Information Mobility and Business Transforms

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Abstract— The dynamic growth of Information Technology offers great opportunities for business enhancements. Information mobility is the latest trend in the IT domain which adds value to Enterprises and puts it in a transition. The transitions from a previous state to an improved one, always involve various risks too. It is essential to have a perfect strategic planning and a set of deployment schemes to bring success in this domain. This has to be realized practically within the time and within the budget. Information mobility is one of the key enabling technologies sweeping across the world offering multifaceted business promotion avenues. The mobility technology is expected to transform enterprise patterns and its operations through various modes of liberal coupling of users and a variety of business processes. The enterprise mobility needs to deal with terms like BYOD, CYOD, MDM, M-Security and M-Analytics to ensure a successful implementation leading to expected transformation. There are various direct advantages derivable from it, like real time enterprise data access, improved collaboration as well as employee and customer satisfaction. At the same time it poses several challenges and risks spread over security of implementations, data classification and user rights management. In this paper we discuss the features of Information Management and the challenges posed by them along with a possible risk profile associated with them.

Index Terms—Information Mobility, Enterprise Mobility, BYOD, CYOD, MDM, and M-Security.

I. Introduction

Mobility in general terms is defined as the capability to move. This concept can be applied to information which was previously available mostly statically at desktops. When a static information architecture of an organization gets modified for delivery on mobile platforms and devices, the enterprise mobility is born. The enterprise mobility has various components which can be categorized into direct benefits and its architectural requirements. Among the benefits that enterprise mobility can bring include competitive advantage, real-time enterprise data access, collaboration, increased efficiency and productivity, increased sales potential, employee and customer satisfaction. Information mobility now involves with few new concepts like opting for schemes such as bring your own device (BYOD), choose your own device (CYOD), mobile device management (MDM), mobile security, application integration, Social media integration and analytics.

Enterprise mobility can enhance several functionalities of an organization such as increasing the supply chain collaboration, effective human resource and project management etc. Some of the other areas include productivity management, marketing, logistics, decision making, customer relationship, and sales. The support features of each component are given in Figure 1.

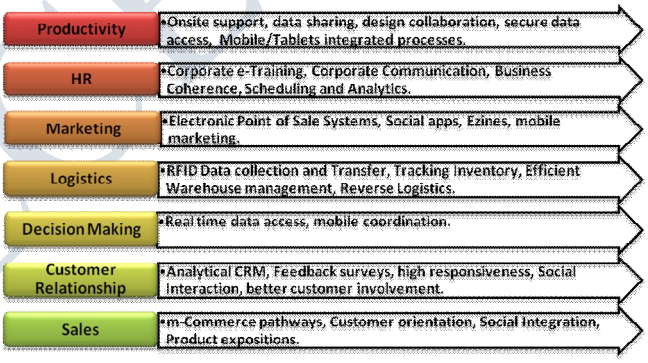


Fig. 1. Enterprise Mobility Support Areas.

Many aspects which were seen with skepticism in the early years of this century have already become part of many organizations. Mobile ICT has overcome the challenges of time and currently promises high integration and offers real time collaboration within and between organizations. It has reached a stage where the decisions are now taken at strategic level and researchers are putting forth suggestions and recommendations for successful adoption and implementation of mobile information management and service. The emergence of Smart Phones or Tablets with their powerful operating systems has been the key driver of enterprise mobility. Lee [1] deduced that the mashups enabled by mobile web widgets have the potential to empower large number of smart phones.

The rest of the paper is organized as follows. A Literature review is provided in Section 2 and the mobility practices are presented in Section 3. Section 4 briefly presents the differences between the BYOD and CYOD concepts and Section 5 discusses about the development process of mobility applications. The key challenges of mobility are then presented

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in Section 6 and the major implementation schemes are discussed in Section 7 followed by conclusions.

II. Literature Excerpts

Basole [2] discussed the adoption of enterprise mobility and classified the benefits of enterprise mobility broadly into efficiency, effectiveness and convenience. Among the types of benefits that organizations can realize from enterprise mobility, Basole [3] also includes strategic benefits along with informational benefits, transactional benefits and enterprise transformation benefits. Although mobile solutions had many potential benefits, its adoption was not as extensive as initially anticipated [4]. However, the growth was significant and it was speculated that within 2008 many enterprises will begin to realize the benefits of transformation and since then it has been growing exponentially. Basole [2] explored the salient factors that lead to an enterprise's decision to adopt mobile solutions through theories of engineering management, enterprise transformation, and information systems literature.

