

# Transition of E-Business to M-Business Driven by Wireless Communication

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**Abstract** –due to wide implementation and integration, e-business has established a new paradigm for companies to capitalize on the potential of information & communication technologies mainly operating on the Internet and Web technologies. Current trend and future challenge of e-business is to conduct mobile business and bring the trade and service to where potential customers are located, and goods are produced, consumed, delivered and provided. This article provides an overall review of Mobile Businesses, as a future trend of e-businesses, with emphasis on its supporting mobile technologies and wireless networking. The discussion starts with the concept of mobile business that projects the opportunities, motivations and needs for e-business. Following this discussion, the article studies the current status of mobiles business, key hardware solutions and software business applications available on the market. Furthermore, the article discusses different mobile devices, communication infrastructure, supporting networks and other crucial components that make the businesses mobile and provides the ability to the business to be conducted at anytime and anywhere. Finally, an extended discussion is focused on issues and future developments of m-businesses along with some recommendations, and suggestions regarding mobile business (mBusiness).

**Keywords:** e-business, mobile business, m-business, mBusiness, wireless business, mobile devices, 3G, wireless networks

## 1. OVERVIEW

Increasing implementation and integration of e-business by enterprises has established a new paradigm for businesses to capitalize on the potential of information & communication technologies mainly operating on the Internet and Web technologies (Pankaj, *et al.* 2004). Current trend and future challenge of e-business is to conduct business that is mobile and bring the trade and services to where potential customers are located or goods are produced, consumed, delivered and provided. This paper is

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mainly focused on wireless communication and the web that facilitate e-business and conventional business to become flexible and mobile.

Mobile Business is outcome of the Advanced Communication Age and driving force of the new economy. Therefore the discussion of mBusiness is greatly aligned with the study of underlying information and communication technologies and its impact on the new economy. The increasing pace of innovations in information and communication technologies in recent years has opened a wide spectrum of new opportunities and challenges in the business industry. These opportunities demand dramatic shift towards mobility in almost every aspect of life such as retail, education, entertainment, health care, etc. Rapid developments in wireless communication technologies, mobile devices, high speed transmission mediums and broad bandwidth technology paved the road for transforming human activities towards mobility. The most noticeable impact of these evolving technologies can be seen in businesses that are preparing for another revolutionary change. First businesses have gone through transformation from traditional business to an electronic business (e-business) and now they have to adapt towards mBusiness.

Undoubtedly, for the coming years, mBusiness will remain practice of interest for industry, researchers, enterprise managers and society as a whole. This will be the business style of the 'Age of Communication' inspiring managers and enterprises for serious shift. May be there are enterprises that will experience another era of Business Process Reengineering, or mBusiness Process Engineering (mBPR)!

In order to understand how different sectors could benefit from mBusiness, it is worthwhile to mention some examples and instances where mobility has been successfully making its breakthrough. These different examples are aimed to provide an idea about the breath, depth and diversity of mobility and mobile business:

**Sale and Marketing:** Retail, wholesale, and mass distribution centres use mobile business environment to communicate simultaneously with branches in different locations for all business services (goods delivery, shelves refill, inventory control, warehouse management, transport and logistics).. Mobile devices help to track goods

delivery and movement from anywhere at any point of time. Large businesses such as Wal-Mart are moving towards RFID (radio frequency identification) to pursue a better inventory control. Wal-Mart's initiative to adopt RFID technology requires top 100 suppliers to comply with RFID requirements that will create complete automatic mobile environment in dealing with millions of boxes to be daily tracked, recorded and entered into the system.

**Health care:** Hospitals in general and modern medical practices in particular are adapting towards mobile health care delivery. Computer-based Patient Record, also referred to as Electronic Medical Record, is a system that provides mobile working environment for physicians, staff and managers of medical practices. Each physician carries a handheld computer to access patients records, digital diagnostic images (X-rays, magnetic resonance imaging scans, ultrasound images, computerized tomography scans, digital subtraction angiography images, positron emission tomography scans), and digital surgery videos. Furthermore physicians can share and discuss digital diagnostic images and digital video clips with specialists from other hospitals across the continent, coordinate remote operations, etc. Physicians could use their handheld computer remotely to obtain information on a particular drug (side effects, drug interactions, drug information, etc.) prior to issuing a prescription. Mobile facilities can dramatically increase productivity and quality of health care services.

**Education:** Educational institutions implemented wireless networking environment to provide students with the flexibility to access campus resources and download academic applications at their convenient time and desired location (lab, classroom, library, cafeteria, campus garden or while watching campus games). Not being tight to the lab hours and classrooms, students are given more flexibility and opportunity to pursue their education, which in turn increases quality of education. So, campuses are going mobile within the campus area.

