MOBILITY AND FLEXIBILITY: THE USE OF MOBILE TECHNOLOGIES IN CORPORATIVE ENVIRONMENTS

The wireless network is advancement in the way in which the data transmission is done between computers and electronic equipments in order to support corporate managements.
According to Sondergaard(2011), a “post-modern world ” centered in contents, the mobility requires from the enterprises to place customers in the centre of the design and to get involved in the relationship through mobile devices. Then, the present research collects data with structured questionnaires through industries and service companies into the industrial region of Sao Paulo - Brazil to value the current status regarding mobile technologies.

Key words: Mobile technology, cloud computing, strategic planning

INTRODUCTION

Though in the beginning o XXI century mobile technologies have suffered significant advancements, it continues in adjustment and development.

On the other side, emergent mobile technologies begin to activate an efficient support for mobile populations. This support is not treated simply in securing network connection or in the availability of most wide band width of transmission.

In fact, technology transcends many facets of user’s life besides the expectations on confrontation with offered service performance and capacity of daily life problems solutions. In other words, users experiences with the technology are paradoxical.

The idea of what technology is paradoxical and it behaves paradoxically is been observed by Mulgan (1998) that defined paradox like the situation, an act or behavior which seems you it have contradictory or inconsistent qualities.
Heidegger (1993) affirms that technology of communication destroys distances by destroying proximity and that technology does not bring near the persons, but it hardly believed conditions in what they all are near, now and at the same time independent of the geographical distance.

Easterbrook (2003) argues that technologies brought progresses also created an economical and social paradox that more and more increases personal challenges in his individual and social lives.

In a business orientated approach, Handy (1994) argues that capacity to manage paradoxes is the key factor of corporative success in today’s high-tech world.

Likewise, Mick and Fournier (1998) describe that post-modern society of consumption in which consumers are confronted by multiple and contradictory consequences of products consumption that provide so much new freedoms and new forms of dependences.
Then enterprises must value level of maturity of the technology when transformations are looked in the field of mobility in own business.

JUSTIFICATION

Commerce is defined in the traditional form as a process of purchase and sell goods and services.
From the beginning of XXI century, many organizations are selling goods and services in the Internet, which has been called in generic form like electronic commerce or e-commerce.
In this way, e-commerce took off in the geometrical form taking many enterprises to invest in this business segment.

Today, more and more persons and enterprises interact with the digital technology and with these advancements industry are moving towards a more mobile economy. This new form of mobility can be attributed to technology advancements like cell phones, computers and other portable devices and, especially supported on the wireless communications infrastructure.
Due to the quick advancements of these technologies, it observes a gradual necessity of enterprises to formulate plans that allow the insertion in this new environment of interaction and doing business that very often are driven in isolated and scattered form.

Wireless networks are becoming very popularly and offer a better cost-benefit relation when compared between traditional physical wired networks.
Since it happens with any new project, it is important to get deep knowledge regarding new technology to understand its contribution and in the solution of the communications network necessities.
The most important issue resides in configuration and construction of the enterprise site in order to integrate with wide network adapted for the corporative environment.
Several questions, including the security, must be boarded like part of the process of mobility strategy formulation.

Up to the moment, few enterprises created a strategic plan with really wide approaches for the mobile capacity though a growing number of enterprises is interested in attempt to realize
in the public and private sector.

The commonest thing up to now it that enterprises being focused strategies on a technology dimension mainly with shared skills through partnerships for risk reduction as well as in the reduction of costs.

However, it is a fact that enterprises need a strategy model of and more wide directions as key success factor in the wireless technology project development.

Research Methodology

Bibliography revision of M-commerce processes and technology and its evolutions then the field survey and direct inquiry on products performance and available services together with a discussion on the benefits and challenges of the M-commerce.
The research sources was specialized sites like ProQuest, Ebsco, JStore, IDC, annals of Congresses like EnAnpad, Simpoi, SeGet, Contecsi, and specialized magazines between others.

The field survey questionnaire determined context and universe or of enterprises to examine strategic questions like:

Management issues:

- Why and how employees use mobile devices and services?
- Which mobile devices or solutions use?
- What value perceiving mobile devices users in his personal and professional life?
- What reasons that get a frustrating mobile technology users?
- How have the mobile solutions been influencing his lives? – How they interact and to spend the time with colleagues and friends?
- Which business relative questions can be solved by the mobile technologies?
- The clients and employees are inclined to using mobile devices?
- Which mobile platform will be used principally to distribute informations (M-information) or to make transactions easy (M-commerce)?

- The available products or services are time and local sensitive?
- The potential users of M-service feel secure in the transmission of the sensitive informations through wireless networks?
- Can the enterprise improve profits or reduce costs with investment in M-commerce technology or variable like initial investments its, transaction and service support costs exceed profits obtained by the sale of product or service?

- Does the M-commerce technology investment produce intangible benefits like better service to a client employee motivation of the official and for other stakeholders?

MOBILITY PRINCIPLES REVIEWS

Bellotti and Bly (1996) and Luff and Heath (1998) did first and significant contributions to understanding of mobility inside concept of human-computer interaction (HCI) and collaborative supported computer works (CSCW).

