced.

2. Challenges of heterogeneous Information Technology

IT environments have become complex systems (Bhaskaran & Krishnan, 2006; Brooks, Sing, & Wright, 2007; ORACLE, 2008) and are often defined as Digital Ecosystem (Gartner, 2016) that are becoming more and more difficult to manage efficiently (Gartner Symposium, 2016) and organizations are making significant investments in these complex information systems that integrate heterogeneous infrastructures, processes, components, and applications, demanding the organizations' resources at an ever-growing rate for their maintenance, management, and security (Hsieh & Wang, 2007; Ponemon Institute, 2009; Defense Advanced Research Projects Agency, 2015). The four challenges identified here are: (a) organizations are making ambitious investments in IT; (b) economic pressures on IT investment for business value creation; (c) IT solutions converging to heterogeneous IT schemes and (d) uncertainty of IT business value and lack of return on investment.

(a) Organizations are making ambitious investments in IT, for example, worldwide organizations spent \$20 billion in total to adopt and implement ERP systems (enterprise resources planning) in 2000 (Willcocks & Sykes, 2000). Such investments increased to \$26.7 billion in 2004 and were expected to rise to \$37 billion in 2008 (Kawamoto, 2004). However, while organizations continue to implement ERP solutions to improve efficiency, many ERP

implementations have a long history of unsatisfactory results (Kim, Lee, & Gosain, 2005). A study conducted by the Panorama Consulting Group (2009) over three years (2005–2008) shows that 93% of ERP implementations take longer than expected, 59% of implementations cost more than initially assumed, only 13% of respondents characterize themselves as “very satisfied ”with their company’s software implementation, 38% of respondents indicate a “lack of employee buy-in” as the biggest challenge facing ERP implementation teams,57% of participants suffered operational stoppages, and only 21% realized 50% or more of their projected benefits. On one hand this underachievement can be attributed to underutilization of the implemented systems; on the other hand it can be attributed to the specificity of the organizations’ IT implementation and their business strategy.

The implementation of complex and heterogeneous IT is not being adopted in the private sector only; the state-of-the-art IT projects are also being introduced in the public sector as very ambitious investments. For example, Korea’s government is considering creating a ubiquitous city that will be a set of heterogeneous information communication technology (ICT) to improve a wide range of services to the heterogeneous public. The project is evaluated at US\$35 billion (Microsoft, 2008).

The French government under its Ministry of Transport launched a program of consolidation of its information system and will integrate a geographical information system (GIS). This project was designed to be a state-of-the-art information system that should conform to all the parameters in urban infrastructures. The objective of this project is, on one hand, to improve the collaboration between the ministry and other state institutions and, on the other hand, to improve the quality of service to people. Developing countries are not far behind. Aiming to meet requirements from financial institutions and to improve their good governance, they are launching ambitious heterogeneous IT projects (Musabende & Cotae, 2016). For example, Rwanda launched its ICT plan aimed to create heterogeneous IT environments, including optic fibers; an e-government state of-the-art project; wireless for all; digital identity cards; country data centers, just to name a few. Rwanda became the first nation to use drones to deliver medical supplies in remote areas using sophisticated interconnected information technology (NewScientist,2016).The aim is to provide the country with all possible heterogeneous IT to boost the economy and make the private sector equipped to attract investors with the vision of becoming a regional ICT hub. The project is very ambitious and will cost several million U.S. dollars including nearly \$200 million for the optic fiber project (Rwanda Information Technology Authority, 2008).

A study conducted by World Bank (Dener, Watkins, & Dorotinsky, 2011) over 25 years of World Bank experience in implementing financial integrated systems shows that since 1984, the World Bank has financed 87 Financial Management Information System (FMIS) projects in 51 countries, totalling over US \$2.2 billion, of which US \$938 million was for FMIS-related ICT solutions. However, the report indicates that despite the high levels of financing by the World Bank in this area, little is known about the achievements and the lessons learned across projects over time.

