

E-Commerce and M-Commerce Revolution: Perspectives, Problems and Prospects

Over the last few centuries, human beings have experienced two major revolutions—the industrial revolution and the electronic revolution. The former transformed our society from

Internet technologies and advanced cryptographic techniques has led to the growth of e-commerce. Once the Internet was opened to commercial activity, this worldwide network became the major carrier

India) in March-April 2005, the “total value of e-commerce activities within India crossed Rs 570 cr during 2004-05, and is expected to increase to Rs 1180 crore in 2005-06. Further, the report estimates growth in excess of 300 percent during the next couple of years and says Rs 2,300 cr (or \$229 million) worth of e-business will be conducted within the country by the year 2006-07” (see Box-1). Kiran Karnik, head of the National Association of Software and Service Companies (NASSCOM) points out “Though it is at a nascent stage right now, there is a huge prospect for e-commerce in the country.” The rapid development of e-commerce is forcing companies today to adopt business strategies revolving around the Internet. The report reflects the changing face of business trends in India.



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Electronic commerce, combined with mobile commerce, is likely to become a major business phenomenon across the globe in the near future. India is currently in the midst of an e-commerce and m-commerce revolution. The Internet has enabled manufacturers, retailers, wholesalers and suppliers to communicate and transact their business better, faster and cheaper in a wide-range of markets. It has empowered the consumers by giving them access at anytime and a wider choice of products and services than before. Undoubtedly, both e-commerce and m-commerce are at a nascent stage in India but these have huge growth prospects in the country. The Information Technology Act, 2000 makes e-commerce, online transactions, and digital signatures legally binding in India. This article probes into various aspects of this revolution.

being agricultural based to industrial based, whereas the latter transformed our society from being mechanical based to electronic based. Turban (et al., 2000) observes: “As we enter the 21st century, we are seeing the beginning of a new revolution, namely the network revolution. It interconnects different parts of the world, enabling the seamless flow of information. The Internet is the engine of this revolution and electronic commerce (e-commerce) is its fuel.” The idea of conducting business transactions via electronic media, rather than face-to-face, has been an integral part of many businesses for several decades. However, the term “electronic commerce” has entered the public consciousness only recently.

The advent of the latest

of business-to-business (B2B) electronic data interchange. The relationship between the Internet and commerce has passed its nascence. According

Box-1

Year	2002-03	2003-04	2004-05	2005-06	2005-06
B2C – Rs crore	130	255	Rs 570	1180 crore	Rs 2300
% Growth		96 %	124 %	107 %	95 %

Year	2003-04	2004-05	2005-06
Average No. of Transaction per month	207,000	440,000	795,000
% Growth	-	112 %	80 %
Average Transaction Value	-	Rs 1080	Rs 1100

Source: IOAI, “The Power Shopper: E-Commerce Sector Report, 2005.”

to a survey conducted by the Internet & Mobile Association of India (formerly, Internet & Online Association of

People are using the Internet in myriad ways: for e-mail, to pay their bills, for news, for entertainment, to find mar-

riage partners and jobs, and increasingly for shopping. The middle class in India is taking giant strides forward, with money in their pockets and an increasing propensity to consume. Online shopping has begun to catch their fancy, since it not only offers the convenience of buying from home, but also provides a wide array of choices and even lower prices. The categories that were favoured by early adopters have become staples of the Business to Consumer (B2C) environment. Products and services usually bought online include: books, electronic gadgets, railway and airline tickets, apparel and apparel accessories, gifts, computers and peripherals, music and movies. The most interesting trend in B2C e-commerce is that the travel industry (including hotel booking) has emerged as the fastest-growing category. IDC, for example, expects the travel space to grow at 140 percent to reach Rs. 1,430 crore by 2006. Some of the Indian e-commerce sites include ebay.com, rediff.com, indiatimes.com, fabmart.com, fabmall (India), sify.com, and so on. Juxt consult says the motivation for Indian users to make purchases online varies (viz., saves time, convenience of shopping, home delivery, etc.), but users fear of compromised personal information (viz., misuse of credit card) is still a great risk when it comes to e-commerce.