In his study where detaches project team distributed spatially, argue that mobility is essential in the process of communication and in the shared use in resources.
The mobility inside specific environments can make easy the informal interactions and stimulate an attitude in available correlated information to colleagues who work in remote places.

Kraut et al. (1996) lembram o sistema de projeto colaborativo com o uso da computação móvel no reparo de equipamentos no campo e na manutenção de dispositivos mecânicos, onde o corpo de manutenção obtém ajuda de especialistas remotos com o uso de diferentes tipos e nível de qualidade dos dispositivos de comunicação em vídeo e áudio.

Outros autores como Cash et.al. (1991), Orr (1990) e Sachs (1995) também observaram o valor da colaboração por meio de tecnologias móveis no diagnóstico e na solução de problemas dos equipamentos tecnológicos complexos.

Kraut et al. (1996) remember that collaborative project system by using mobile computing in repair of equipments in the field and maintenance of mechanical devices, where maintenance group get remote support from specialists with different types and quality level like video and audio communication devices.

Other authors as Cash et.al. (1991), Orr (1990) and Sachs (1995) also observed the value of collaboration through mobile technologies in the diagnosis and solution of problems of technological complex equipments.

A rhetorical and generalized figure in mobility conceptualization in academic and practice, is the perception of “any time, any place ".
In accordance with this point of view, mobility is something always desirable because it became different forms of freedom.

To Voelpel et. ali. (2006), mobility is like a term that refers to the identification, using, expansion and introduction in entire organization resources of the tacit knowledge and innovative capacities inherited and personified in the persons who provide most spread out impact of organizational innovation.

The mobility can be boarded in two dimensions:

1. Real mobility: it is defined as the physical co-location of the persons, principally inside an enterprise, but also the co-location of persons made a list out of the enterprise as clients and business partners.

2. Virtual mobility: it constitutes the second dimension of the mobility, what is defined I eat it virtual co-location of persons through the telecommunication technology; since there is possible the co-location of the relevant parts like persons, of a voice for telephone, the image of a person through videoconference, or of thoughts in the form of letters, or of the documents he was seeing e-mail.
In this way, Kleinrock (1995, 1996), pointed out:

> *" the combination of the portable computation with portable devices of communication is changing our way of thinking on the processing of the information...*

We now recognize what, for the access to the resources of computation and of communications is necessary not only of a " fixed point ", but also in traffic and / or in movement that it constitutes in the access to any hour at any place ".

An important premise in the identification of an enterprise turned to the mobility is the concept of readiness. Readiness to the mobility refers to the potential and availability of the enterprises in adopting the mobile technologies. A low degree of Readiness to the mobility is, so a significant barrier in the process of transition. In the sense of surpassing this barrier, the enterprises must build an appropriate business architecture and a technological infrastructure able to support the mobile current solutions and to accommodate future capacities.

Kakihara and Sorensen (2002) formulated the mobility in terms of aspects: the space mobility, storm mobility and the contextual mobility.

1. Space and storm mobility: the commonest form of conceptualizing the mobility, principally that what shows the physical geographical freedom or a proposal of "nomad city" regarding the life and urbane work of the present (Kleinrock 1995, 1996. Dix et al 2000). Does the space mobility send to questions like " where? ", do the storms mobility lead to the questions of the type " when? ".

Perry et al. (2001) affirm that " the notion of space assumes the rhetoric of ' any place ', the notion of " any moment " very often assumes a linear notion of time, against the 'instant', which is characterized by the social standards and the properties of time that affect the access to the information and in the behavior of the communication.
Then, information technology can influence the form as persons can change his involvements in different contexts of two manners, in according with Urry (2000).
First, change in the involvement can take place because of physical mobility of the persons. This suggests that human mobility being takes place in terms of space and time location generally amplified by modern transport technologies that can appear physically in very different contexts, still in the same day. In the previous societies with less developed transport technologies systems, quick changes in the contexts were considerably more limited.

2. Contextual Mobility is the second form, not less modern and less important, several types of information technologies that enables human beings to stay in an infinity of social context, sometimes simultaneously, without having to be physically in the place, but through e-mail, instant messages, chats, online games, forums of discussion between each others.

According to Rasinghani (2001), Sonera from Finland was the first telecommunications operator to supply wireless technology to allow commercial transactions from his clients.
This introduced a new marketing concept known as mobile commerce (M-commerce). Some authors define m-commerce as any forms of mobile communication with clients.
However, there are other authors who try to associate some form of monetary profit that must be reached.
Leung and Antypas (2001) defined m-Commerce like a " delivery of contents (information and reports in general) and transactions (operations of purchase and sales with information exchange) using mobile devices.
Another term employed by some authors in the M-commerce is “wireless E- commerce “like an extension of business activities with current technological infrastructure including Internet.

Another term associated to M-commerce is mobile information. A mobile Information can be defined as “exchange of informations between an enterprise and client or employees through a wireless communication systems. The transmitted contents can assume form of text, graphics, audio or videos. Monetary profit from mobile informations delivery is not necessarily the core motivation of this service.