(b) *The economic crisis and downturn is pushing companies to invest in IT management seeking business value* and studies show that IT investments overall are on the decrease (Mattern, Schönwälder, & Stein, 2003) with a very significant cut in hardware and software expenditure

(15% to 25% on average in 2002 compared with the annual increases of 5% to 10% during the past decade). In a tightening economy, to remain competitive while ensuring the achievement of their business strategy outcomes, organizations now have to consider the expanding heterogeneity of the computing components, systems, and solutions offered and try to integrate them into their information system organizational schemes.

Organizations are considering cutting costs by mixing their information systems, such as outsourcing/off-shoring, consolidation of data centers and storage, virtualization and some innovation such as Artificial Intelligence (AI), machine learning, Internet of Things (IoT) and blockchain (Gartner, 2016).

(c) *All IT solutions are converging to heterogeneous IT schemes* as the current competitiveness on the market and the need to extend as much as possible the market-breaking geographical, cultural, and languages barriers have led to an increasing need for mobility and flexibility in business, thus the responsiveness on the market leads IT providers in an open system to aim to find appropriate solutions to respond to these increasing demands. Then, we observe information technology entering a new era of heterogeneous information systems or digital ecosystem which challenge the traditional information system conceptual architecture and may provoke rethinking of the overall information systems conceptualization. The solutions identified here are: outsourcing vs. virtualization, cloud computing and m-commerce (Musabende & Cotae, 2016).

- *Outsourcing/offshore vs. virtualization*

A study conducted by Gartner (2009), an online survey conducted among 116 companies across western Europe during the last week of November 2008 and the first week of December 2008 and directed to individuals who were involved in decision making on outsourcing and IT services in 2009, shows that organizations are increasingly relying on outsourcing to achieve cost optimization. More than 70% of the respondents rated budget and cost containment as their top concern in 2009, an increase of 17.5% from 2008. Forrester estimates that 3.3 million U.S. jobs and \$136 billion in wages could be moved to such countries as India, China, and Russia by 2015. After outsourcing/offshoring services, applications, and IT components, the virtualization system has been proposed and, according to the statistics, organizations are integrating or intend to integrate virtualization into their information systems at a very high pace. For example, a survey from F5 Networks shows that 60% of companies recently surveyed say the server team is leading their virtualization initiatives (F5 Networks, 2008; Musabende & Cotae, 2016)).

Organizations express their expectations from virtualization technology as hoping to reduce costs by 70% in organizations and 74% in SME (Forrester, 2009). At the same time that organizations are integrating virtualization, studies show that the rate of deception is high in organizations that integrated a virtualization system: a study conducted by HP in Europe of 500 CIO including 37 from France showed that 54% have launched virtualization projects but only 27% declared that they see benefits from this system (Guerrier, 2008).

- Cloud computing

A new IT solution currently being introduced to the market is cloud computing, a concept that may be summarized in IT terms as “a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software” (Knorr & Gruman, 2008). The concept of cloud computing seems to be attractive and organizations will be interested in this offer; according to research by Forrester, 5% of organizations have implemented cloud computing; 3% will integrate this concept by 2010; and 2% of SME use cloud computing against 2% that intend to implement the concept by 2010 (Forrester, 2009). Whilst most researchers doubt the success of this concept, with the economy contraction and IT managers under pressure to reduce IT costs, researchers expect that organizations may be tempted by cloud computing with the objective of cutting IT services and infrastructure costs. “The next big trend sounds nebulous, but it’s not so fuzzy when you view the value proposition from the perspective of IT professionals” (Knorr & Gruman 2008); and other commentators predict that the economic downturn creates the interest of companies in adopting cloud computing as businesses are trying to find a way to cut costs. Nevertheless, CIOs show their fear and reticence regarding the adoption of cloud computing. According to a top CIO survey conducted by Goldman Sachs & Co, cloud computing does not appear to be their priority as they prefer servers and storage virtualization and one analyst said that the “message here is CIOs are looking primarily to tested, well-understood technologies that can result in savings or increased business efficiencies whose support can be argued from a financial point of view” (Schwartz, 2008).