Although reliable statistics on the amount of e-commerce conducted globally can be hard to come by, Forrester Research estimates that by 2004-05, worldwide sales of goods and services conducted online will total U.S. \$8.1 trillion, with North America, Asia Pacific, and Western Europe being the leading players (see Table-1). However, the value

of US online sales was \$95.7 billion in 2003, which is likely to jump to \$229 billions by the year 2008. By 2008, 10 percent of US sales will be executed online and over 63 million households will shop online in 2008.

The mobile phone, in fact, is the fastest growing commu-

nication medium in India. In just a few years, mobile connectivity has outstripped landline connectivity and promises to keep up the pace of growth. The IOAI and the COAI estimates that there are over 25 million Internet users and 37 million mobile users. This number is set to grow to 100 million Internet users and 110 million mobile users by 2007, respectively. India had one of the world's lowest levels of basic telephone penetration (or tele-density) in 2004 with just 4.3 main lines per 100 population. While urban India has raced ahead with a tele-density of 15.2 per 100 populations up from 10.4 two years ago, penetration in rural India lags behind at just 1.49, according to the Ministry of Communications and IT. Mobile phone use is, however, growing rapidly (overall about 20 per cent population covered by mobile signal) and cellular service subscriptions (52.21 million) have now surpassed those of fixed line (45.91 million) in 2005. The medium is literally in the hands of the consumer: wherever they go, the medium

follows. Mobile phones make possible focused, undistracted, one-to-one communication levels between a brand and the consumer. However, there are other compelling arguments in favour of the medium: it allows for permission-based marketing; is characterised by high-response rates; the

Table-1: Forrester's Global E-Commerce Revenues for 2004-05

Region	Total (US Dollar)
North America	3.5 trillion
Asia-Pacific	1.6 trillion
Western Europe	1.5 trillion
Latin America	81.8 billion
Rest of World	68.6 billion
Total	8.1 trillion

performance is measurable (like the Internet); and has a low-cost-per-contact. It is no wonder that mobile advertising has worked wonders for a host of industries in India like travel, entertainment, government, retail, automotive, financial services, and technology. One of the major marketing vehicles on the mobile medium is "short messaging service (SMS)". Users can access many of the content and premium services provided over the mobile phone by sending an SMS to a four-digit number. This four-digit number is called a 'short-code' and is a gateway to a world of contests, promotions and premium content. Nowadays, it is widely agreed and thus, reinforces the stance that 'Internet' and 'mobile' marketing should be reinforced (along with traditionalist media), and both "electronic" and "mobile" strategies should be incorporated as an integral part of an "integrated marketing mix."

Undoubtedly, e-commerce in the future, combined with m-commerce, is likely to become one of the major players

Online shopping has begun to catch the fancy of the Indian middle class, since it not only offers the convenience of buying from home, but also provides a wide array of choices and even lower prices.

Realising the advantages to be gained from both e-commerce and m-commerce, many major companies have begun to offer m-commerce options for their customers, in addition to the e-commerce they already provide.

in commerce across the globe. M-commerce is an effective and convenient way to deliver e-commerce to consumers from anywhere and at anytime. Several technological developments will make e-commerce more popular than what it is today. The most important one is m-commerce: on-line commerce executed from wireless devices, such as, cellular phones and Personal Digital Assistants (also known as handheld computers). However, the 'e' in e-commerce will probably disappear in the future. The novelty of e-commerce (and it is still a novelty for billion of people) will gradually wear off as it becomes commonplace. You will continue to see significant changes in both B2C and B2B commerce. Apparently, m-commerce is already more popular in Europe than in North America, and the disparity is expected to grow.

In just over a decade, mobile phones in India have gone from an 'expensive' accessory to a 'ubiquitous' necessity. In fact, so popular have they become today that there are more subscribers for mobile phones than landlines. Even as the user base has grown dramatically, mobile phone handsets have evolved into "mini-entertainment" consoles. Service providers have risen to the task by providing a variety of interactive content and services. Realising the advantages to be gained from m-commerce, many major companies have begun to offer m-commerce options for their customers in addition to the e-commerce they already provide.

What is e-commerce?