These three small examples illustrate different ranges of mobility within a building, within an enterprise, within a town used for a wide range of activities. These examples help analysts in extracting some important characteristics of mBusiness including range of functionality and types of mobile devices (wireless laptops, tablet PCs, smart phones, etc.). According to some authors, application of mBusiness can be distinguished as 'macro' applications in outdoor settings or 'micro' applications in indoor environments such as hospitals, libraries, hypermarkets, etc. Likewise the underlying wireless networks that support the application of mBusiness can be distinguished by its span as a local, regional or global mBusiness.

With this brief introduction, this section is concluded and the rest of the article will discuss different aspects of mBusiness, its technological components and elaborate on various facets of mBusiness.

## 2. OBJECTIVE OF M-BUSINESS

In general, the main concept of mBusiness is about moving enterprise's critical business to the point of sale and service or even closer, to the point of consumers.

Like its predecessor (electronic business), the concept of mobile business has been used to a wide range of application areas comprising from communication to consumer transactions and corporate services (Vos & de Klein, 2002). However, the real potential of mBusiness is much broader than merely providing service, for sale and delivery of products. A well engineered, designed and integrated mBusiness can support not only conducting business but also adds collaboration, coordination, instant communication and management features to the business. Being based on most advanced information and communication technologies, mBusiness aims to be more productive than a traditional business or a business that is supported by network of computers

Evolving from mainframe and wired network eras, mBusiness is the leading edge of the new generation (3G or third generation) of wireless networking that aims to adapt the best business and management practices, standards and styles.

### 2.1. M-Business Drives

The m-commerce revolution has already begun (Dholakia and Rask, 2004). The driving source behind the mBusiness can be sought from two different perspectives: from the business perspective the main motivations that pushes e-business towards mBusiness are competition for flexibility in conducting business, extending functionality and service to the business point, convenience of employees and comfort of consumers, better satisfaction, quality improvements, personalization and localization of business. In addition to aforementioned benefits in the core of the driving forces that pushes businesses toward mBusiness is revenue increase and market gain.

From the technological perspective the revolutionary progress in wireless networking, information technologies and mobile devices with high-speed wireless communication has provided new infrastructure for business that resulted in more mobility.

### 2.2. Definition of M-Business

Mobile business is the business of future which is based on wireless infrastructure, using mobile devices that could bring critical business to the point of service and sale, with the aim of higher

productivity in wide economic sense. Depending on a focal point and perspective, mBusiness can be defined in quite different ways.

Mobile Business study and application attracted attention of many outstanding authors, scholars and researchers (e.g., Deitel *et al.*, 2001, 2003; Vos and Klein, 2002; Paavilainen, 2002; and others). In the abundance of available definitions used by different authors, it is quite challenging to find a unique definition, however the definition given by (Kalakota & Robinson, 2001) could be cited here as an example: mBusiness is “the application infrastructure required to maintain business relationships and sell information, services, and commodities by means of the mobile devices”. This is one of definitions that characterizes mBusiness. Different definitions are given from different perspectives. However, regardless of definition perspective, what is generic about mBusiness is that mBusiness encompasses three essential components: Wireless networking technology (3G Networks, WLAN, WWAN), mobile devices and improved business practices (procedures). The last component is a key component of mBusiness. If the first two are facilitators, the third one is the main objective of mBusiness.

### 3. CURRENT STATE OF M-BUSINESS

Although application of mBusiness started not too long ago, this opportunity very quickly attracted enterprise managers, industry leaders, researchers and authors. Today a number of periodicals are adapted or founded on mBusiness, numerous monographs are published (e.g., Paavilainen, 2002; Vos and Klein, 2002; Kalakota and Kurchina, 2004; Sadeh, 2002), annual conferences such as ICMB (International Conference Mobile Business), and a wealth of internet based resources reporting studies, results, examples and models of mBusiness. In addition, tens of IT and business consulting companies refocused their activity from electronic commerce and electronic business towards mBusiness.

Studying the overwhelming opportunities and increasing demands in mBusiness, Kalakota (2005) in his work “Mobile Business: Vision to Value” emphasizes how rapidly the emerging technologies change the way enterprises conduct their business and how dramatically mBusiness is replacing traditional business and e-business. As a result of these changes, the author states, that the question of “Should I do mobile business?” shifted to “How can mobile create business value?”

Enterprises and business worldwide are implementing mobile business solutions to accelerate their business cycles, increase their productivity, reduce the operating costs and extend their enterprise infrastructure.

The need for going mobile turned into serious competition between leading companies that provide wireless infrastructure, application

solutions and mobile devices for mBusiness. Today, the following market leaders are among the top providers of applications and wireless networking infrastructure for mobile businesses.