Another concern in relation to cloud computing is that companies seem to fear losing control of their data and applications, and may want to keep a hand on their applications and their systems. Therefore, one solution may be to integrate cloud computing partially while keeping sensitive processes and data under their own control. Then, cloud computing could be implemented in organizations as part of their heterogeneous IT, given the advantages that they cannot ignore.

- M-commerce

Technologies such as e-commerce, and more now m-commerce (mobile commerce), have their own comfortable place in organizations’ information systems as heterogeneous IT components. According to Carr (2004), as e-commerce and wireless technologies continue to expand, the m-commerce market alone is expected to be worth over \$50 billion by 2009. Recent statistics show that China’s m-commerce market reached RMB1.3 billion (\$163 million) in 2006 and is forecast to reach RMB7.6 billion (\$953 million) by 2010 (Paul Budde Communication Pty, 2009).

FirstPartner (2009) forecasts that the UK mobile advertisement market will be worth €220 million by 2013 with western Europe forecast at over €990 million. FirstPartnersays that Edgar, Dunn & Company forecast the global advanced payments for mobile commerce to be worth \$510 billion by 2012, rising from a small base in 2009.

(d) *Uncertainty of IT business value and lack of return on investment (ROI)*, relate the difficulty of assessing the real business value created by implementing IT solutions; difficult exacerbated

by the competitiveness of the global business environment and the short life span on these solutions. Carr at Computerworlds' premier 100 IT leaders conference 2004 stated that, with any innovation in IT, in order for it to be strategic, you have to be able to hold onto those benefits at least for long enough to pay back your initial investment. "I think that time clearly has shrunk" (Carr, 2004). Carr expressed concerns about IT capabilities to give a competitive advantage to organizations and thinks that IT has become strategically irrelevant, therefore IT capabilities will continue to progress, and maintaining competitive parity will continue to be essential to survival. Carr even goes as far as accusing IT vendors of putting a lot of IT solutions on the market while recognizing that business value will depend on how companies use them.

A study of Unisys, a poll of 400 IT and financial directors, showed that IT and financial directors in the UK do not consider ROI as a key indicator of IT success and suggest that another measure to evaluate IT contribution may be implemented (Computerwire, 2002). But how can you sell a product that neither increases revenue nor decreases costs? What are the other benefits organizations are disposed to obtain from the IT and how do they know that they have been obtained? Those are crucial questions that will face IT.

In contrast with what was said above, as the world is expressing concerns about environmental and climate issues, the IT domain is not staying behind. According to a recent study involving IT executives conducted by IDG Research Services (Harbert, 2008), the return on investment (ROI) of green information technology projects is the main key that leads them to adopt green computing. Indeed, in an interval of six months the study shows a decrease of about half (from 31% to 16%) of the respondents citing an inability to see the ROI as the top reason for not placing more importance on green computing. The study shows that cost savings are a major factor that leads interest in green computing with annual savings in energy evaluated at an average of 7.7% (\$439,012).

3. Literature review

IT cost is a permanent subject of discussion in all organizations and the problem becomes more exacerbated in a recession where companies are more eager to reduce costs than spend revenue. The question then that IT managers and academic have aimed to answer is: how to prove that IT contributes to business value, and how to explain this business value to top managers? Is there any way to create IT business value that reflects their investments? There have been many studies and theoretical developments regarding IT business value creation, exploitation, and evaluation. However, the rapid change and the pace of innovation in IT keep this problem as a research issue. Indeed, recent literature still identifies the problem and clearly indicates that moves to heterogeneous IT have created some different environmental and competitive influences that sustain the information system business value approach as a research issue. Below, a précis represented by some examples from the literature is given to illustrate this need.