Electronic commerce (or, e-commerce, as it is popularly called) is not a new phenomenon. It has been around for at least three decades. The forerunners of today's Inter-

net-based e-commerce were "electronic fund transfer and electronic data interchange" by Banks. This may be regarded as the earliest use of commerce executed by means of electronic data transferred through communication lines. The reason, e-commerce became so visible in the second half of the 1990s was the commercial aspect of the Internet. Once the Internet was opened to commercial activity, this worldwide network became the major carrier of B2B electronic data interchange. With the advent of Internet technologies and advanced cryptographic techniques, it is now feasible to implement e-commerce over a public network—the Internet. The development of the World Wide Web greatly accelerates the development of e-commerce and expands its scope to cover different types of applications.

"Generally speaking, e-commerce is about the sale and purchase of goods or services by electronic means, particularly over the Internet," observes Henry Chan. There are three main components to the definition of electronic commerce—(a) Economic activity is involved, (b) Interaction occurs electronically, and (c) The interaction typically crosses organisational boundaries.

Professor David Whiteley defines e-commerce as: "A general concept covering any form of business transaction or information exchange executed using information and communication technologies." E-commerce takes place between companies, between companies and their customers, or between companies and public administrations. It includes electronic trading of goods, services and electronic material. E-commerce systems include commercial transactions on the Internet but their

scope is much wider than this. We can classify e-commerce by application type into the three broad categories, namely, (a) Electronic Markets, (b) Electronic Data Interchange (EDI), and (c) Internet Commerce.

E-commerce Revolution

The e-commerce is changing economy and affecting all aspects of business globally. Today, no company can afford to ignore e-commerce. It is even predicted that e-commerce will become part of the 'core' business functions just like accounting, marketing, etc.

India is currently in the midst of an e-commerce and m-commerce revolution. The arrival of the Internet, followed by the escalating growth of Web-based businesses is leading to e-commerce both on the B2B and the B2C sides. The e-commerce trends in India are in perfect accordance with the sweeping changes taking place in the global markets. Even the government has taken significant strides to ensure that the economic climate is ripe for e-business. As per a Nasscom-McKinsey study, "India has the potential to earn revenues worth US \$100 billion by 2008 from e-business solutions (both domestic and export markets put together)." The projections of revenues from Internet and e-commerce related software and services exports were 1,200, 1,800, 2,300, and 3,000 million US Dollars during 2000-01, 2001-02, 2002-03 and 2003-04, respectively.

Internet-based e-business is only in its infancy in India. As organisations become more adept at e-commerce, and as consumers become more used to conducting commerce over the Internet, e-business will continue to grow rapidly. E-

business can help organisations extend their operations and reach markets across the world. Mr. Mahendra Swarup, Vice-Chairman, IOAI, amply observes: “This business module is cost effective, easily accessible and profitable in many functional areas. Consumers and retailers both desire a safe, simple and comprehensive online shopping experience that will truly realise the range of power of the Internet. From a business perspective, it offers unlimited shelf space, it is not bound by operational timings and geographical boundaries, and an opportunity to cater to country-wide city markets (for consumers and suppliers alike) at a comparative minuscule cost to an audience all set to grow to a 100 million by 2007. For consumers, shopping online means speed, convenience, savings, information and variety. From a consumers perspective, it allows greater access (hence, the high response rate by tier-two cities) to markets and an opportunity to make informed decisions on purchases.” For retailers, the Internet offers bigger markets and reduced infrastructure costs, which they can pass on to the consumer. The online business is very different from the offline one; we firmly believe that the potential of the medium is still not used to the fullest. However, there are a number of challenges to global e-business, including the complexity of taxation, differences in privacy and product laws, cultural and language differences, and differences in e-business readiness. However, we feel that there are some technologies and e-business applications that are likely to help shape this future. Currently, we are only seeing the tip of the e-business iceberg.

The Asian e-commerce

market is not a single market, but rather a collection of economies at markedly different stages of maturity. Japan is the biggest market in the region with sales of \$38.4 billion last year, making it roughly one-third the size of the US market. Second is South Korea with sales of \$6.3 billion, followed by China and Taiwan tied by third, each with about \$1.1 billion in sales. While Canada has the essential underpinnings of a strong e-commerce society, online purchasing remains minuscule. Canada is a country one-ninth the size of the US; yet in 2005 Canadian consumers will spend only \$4.6 billion online—less than one-thirtieth the amount spent by US consumers.