**On the software market**, SAP as the world's largest inter-enterprise software company took a pioneering initiative in providing software packages for different types of mBusiness that is listed below. In getting leading position in mobile business solutions, Microsoft is adding mBusiness features to Windows.

**On the wireless market**, Cingular and Verizon are pioneering in providing modern wireless networking services by introducing and expanding 3G networks in major cities and metropolitans (Segan, 2005).

**On the mobile devices market**, Siemens ([www.siemens.com](http://www.siemens.com)), Nokia and other leading providers are introducing mobile technologies that significantly boost competitiveness of businesses.

SAP mobile business solution set includes ready-made applications that provide access to the corporate information and processes anytime, anywhere allowing use of a variety of mobile devices. Among various software packages, SAP provides mobile business applications (SAP, 2005):

**SAP Mobile Time and Travel** – this package gives mobile workers access to time sheet and travel management functionality.

**SAP Mobile Sales** – this package provides a solution for salespeople who need to perform their tasks quickly and productively.

**SAP Mobile Service** – this package enables field service engineers to react quickly to customer needs.

**SAP Mobile Asset Management** – this package allows in-house service engineers to access relevant business processes anywhere, anytime.

**SAP Mobile Procurement** – this package enables mobile workers to manage the entire procurement process, from price comparison to ordering.

### 4. M-BUSINESS FRAMEWORK

As Pelkonen and Dholakia (2004) states, mBusiness is a complex network of business relationships comprising telecommunications service providers, manufacturers of mobile devices and various third-party value-adding companies. For more accurate understanding of the mBusiness framework, one may think of mBusiness as a two-level framework (as shown in figure 1), where the upper level is the business level (processes, procedures, standards) and the bottom level is the IT infrastructure (hardware and software) that supports business to carry out its mission and tasks and sets business in motion.

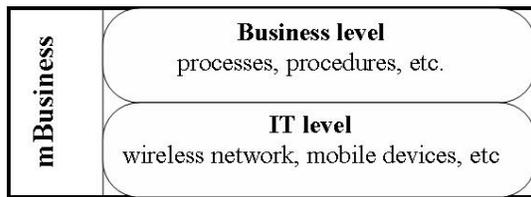


Figure 1. mBusiness IT infrastructure

From a high level perspective, one can consider that the business level is a variable and the IT level is relatively constant. Business level is variable, because it represents different types of businesses, whereas the IT infrastructure, in its general functionality, will remain the same for most types of mBusiness but differ in constituent details or nuts and bolts (range, size, structure, configuration, potential, complexity etc).

IT infrastructure of mBusiness includes hardware (wireless networks and mobile devices) and software (mobile business, office and enterprise applications). The hardware or mobile devices and wireless networks will be discussed further in subsequent sections.

#### 4.1. Mobile devices

One of the main characteristics of mobile devices used in eBusiness is the communication or networking facility and capacity to receive, transmit and process different types of data (text, audio, video) at high rate. In addition to high speed data exchange, ease of handling, portability and size are important in these devices. Furthermore, these devices must be able to download essential business, office and enterprise applications and have sufficient memory to run them.

Currently devices used in mBusiness are wireless handheld computers, laptops, PDAs, tablet PCs, smart phones, Blackberry, etc. These devices should be capable to run high-performance business, office and enterprise applications such as multi-media, full-motion video, wireless teleconferencing and use connection over wireless networks using Wi-Fi, GPRS, Bluetooth or other advanced connections. For a better idea and distinction between ordinary mobile devices and business quality devices and better idea about business quality mobile devices, one could look at the features provided with Nokia 9500 that have a full set of critical business tools, full keyboard, with a large memory capacity and versatile network connections (Nokia, 2005):

Browse the Internet in rich full color, on a wide, easy-to-read screen. Work with office documents - not just email and memos, but presentations and databases too. Get them from your corporate network via Wireless LAN or EDGE for fast mobile access. Keep your Personal Information Management data in sync and up-to-date calendar and contacts - with PC Suite and SyncML, you can easily exchange data between

your Nokia 9500 Communicator and a compatible PC.

#### 4.2. Wireless Networks

Although not in mass application yet, but in the future mBusiness will be operating on third generation wireless networks, 3G, that provide high speed download and upload rate. The speed of transmission in these networks using mobile devices is at the level of DSL connections. Because data costs on 3G networks are lower than on traditional networks (Solheim, 2005) more and more enterprises will shift into using 3G networks as main infrastructure.

Currently, mBusinesses are based on different types of networking technology:

Personal area network using Bluetooth technology that enables short-range device-to-device wireless connections within a small space (office, a desktop, a personal space).