The literature review will discuss two main axes: the heterogeneous IT integration in the organizations and the IT business value approach. The IT business value approach can be defined as permanent veil wrapping IT in time and space to ensure IT business value identification, creation, exploitation, sustainability, monitoring and measurement. The heterogeneous IT integration in the organizations axis refers to the line drawn and followed by a given

organization seeking IT business value.

Heterogeneous IT integration in organizations

This section discusses two theories: computerization movements and the ubiquitous computing environment, discussing their concepts and principles.

(a) - Computerization movements

The computerization movement notion was introduced by Kling and Iacono (1988) and they defined it as a particular social movement that advocates focus on computer-based systems as instruments to bring about a preferred social order. The sub segment distinguishes between the expectations and perceptions in the computerization movement and heterogeneous It as the model for interorganizations era.

- Expectations and perceptions in the computerization movement

According to Kling and Iacono (1988), the computerization movement refers to ideas or a set of necessary activities that may be launched to convince a given category of the population to adopt a given computer system, a movement that supports and pushes the adoption of a given technology within an organization. This computerization movement has four elements: the systems, the population, the benefits from the systems and the promoters of the systems that may work together. The way these elements will interact and find a good balance will define the level on which the systems will be accepted or adopted in the organization, and thus its contribution to the business. This concept is the ideal from the adoption of information systems where expectations or the reasons why the information systems were adopted will be met. However, the literature shows that in the real life of the business this is far from the truth. Elliott and Kraemer (2008) define the computerization movement as a specific kind of social and technological movement oriented toward the mobilisation of bias for continuing investments in computer technology and related uses based on Utopian visions of better social worlds.

Organizations adopting information systems solutions in computerization movements may face two situations: the first one is that expectations from the IT will be drawn by the computerization movements ideology that set the contributions of the proposed IT solution, thus organizations will adopt the IT solution based on its expected contributions and the needs in the organization will be created in line with the acquired or adopted IT solutions. This is the case of the Internet, mobile solutions and e-commerce where organizations adopting these solutions may change their systems and organizations and acquire new infrastructure, new resources and competencies to fit the new solutions. The second situation is where the organization will adopt IT solutions to respond to the existing needs and will apply the solutions and incorporate them into the existing system (Musabende & Cotae, 2016). Therefore the adopted IT solutions will be adapted to the existing procedures and organization system.

- Heterogeneous IT as the model of the current inter-organizations era

Kling and Iacono (1988) distinguish five computing era and say that currently we are in the era of inter-organizations where each organization may depend on others even when they are not operating in the same industry. With this business environment there is no time to lose in sole

activities of evaluation or setting own expectations. In the current business environment there is no sole organization, thus there is no sole decision and there is no sole evaluation. The decisions are based on the trust of the network of different organizations that work together to achieve their respective goals. Elliott and Kraemer (2008), using theoretical analyses, systematic empirical studies and studies of specific technologies state that: “computerization movements are driven by Utopian visions of technology that become part of the ‘ether’ within society, creating a general bias in favour of computing adoption”.

They find that the computerization movement rhetoric tends to shift from the Utopian to the pragmatic with experience and contending discourse, the technology that requires new infrastructure may take longer to be adopted than those that can use existing infrastructures. This element may push organizations to adopt more IT solutions that do not ask for new infrastructures to save time and money but also to reduce the time of adoption and thus accelerate its period of return on investments. This situation may also reinforce the cooperation between organizations where a set of organizations with different competencies and/or facilities will regroup to work together where each one brings to the other something they do not have. This may be illustrated by offshoring and outsourcing of infrastructure and business processes or it may explain the current mass adoption of virtualization and cloud computing solutions (Musabende & Cotae, 2016).