Basole [3] developed a framework that conceptualizes the overall implementation decision that included integrating firm-level theories from the strategic management, information technology adoption, and business transformation perspectives. The article provided important theoretical and managerial insights in adopting mobile ICT and justifying investment of mobile business solutions. The growing use of laptops, handhelds and cell phones carried by mobile workforce has been challenging for the organizations to provide the support services needed by the customers. To overcome the gaps of the mobile network operator business models and to meet support needs, businesses started to develop their capabilities in-house. A study by Loh *et al* [5] concluded that organizations are showing increased willingness to outsource the support services for their mobile workforce. Basole [6] explored the salient value propositions that drive the emergence of the mobile enterprise and attempted to identify categories of workers that can benefit from mobile ICT. The paper also discusses the solutions offered by mobile ICTs that include personal information management, m-ERP, m-CRM, m-SCM, and m-Knowledge Management.

The leading IT companies acknowledge the growth and the need of mobile ICTs in various organizations and are keen on providing best solutions to answer the needs of the current day customers. One of India's leading IT companies, TCS runs journal that addresses the needs of the industry and have dedicated a complete volume for Enterprise mobility [7]. This volume discusses issues of developing strategies for mobility, impact of mobility, major issues related to industries like banking, insurance, manufacturing and retail, and also discusses the future of mobility.

Rodrigues [8] discusses how a cloud computing model and services provide a unique model to simplify the challenges of the traditional enterprise mobility model. The complexities of the mobile enterprise server from a corporate network can be removed by placing it in a cloud infrastructure powered by enterprise cloud mobility platform. Enterprise Mobility has the potential to fundamentally transform enterprises, their business value chains and markets [9]. It is increasingly becoming popular for enterprises to adapt Mobile Device Management (MDM) system to manage their data and related hardware. Rhee [10] proposed security requirements containing the basic criteria that help evaluate the essential security functions required by business organizations and to determine whether these security functions are correctly implemented.

III. Mobility Practices

Mobility Practice is a multilayered concept with its heart as enterprise mobility. This layer is engulfed with the entity layer that includes prominent functional entities of an organization like productivity, responsiveness, availability, knowledge management and communication among others. The second layer comprises of strategy, technology, process management, monitoring and compliance and many process level entities. The outcome of this practice will create a transformation index, facilitate communications, increase availability, and enhance knowledge units and productivity. The organization's resources and processes are now enabled by mobility which will help achieve the strategic goals in the most efficient way in today's IT environment. The multilayered mobility practice is shown in Figure 2.

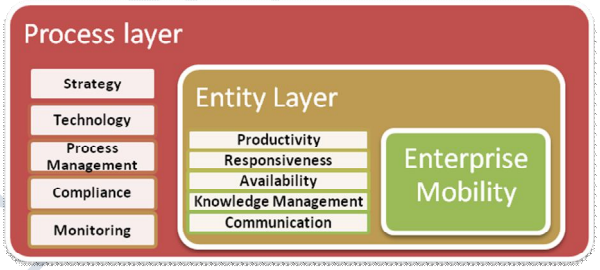


Fig. 2. Multilayer Mobility Practice.

IV. BYOD vs CYOD

Every user has a device preference and many prefer the device they have at home. This has given rise to two new trends namely Bring Your Own Device (BYOD) and Choose Your Own Device (CYOD). BYOD gives the flexibility of having any device, owned by the user to use it anywhere. The users purchase, own and maintain a device found on the open market. They even install apps themselves. The challenges in this trend include data security, experience consistency, support expenses, policy and integration. On the other hand CYOD has a preapproved device, owned by the organization that can be used anywhere. In most cases, the company purchases, owns and maintains the device and the employees are allowed to choose from an approved list in a custom online portal. The challenges include security and scalability. Regardless of the choice between BYOD and CYOD, a successful IT organization must solve the mobility challenge with an integrated solution. The returns can be in the form of quick and efficient interaction, able to access as needed and quick deployment, greater quality measures and monitoring, and more people in collaboration.