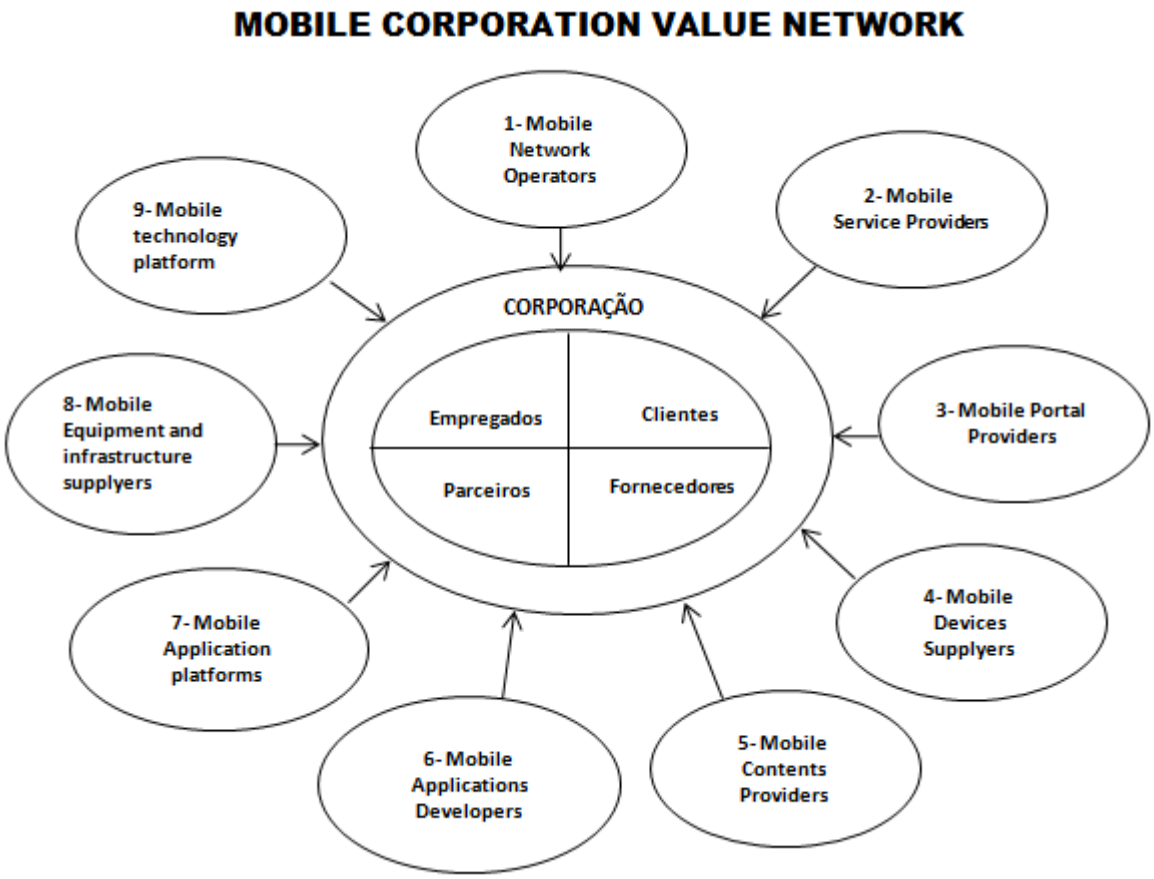
However, Frolick (2004) remembers that mobile information is very often indirectly associate to cost reduction and revenue increase generated through process substitution based on papers improving efficiency and productivity in through customer relationship.

Because of understanding differences between M-commerce and the mobile information, a better base of knowledge should requires to determine type of mobile technology it must be offering to the clients.
A basic question for organizations is to identify amplitude of information into the mobile commerce being offered to employees, stakeholders and other business partners.

Chen and Nath (2003) pointed that M-commerce value is a function of data or transactions that are time sensitive (level of actuality) and degree of users mobility regarding informations. The value of M-commerce increases with increase user mobility and time sensibility with requested or transacted data (see Figure 1). By using time sensitive data or transaction and user mobility in two strategic dimensions, managers can categorize business activities in classes of applications programs according to the potential of contribution and returning as low, middle or high level value on the wireless applications. This approach allows to managers in identifying business processes where wireless applications are sensitive of bringing high value to the enterprise.

Wireless technology adds value to enterprises when it allows to employees access data in real time for taking decision that make possible cost reduction and increase revenues. For example, a seller in the field can access a vast scale of information including customers purchase history and products availability.
If client desired product is not available in the stock, an appropriate alternative might be recommended immediately by reducing risk of dales losing to competitors.

The wireless transaction process speed can reduce error rate when compared with handwritten transactions.
In this way, mobile commerce provides a efficient business process reengineering and to turn more simple increasing labor productivity. The use of mobile devices allows to create more contact points and improve customer services with close relationship through customers with best lead time.



So, the M-commerce offers a valuable channel to improve customers relations as well as a straight direct marketing channel and promotional actions specially in cases in which time factor is critical, according to Jimenez (2002).