(b) Ubiquitous computing environments

There is no specific or single definition of what is a ubiquitous computing environment (Poslad, 2009) but all researchers outline the same core concept. The ubiquitous computing environment may allow small, affordable, reliable and even invisible devices omnipresent in everyday life and activities (Weiser, 1991; Poslad, 2009; Greenfield, 2006). Weiser who coined the term ubiquitous computing for the first time says that the most profound technologies are those that disappear, which means they weave themselves into the fabric of everyday life until they are indistinguishable from it (Weiser, 1991; Musabende & Cotae, 2016).

The ubiquitous computing environment theory was initiated by Weiser (1991), who suggested that computer users may use a multitude of interconnected devices, an information system becoming a set of heterogeneous IT components integrated into activities of everyday life. He defines ubiquitous computing as fundamentally characterized by the connection of things in the world with computation where hundreds of computers may be accessed in the course of a few minutes (Weiser, 1993). Ubiquitous computing has now gained ground in the business environment and is used as a strategic initiative that may help organizations to attain their business goals.

There are devices and systems that use ubiquitous concept. The most developed is the mobile phone which spreads the m-commerce, radio-frequency identification tags (RFID), embedded systems, geographical positions systems (GPS), wireless technology, sensor network and social media platforms, as few examples. Despite the advancement and vision of the ubiquitous computing environment, there are many problems that may hit organizations who adopt ubiquitous computing. Problems may be technical such as wireless or network connections, or organizational problems where companies may adapt their current structure to the new requirement of the ubiquitous computing environment and social problems (Poslad, 2009). Thus

if the ubiquitous computing environment is going to use those systems a big challenge still remains and will need some improvement to fit this vision.

IT business value in organizations

In the academic literature there is much research dealing with the business value of IT with different viewpoints (Markus & Soh, 1995; Brynjolfsson & Yang, 1999; Brynjolfsson & Hitt, 1996). Researchers are unanimous on the fact that organizations do not see the real business value of their investment in IT and try to explain the gap that exists between what are seen as costly investments and the absence or low return on investments (ROI). This section is developed under two categories: IT Business value creation and IT business value evaluation.

(a) IT business value creation

A minority of researchers have been interested in demonstrating how to create business value from IT before evaluating this value (Soh & Markus, 1995; Gregor, S., Martin, M., Fernandez, W., Stern, S. & Vitale, M., 2006). Soh and Markus (1995) model shows that to create value, IT investment may be converted into IT assets and these assets will impact on organizational performance. This model shows that the impact of the IT investments on the performance of an organization will be determined by whether or not the business has set a favourable environment and conditions to the business value creation.

Bannister and Remenyi (1999) claim that the absence of the real definition of the IT business value expected by companies may be an obstacle to its creation. In their work, they suggest that: “until there is a better understanding in the IT community of what value is and how managers attempt to optimise it, current IT evaluation methods for complex decision-making purposes will often be neither credible nor effective”.

Wiseman (1992) suggests that IT business value should be seen as more important than the benefits. Therefore it is not only the benefits they produce but the importance that they have in the eyes of the one who evaluates them. However, many other researchers seem to agree on the fact that IT business value may include, at the same time, the financial and non-financial benefits (Berghout & Renkema & Berghout, 1997b; Soh and Markus, 1995; Bannister and Remenyi, 1999).

(b) Business value evaluation

The evaluation of business value of IT investments occupies a large part of the literature compared to the creation of IT business value. This is because, companies are more interested in knowing what the investments they are intending to undertake are worth or what they will bring to the company business value (Silvius, 2006).

The business value of IT evaluation in the literature is approached under two major categories: the financial measurement which tends to evaluate the tangible benefits of IT investments using the traditional economic and financial measurements such as ROI and non-financial measurement where researchers tend to explain other than financial benefits.