V. APPLICATIONS DEVELOPMENT

The applications developed for mobility may have different characteristics than that of a regular application, but the process is not significantly different. In the following discussion a model of application development process is presented which is a generalized version of different ways being provided by developers in the literature. The first step is to determine the requirements in terms of functionality and technological needs giving emphasis to mobility factors. Designing is done in the next stage that covers user interface, wire-framing, prototyping and other related issues which are part of software engineering practices. The third stage involves several components related to usability, security, connectivity, supporting platforms, devices and browsers, performance, etc. It is expected that a wider outlook for portability across known mobile devices need to be ensured when such efforts are put forward in software development processes. Once the application is developed, it needs to be tested for quality and get certified from potential App Stores or proprietary enterprise sharing silos. The final step is deployment which may need support both from users and developers. It also calls for building appropriate architecture suitable for several upgrades in future in order meet the ever-changing business scenarios. The process in explained in Figure 3.

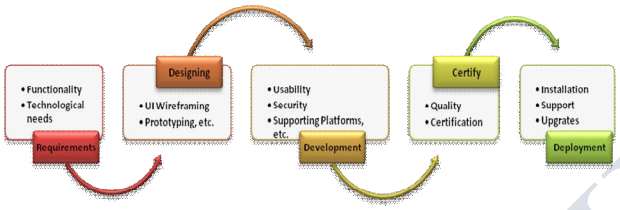


Fig. 3. Mobility Application Development Process.

Mobile Workforce Management Software
Planning & Forecasting
• *Demand Forecasting Software. Safely predict future demand and accurately plan your mobile workforce resources*
• *Mobile Workforce Planning. Minimize same-day risks by allocating resources according to availability*
• *Shift Scheduling. Shifts can be staffed several days, weeks, and even months ahead*
Scheduling
• *Work Order Management Software*. Manage customers, work orders and assets
• *Optimized Mobile Workforce Scheduling Software*. Manage the service delivery process from start to finish and handle unexpected events with ease using our real-time mobile field service software
• *Customer Interaction Management Solutions*. Customers define and control their own service with web self-service
• *Location Based Services*. Estimate travel time accurately to provide reliable appointment windows
Analytics
• *Mobile Business Intelligence. Provides in-depth analysis from current and historical data for immediate corrective and preventative actions*

Courtesy ClickSoftware (http://www.clicksoftware.com/solutions-overview.htm)

Fig. 4. Mobile Enterprise Applications.

There are numerous solution providers in the global market who promise to enhance organizational efficiency through their mobility solutions. To demonstrate the type of solutions available and their functionality a solutions company named ClickSoftware is considered. This company provides a Mobile Workforce Management Software which can assist with major functionalities like planning and forecasting, scheduling and different analytics. Each component has multiple mobility applications as shown in Figure 4. Three examples of applications are chosen namely Mobile Asset Management, Mobile Work Order Completion and Mobile Resource Management along with their features and it is presented in Figure 5.

Mobile Asset Management	Mobile Work Order Completion	Mobile Resource Management
• Asset profile details • Asset documentation • Maintenance & repair history • Inspection reports • Geographic location • Location within the asset hierarchy • Existing orders against the asset	• Closeout work and invoice more quickly • Ensure regulatory compliance • Pre-populate fields with default values • Complete customer and/or regulatory reports while on site • Capture and analyze field workforce metrics in real-time • Achieve greater buy-in and compliance from the field workforce • Print or email receipts and invoices before leaving the job site	• crew creation and allocation • shuffling resources between crews • identifying the skill sets of individual crew members

Courtesy ClickSoftware (http://www.clicksoftware.com/solutions-overview.htm)

Fig. 5. Examples of Mobile Enterprise Applications.

VI. MOBILITY CHALLENGES

The challenge to the traditional division between home life and work life is only one of the barriers that Mobile Information Technology (MIT) requires organizations and individuals to negotiate [11]. Sørensen *et al* [11] highlighted some of the key challenges in the application of mobile ICT to improve organizational efficiency. This is accomplished through comparing and contrasting findings from a selection of 11 empirical studies of enterprise mobility with information technology conducted between 2001 and 2007. Another challenge faced by enterprise mobility is that no single security solution addresses all security threats, and it is imperative to have a multi layered collaboration technique as a recommended solution for providing a comprehensive mobile security infrastructure [12]. Maan [9] presented the key customer challenges in deployment of Social Collaboration applications and Mobility services in enterprises. He further proposed developing composite offerings that can help customers to maximize return on investment (ROI).