Another aspect to stand out in mobile communications use is that corporations can remove copper wire in offices to connect workstations.
The wireless network also contribute to preserve precious metal (copper), which is used in all communications systems and cable network by environmental impact reduction.

In this way, the central objective of the present research is to explore knowledge on mobile technology and infrastructure so that a corporation evolves into the mobility environment.

KEY STEPS FOR THE MOBILITY

The choice of appropriate mobile solution to enterprise requirements applies for a balance between business solution and each costs allied to a right supplier with varied experiences and a products family for success of the project.
The main steps are next for enterprise towards mobility according to IDC:

1. To value the level of readiness of mobile enterprise

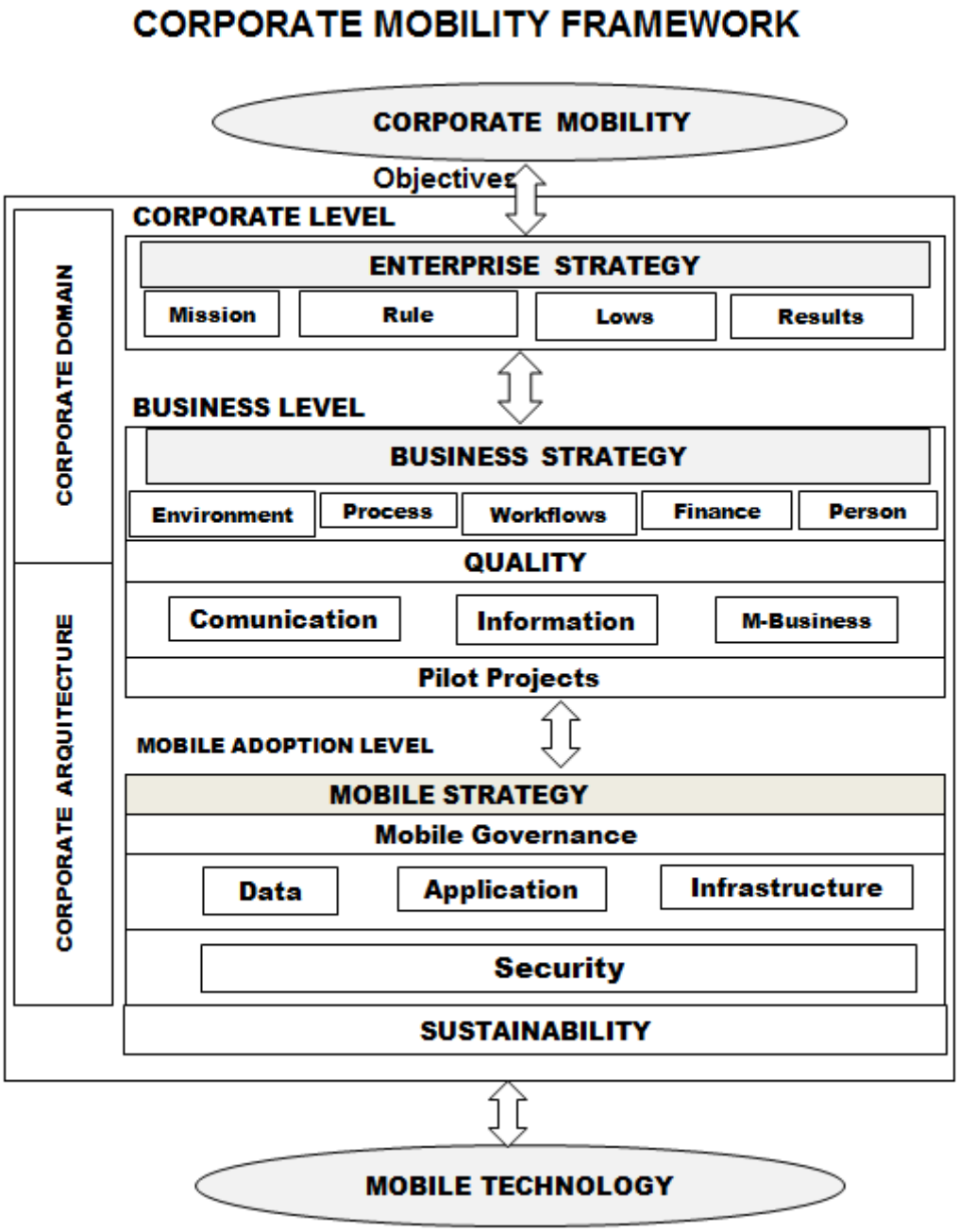
It understands the enterprise readiness to adopt mobile technologies like an important premise as process of adoption, introduction and in it effective use and evaluation.
The organizational readiness is considered as a process of innovation, both in the product and process that is associated to management changes as well as other transformation events.

In the process of enterprise readiness level evaluation of mobile telephony will based on objective criteria of indicators that can be classified in following four areas that are: organizations or enterprises, processes, mobile technology and corporative environment.
Each area demands a deepened analysis what concerns level of maturity of mobile technologies. Among the factors connected with the organization they are the size of the enterprise, management direction to risks, budget availability and general attitude for mobile technologies incorporation (Decanio, et al., 2000).