Wireless local area networks using Wi-Fi technology, based on IEEE 802.20, 802.11 standards, which supports a wireless connection to a network from inside a home or from a hotspot in a building, campus, or airport.

Wireless metropolitan area networks using WiMax, based on IEEE 802.16 standard, will enable any remote worker to make a wireless connection anywhere in a range up to 50 kilometers.

Wireless wide area networks or 3G networks provide the highest available bandwidth for mobile devices. Although, theoretical rate of transmission is 2Mb, but for practical purposes the transmission speed is like DSL which enables users to download text, audio, video, web contents, and send or receive e-mail while in motion.

4G technologies promise to integrate different modes of wireless communications – from indoor networks such as wireless LANs and Bluetooth, to cellular signals, to radio and TV broadcasting, to satellite communications.

### 5. ISSUES OF M-BUSINESS

In the previous sections we discussed advantages and benefits of mBusiness, however, enterprise managers and business owners ought to be aware of issues and challenges before undertaking the transformation initiative.

It would not be less than an illusion, if consider transition from traditional or eBusiness to mBusiness as just shifting from wired environment to wireless communication and networking. The transformation into mobile business is not just about moving from wired environment to wireless, from desktops to handheld computers or from office to field. Also the challenge of adapting mBusiness is not only about acquisition and implementation of best wireless technology or awareness of emerging mobile technology, but it is rather a multi-

dimensional issue where technology is only one facet of it. Challenges that may require more profound study are transformation of the business and enterprise, shift in the mind-set (e.g. using mBusiness as a different way of doing business rather than considering mBusiness as an implementation of best business practices), improved procedures, higher quality, etc. Feeny (Feeny, 2001) suggests rethinking business processes, models, customer relationship and the whole supply chain in pursuit of highest productivity and customer satisfaction, should be part of taking advantage of e-opportunities. Thus, the challenge of going mobile is much complicated than application and implementation of mobile technology.

Different sectors of business may have their own features and attributes, however some of the common issues for enterprises to carefully study while embarking on competing for faster implementation of mBusiness are:

**From business's perspective:**

How well mBusiness opportunities are studied?  
How much Business Process Reengineering, ERP system changes, customer relationship management is required to go mobile?

What they expect from mBusiness, direct profit or quality of service? How qualitative values can be turned into quantitative values?

How much patience they have before harvesting first fruits of benefit?

Mobile business should not be considered as an immediate way for profits.

Are the employee ready and trained to go mobile, or they will resist against?

**From technology perspective:**

What will happen with existing IT infrastructure?

How carefully the problems of interfacing, integration and legacy systems are studied?

While going mobile, an important challenge is security of mBusiness, is this issue studied?

How well the connectivity and management of mobile devices, security and updates issues are studied?

**From consumer's perspective:**

What is the impact of mBusiness on consumers?  
Is the transition for consumers straightforward or painful?

**Transition cost:** Wither to mobilize few employees or the whole enterprise. How much will it cost for an enterprise with tens of thousand employees?

What is the price and benefit of a mobile employee (mEmployee)?

For each of the mentioned categories, list of such questions can be much longer than shown here. These are just some of the issues not including public, political and legislatives related issues.

## 6. CONCLUSION

This article provided a brief overview of mBusiness, opportunities that mBusiness opens

and challenges accompanying these opportunities.

The article also discussed mBusiness in connection to its underlying technology. In this part different technological components of mBusiness were introduced and discussed. Along with technology, the article provided brief information about some mBusiness software solutions.

### 6.1. Future of M-Business

With the arrival of 3G wireless networks on market and development of powerful mobile devices, shift in the business and the needs for more ubiquity, in few years you will be: participating in and watching TV quality business meeting of your corporation on your laptop while in the air (flying back home); coordinating and managing your business while enjoying on the beach; evaluating and managing a project and assigning new tasks while interacting with nature; able to process loan applications while on the road; conducting other serious business activities on the streets and fields. What is most amazing, neither your manager, nor employees or colleagues will realize that all these times you were miles away from your office, because mBusiness will provide you with facilities like being all the time at your office.

In short, you will be carrying your office or enterprise in your briefcase because you will be doing mBusiness. Your office and business will be residing at your fingertips, without being at your office. If all the business services could be managed from the comfort of home or anywhere else then the need to maintain big office buildings will also become questionable. All these changes will be available in the near future because mBusiness is the business of future, but at the present time, there are more than enough challenges and issues in order to adapt and transform traditional way of doing business to mBusiness. We will see how mBusiness can increase the productivity and comfort to the employees, employers and consumers in coming years.

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