- Financial benefits

Silvius (2006) advances that all traditional methods or financial methods used to evaluate IT investments business value are limited in their ability to cope with risk and managerial flexibility (ROI, payback period, internal rate of return (IRR), discounted cash flow/NPV and economic value added). He says that ROI ignores risk and the time-value of money; payback period, ignores part of the revenue and does not determine the value; the IRR ignores risk; the discounted cash flow/NPV may not be conclusive in the case of projects with different durations. The economic value added is in line with shareholder value but is calculated using other methods. Quoting Trigeorgis (1996), he introduces the real options valuation method which allows the calculation of an additional value on top of the NPV of a project. He calls this value the flexibility value that evaluates the optionality of the investment. Other researchers disagree with these methods and consider that IT business value evaluation should take into account many other elements which are far from financial (Soh & Markus,1995). Among these elements, researchers cite improved decision-making, customer satisfaction, improvement in the processes, social and human factors (Land 2000) such as training, relationship between workers.

- Non-financial benefits

When researchers try to find a good metric to measure the IT investments business value, they agree on the fact that the financial metrics are not enough to measure the whole business value created by an IT investment alone but that they have to be complemented by other methods that take into account the intangible values (Renkema & Beghout, 1997; Silvius, 2006; Land, 2000).

Bacon (1992) supposes that criteria used in the evaluation of IT will have a significant impact on the IT investments choice, because they will be a measure against these criteria. Thus the result of this measurement will be linked to the effectiveness of these criteria. Brynjolfsson and Yang (1999) conducted a study on different non-financial firms in the United States and found a strong relationship between the increase in the computer capital and the increase in the financial markets' valuation of the firm. They explain their findings by the adjustments costs and intangible assets where they state that the intangible assets are created by the costly investments in software, training and organizational transformations that accompany computer investments. They propose the financial market valuation of a firm to estimate the intangible costs and benefits of computer capital.

4. Gaps between theories and practice

This section interprets the findings in the literature and in practice, consolidating the needs, gaps, and aspires to provide an understanding of whether any improvement is required to ameliorate the heterogeneous IT business value approach.

The analysis of literature and practice reveals that there is a limited amount of research and theories that treat the heterogeneity of IT in the context of business value while it is treated mainly on a technical level such as integration, or also as a social issue. Other researchers prefer to approach the issues of IT business value at a general level treating IT investments at the same

level whilst others prefer to treat one IT investment as in the case of e-business. The analysis shows that researchers are more concerned with explaining the benefits a company gets from the IT than explaining how to create the business value. This situation may be explained in part by the fact that many critics question the real business value of IT rather than knowing how to create this value or how to exploit it.

The rationales for this research was to study the problem faced by companies of evaluating, creating and exploiting the business value from heterogeneous IT. The problem is that companies are struggling to create and exploit business value because of the very complex IT architecture imposed by its growing heterogeneity and global characteristics resulting in confusion about what is the real contribution of the IT to the company business value and the impossibility to determining if the creation and exploitation of value from IT investment are maximized and under which conditions they can be.

The findings show that the business value from heterogeneous IT is strongly tied to the company IT strategy which deals with the choice of a ubiquitous computing environment, digital ecosystem or the IT global character; the relationship between the business and the IT; the responsiveness of the business to the requirements of the IT by permanent redesigning and continuous improvement of the business processes; the flexibility and rapidity with which it will be done and the knowledge that should be created, managed and shared throughout the company business areas. Along with these elements, the permanent and consistent cycle of evaluation, creation, exploitation and evaluation of business value will be the determinant of the quality of the business value delivered by the heterogeneous IT. The findings show the following:

- There are strong connections between the theory and practice, for example in both theory and in practice IT governance is seen as a keystone for business value from heterogeneous IT and IT strategy.

- There are elements which are important in practice but which are not reflected in the theory such as: the external and internal interdependence between different systems, a real permanent and consistent cycle of business value evaluation-creation-exploitation-evaluation and the business process reengineering program, knowledge management and IT-business relationship and the company culture regarding IT.

5. Limitations of research

The scope of the research is limited to the business value approach from the heterogeneous IT over their business lifetime through theoretical identification and analysis of academic literature and practical studies. Other limitations of this research include: the fact that the research does not cover all aspects of heterogeneous IT integration in the business environment such as IT social issues and Privacy.

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