Other questions as workflow analysis, identification of papers and responsibility are questions made a list to readiness process associated to the capacity of current IT infrastructure to incorporate and support new mobile technologies. These topics can be valued on degree of adherence of the open systems, degree of standardizations, amplitude and flexibility (Parasuraman, 2000).

The environmental variables like marketing demand by adopting new technologies, competitors strategies, level of technological maturity, regulations and legislations and related political factors also impact the level of readiness. An evaluation of mobile level of readiness allows enterprises determine the degree of preparation and potential in adopting and implementing mobile technologies (Decanio, et al, 2000; Ward and Peppard, 2002).

2. Identification of the mobile business processes
Though the potential and conceptual value of mobility is understood because the real uses value of mobile technologies is very difficult to quantify.
The task regarding identification of the areas and appropriate functional processes to mobile technologies is, so, basic to obtain expected benefits (Gribbins, et al. 2003). That is possible through formulation of a process identification frame which it allows to value quantity and quality bases the value of mobile technologies to the business process. A distinct literature model of SI (information systems) includes the theory of task and technology adjusting (Dishaw and Strong, 1999). Similar theories are supplied by HCI (Interaction man-computer) literature, which technology has project turned to attend a specific user needs.



Source: Li (2006), adapted with aothor

3. Understanding mobile technologies users' base

Based on the framework of mobile processes identification, it can show up that not even all enterprise users apply for use mobile technologies.

To identify of several users' types and their corresponding standards of use are, so, important criteria in adoption and implementation process.

The knowledge of the users' base will be going to help the enterprises to develop and to introduce applications programs and mobile services of more efficient and efficient form.

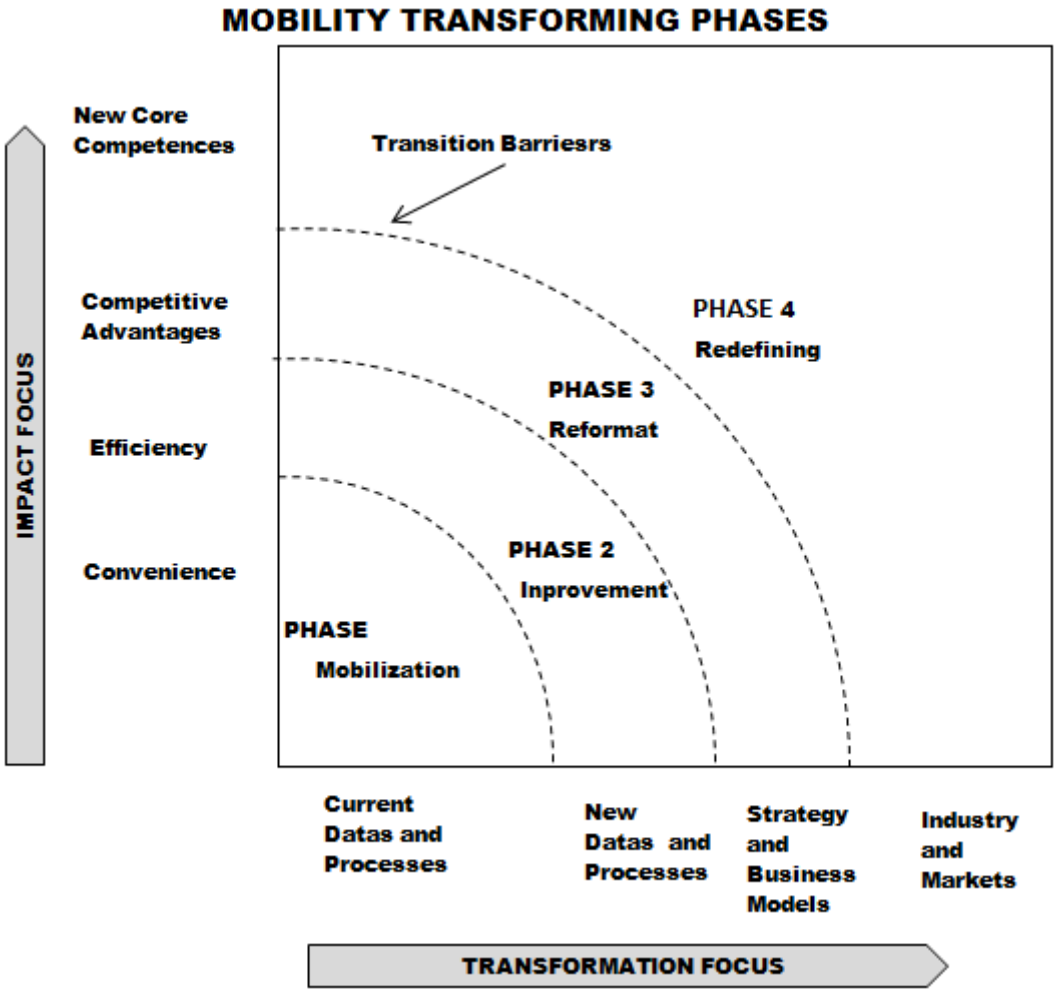
4. Determination of mobile technologies adoption and implementation strategies