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Based on the literature as well as the trends in the markets we classify the challenges broadly into general, technical and adaptability challenges.

A. General Challenges

The General challenges mainly spans operational domain and the business process involvement of the enterprise when the mobile devices start interacting with IT systems specifically intended for static desktops of the past. How and where the interaction takes place is previously known to the service provider system, but under a mobile condition various techniques need to be applied to seek information or automatically collect it from GPS based technology and user based assumptions. It is mandatory to have user guidelines for mobile interactions. Some of the basic challenges are listed below.

- Providing right information, to the right people, at the right time.
- Chances for critical decisions being made without right data, sometimes even if real time access is available.
- Certain amount of customer dissatisfaction may creep in as their needs are not analyzed for better performance.
- How to deal with customer behavior and response analytics over mobility.
- Unclear mobile protection policies and current protection methodologies.
- While the security of the transmission/reception of data is a known challenge, the physical theft also poses a challenge and it cannot be easily controlled.

B. Technical Challenges

The technical challenges mainly deal with the implementation process, safety, security, and information transfer. Some of the major technical problems are listed below.

- Utilization of the existing infrastructure and moderating them to suit mobile access and dissemination of data.
- Tackling the ever changing domain of new devices and operating systems of mobility world.
- Challenges related to inconsistent bandwidth, storage capacity limitations and confined data bases are expected to affect enterprise mobility.

C. Adaptability Challenges

The adaptability challenges mainly arise due the dependency on a variety of information systems, and it can also include system and human adaptability challenges. Some of the major concerns of adaptability are listed below.

- The multiplicity of human cognitive ability can be a challenge in designing human interfaces.
- Dynamic business needs to be organized in a flexible and scalable set of solutions.
- Lack of standardization in the field of devices, OS, browsers, etc, among platform vendors.

VII. Implementation Schemes or Methods

The implementation of mobility based IT system calls for careful strategic planning. The prime importance however goes to safety and security of data and process which are going to be diversified into mobile mode. These operations in an Enterprise environment can be anything as discussed earlier from the fields of Human Resource Management, Sales and Marketing Management, Production Control or Financial processes of any enterprise. It is necessary to have certain policy based approaches for each enterprise to decide which business processes are going to remain in static mode and which are going to be mobilized in to BYOD or CYOD. After having taken such patterns of processes, the requirement analysis has to be executed which calls for meticulous care in capturing the target results. Many organizations, in the recent past, failed to achieve designated target of results because of these gaps existing in translating strategic plan into compatible requirements of the implemented mobility technology. It requires the participation and collaboration of multi-domain team to successfully avoid pit falls of mobility while boosting productivity which could be derived through mobility. The implementation schemes can be dealt with a global view covering net results required for enterprise and a local view covering the operational intricacies and results required from that single operation or set of operations. An appropriate stress need to be given in the system design while the development process starts for mobility implementation. The software development process for mobility can be made interactive by incorporating user experience. This would enable developers to work in an Agile Software Development scenario.

Besides enterprise mobility's apparent benefits, the path is still tough for many organizations to realize its full potential. In 2013 only 40% of the enterprises which enabled mobility could develop strategic position in usage and management. Realizing security and quality simultaneously depends on enterprise, users and infrastructure. It has to be acknowledged that wider service architecture, cloud coupling and better MDM are needed to make every implementation successful in an enterprise scenario.

VIII. Conclusion

It is evident from the past few years that Enterprise mobility is enhancing the corporate business effectiveness. Information Mobility is defining a new work culture where ease of interaction and flexibility of execution are becoming much more feasible. However, safety and security of mobile operations need to be given very specific care while designing and implementing Enterprise systems. The security aspect does not get restricted to software security alone, but it spans over a variety of situations of business where the mobility will be enabled. The information mobility is going to be the key driver for agility in enterprise systems in the coming future.

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