All the presented questions must be considered as a part of adoption and implementation of mobile technologies general strategy. However, when these questions were examined as isolated form it is not possible to describe appropriately the complex environment in which adoption and

implementation strategies should be conducted.
The use of simulation techniques will allow to decision makers in visualizing process dynamic and taking more safe decisions on the options and establishment of appropriate directions. The simulation model for mobile technologies adoption and implementation will allow to decision makers a computational tool in valuing previously several sceneries, politics and strategies and in preparation of budget forecast and visualizing necessary investments in such time frame.
The dynamic models also will allow to decision makers' the holistic view of actions and the impacts on desired results as efficiency, effectively and improvement by adopting mobile technologies.

Basole (2005) apresentou um modelo conceitual multi-fase de transformação da mobilidade, integrando a literatura emergente sobre negócios móveis e a transformação empresarial mediante as abordagens das melhores práticas empregadas na indústria. As quatro fases distintas de transformações da mobilidade: a Mobilização, o Melhoramento, a Reformatação, e a Redefinição, conforme a mostrado na Figura a seguir.

Basole (2005) presented a multi-phase conceptual model of mobility transformation, integrating the emergent literature on mobile business and the business transformation by means of the best practices approaches employed in the industry. Four different phases of mobility transformations: Mobilization, Improvement, Remaking and Redefinition in accordance of following figure:



Source: Basole, 2004

The improvements results

The Mobilization phase refers to data gathering processes and available applications for use in mobile devices in the enterprise. In this way, the transformation process begins with data mobility and existing application systems and business processes.

The second phase changes focus from processes mobility and existing application system to improve and create new data, applications programs and mobile business processes, which use functionalities and specific capacities of mobile technologies.

Typically results appear in the aggregate services form, as intense use of mobile applications to final users, new services modality and emerging information flow (Barua, Konana, Whinston and Yin, 2004).
These mobile processes improvements allow to final users to execute their tasks with a higher level of comfort and efficiency (Air2Web, 2004).

In the phase three, mobile solutions begin to re-formulate business models and current strategies. The creation of new innovatory processes and mobile services allow to enterprises an additional source of competitive advantage. In this phase, mobile solutions, very often, become a critical element in the generic business model.

In forth and last phase of process transformation, the enterprise mobile solutions aim to create new core competences. Business Models and strategies are based and managed around the enterprise mobility and for this lead to a market redefinition and industry itself as a whole.

These four phases of mobility transformation model presents levels of maturity in mobile technologies adoption and it impacts on enterprise environment and the business.

Security in the Mobile Transactions

The question of mobile applications security that includes information confidentiality, integrity and availability is one of the principal preoccupations in the enterprises business mobility.
The reason is high vulnerability in the process of communication through wireless network against attack of hackers more than wired networks.
Protection keyword is a basic security of the mobile included in most of the mobile portable devices.
Other forms of security include authentication, cryptography, safe communications, and methods of mobile payment what will be objects of more deepened researches.

SURVEY RESULTS ANALISYS

Information

Mobile applications use multimedia content, which poses three key challenges: content sourcing and presentation, secured content storage, and content “mining. Presenting quality multimedia content- including structured and semi structured data, natural language text, images, audio, and video- often drawn from multiple sources (in different formats) on a small screen with lower demands on computing, storage, and communication resources is a challenge. Furthermore, the presentation might have to be reformatted to suite specific devices with different form factors (UNHELKAR and MURUGESAN, 2010)
.

The storage mechanisms affect access speed and content quality. For example, developers might have to sacrifice quality when displaying video content on a mobile device, but they can still store the content in a high-density format on a database. Data-mirroring strategies enhance redundancy and improve reliability, but the dual storage and related maintenance functions result in additional overhead and slower data access.
To obviate this challenge, mobile applications should pool the data in a centralized database. This streamlines the process flows and architectures and leads to a more consistent way of handling the information.
Developers can use design patterns such as the Observer pattern to model the solution. As client-side storage needs grow in size and sophistication, they should consider creating cache content on the user device itself—opening up opportunities for mobile grids. Furthermore, the mobile application architecture should handle the replication of events on each client device and synchronize event creation or modification on each mobile device.

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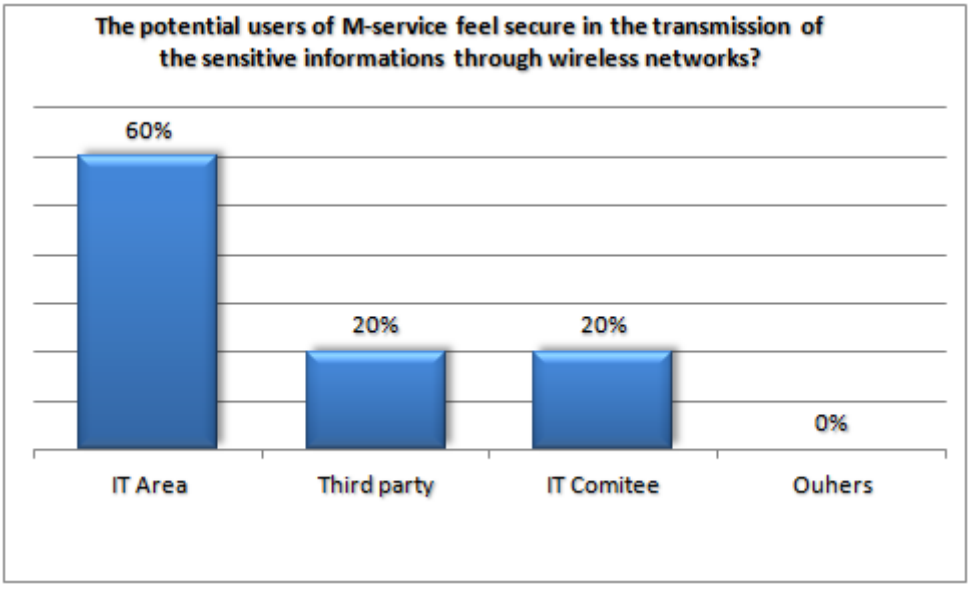
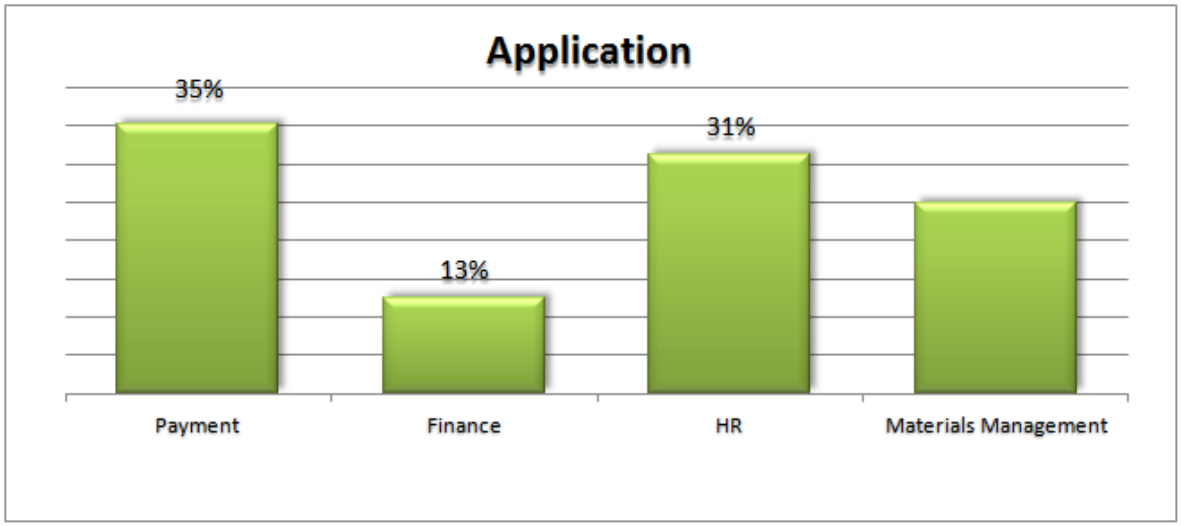
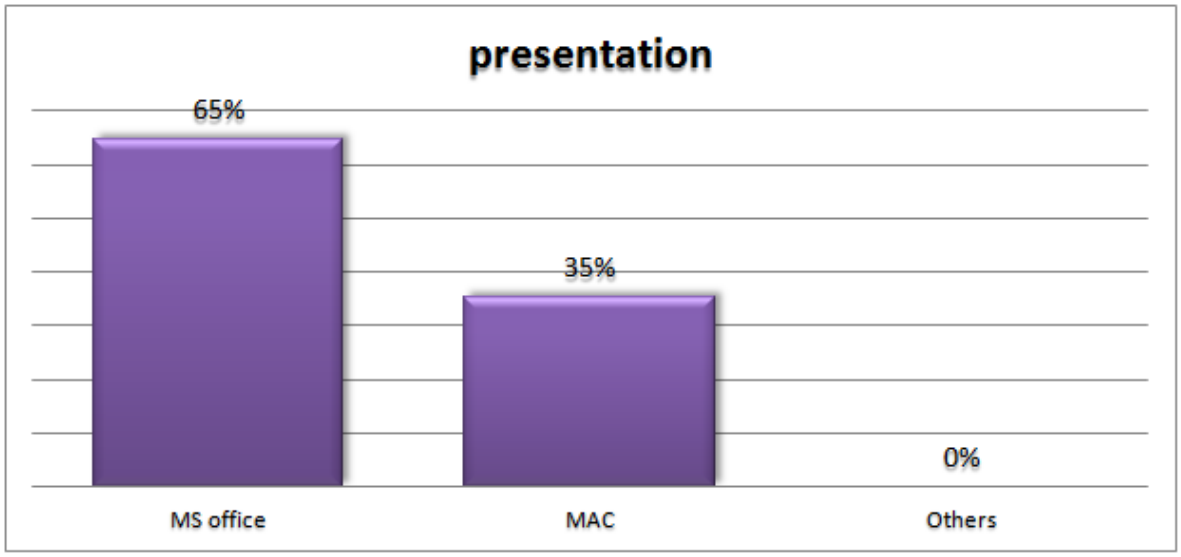


Finally, mobile content management should explore opportunities to provide correlations between business intelligence, integration, and reliability.

Applications
Applications containing the business rules of the enterprise reside in this layer. Modeling mobile processes are a vital element in developing mobile enterprise applications.

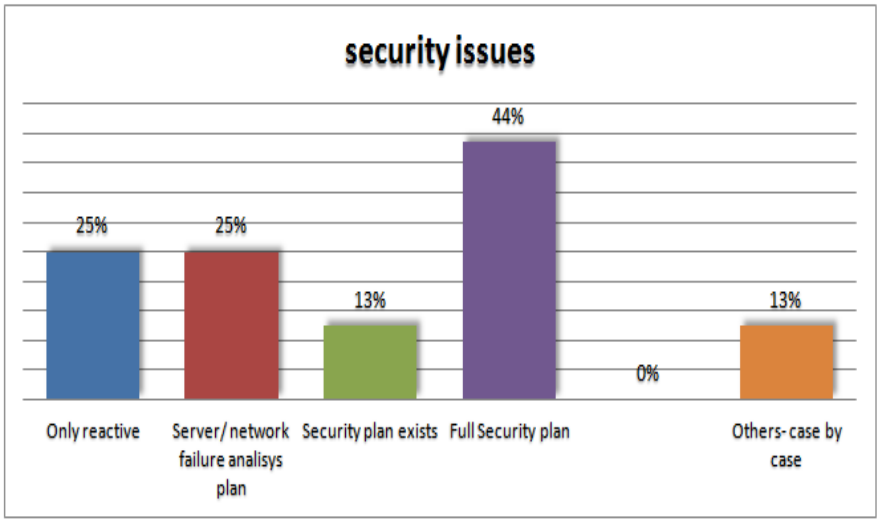


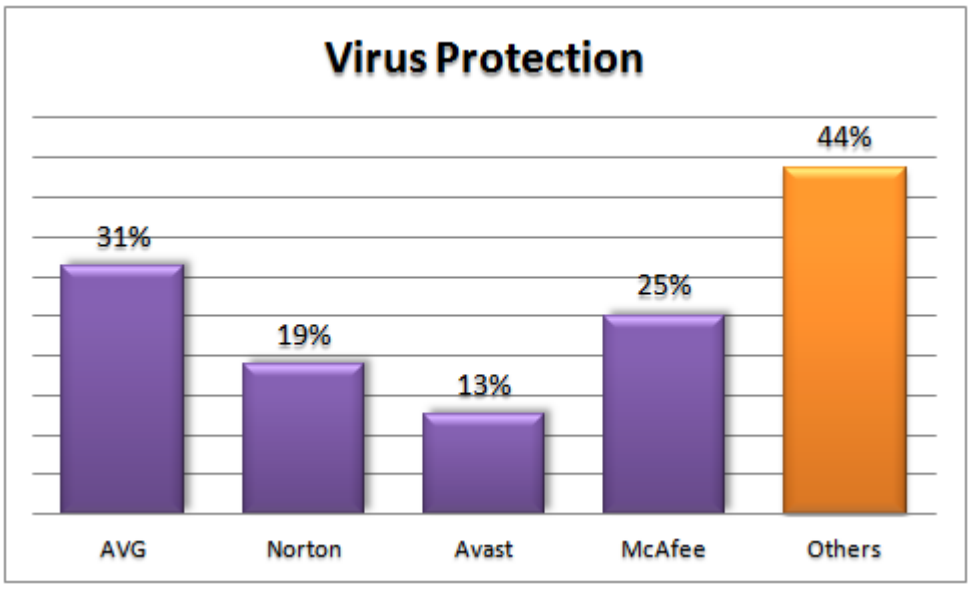
Presentation
Presenting information to users on their mobile devices and providing suitable user interfaces and navigation systems are a vital part of mobile application development. Developers must consider
application deployment on smart mobile phones, iPods, PDAs, and Blackberries.
As highlighted earlier, these wirelessly connected mobile devices are far more “personal” than the corresponding desktop PCs. Therefore, developers should use the presentation layer to consider user profiles and usability and privacy requirements.



Security

Mobile application security, which includes information confidentiality, integrity, and availability, is a key concern in enterprise mobile applications. This is because communication through wireless and mobile networks is more vulnerable to attack than in wired networks.





Conclusion

The consulting organization was less interested in the mobile networks, because it assumed they were a "given." It instead focused on the analytical applications and their m-informative output and usability on mobile device interfaces. The security organization focused on the middleware and application layers.
We hope this discussion, highlighting significant aspects of enterprise mobile application development and presenting our framework, help developers and enterprises realize the full potential of mobile enterprise applications.

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