The UK economy is the bright spot among the large Western European economies, reflected in retail e-commerce sales growth worth \$26.4 billion in 2004, up from 32 percent over 2003, compared to 25 percent growth for US e-commerce in the same period. Germany is a different story. Domestic consumption has been sluggish. Still, taken together, the UK and Germany accounted for 61 percent of total online retail sales in Western Europe last year. Online purchasing in France surged by some 50 percent in 2004, but the French, like the Spanish and Italians to the south, seems less enthusiastic about online commerce than some other Europeans. Nevertheless, during the 2004–2008 period, eMarketer estimates that US retail e-commerce sales will grow by 18.5 percent, compared to 41 percent for the U.K., Germany, France, Italy and Spain combined—which makes Europe an attractive opportunity for US online merchants.

Many believe that a fundamental shift is taking place in the way global business is conducted. Put simply, businesses are using information and computer technologies (ICT) to make their operations more efficient and more effective. On the surface, this is nothing new. Businesses have been automating through the use of ICT for forty years. Recently, however, more and more organisations are not only using ICT to improve their internal operations but are also changing the way they deal with customers and suppliers. This is the real revolution!. The ICT, when effectively applied, can drastically reduce transaction costs, which leads to better overall efficiency in the economy. These lower transaction costs can result in a “win-win” situation for both businesses and their customers.

Types of E-commerce

According to buyer and seller relationship, e-commerce applications can be divided into the following categories:

(a) **Business-to-Consumer (B2C):** In this case the seller is a business organisation whereas the buyer is a consumer. This emulates the situation of physical retailing and so it is commonly called electronic retailing. Typically, electronic stores are set up on the Internet to sell goods to the consumers. For example, Virtual Book Store sells books to the consumers through the Internet.

Established in 1955 by Jeff Bezos, Amazon.com (www.amazon.com) is a typical example of B2C e-commerce in which a business sells manufactured products to the consumers directly on the Internet. Amazon.com makes use of data mining techniques to promote the selling of books

As content delivery over wireless devices becomes faster, more secure and scalable, there is a wide speculation that m-commerce will surpass e-commerce.

Currently, m-commerce does not seem to have 'single' "Killer Application" to spur its use. It is, therefore, expected that the current WEB will evolve to become MEB in the 21st century.

by suggesting books to the customer. After shopping, consumers check out the books and pay by credit cards in most cases. Finally, books are sent to customer by mail or courier, as he prefers. Besides books, Amazon.com has now become a superstore (or a horizontal portal) by selling a variety of other things such as toys, wireless phones, cameras, and video games. In this case, it should be noted that the business drives the specification of the product and the customer chooses whether or not to buy a prefabricated product. An example of this in traditional commerce is purchasing suits "off the track."

(b) Business-to-Business (B2B): In this case, both the buyer and the seller are business organisations. There are three types of systems, namely, buyer-oriented system, seller-oriented system, and virtual marketplace. For example, the Virtual Book Store needs to order books from various publishers. The ordering process can be accomplished by using electronic data interchange. General Electric's Trading Process Network (www.tpn.geis.com) is an internet-based trading network for buyers and sellers to carry out B2B e-commerce on the Internet. Here, a typical purchase cycle is to be followed by the buyer.

(c) Consumer-to-Consumer (C2C): This refers to situations where both seller and the buyer are consumers. With the advent of e-commerce, on-line auctions provide an effective means for supporting C2C e-commerce. For example, VBS can provide on-line auction services for customers to sell used books to other customers through the VBS web sit. In addition, a virtual community can be formed.

Established in 1995, eBay

(www.eBay.com) provides the world's largest online trading service by means of online auctions. Basically, a user places an item on the eBay Web site for bidding. Other interested members then bid for it before the deadline. Currently, eBay has more than 29 million members. By means of on-line auctions, they participate in the buying and selling of a wide range of items, including books, stamps, coins, music, etc. In addition to auctions, eBay creates a virtual community for its users to "talk" at the eBay Café (a Chat room) and to communicate with other users via the bulletin boards.

(d) Consumer-to-Business (C2B): This is a new form of commerce in which a customer specifies the requirements to a business, which provides a product that meets these requirements. These requirements could be as simple as an acceptable price, or could involve considerable customisation of an existing standard product, or creation of a new product. An example of this in this traditional commerce setting is a "made-to-measure" tailor. The key distinction is related to who is driving the specification of the product being purchased. Unlike B2C, there is a strong element of customisation. Priceline.com (www.priceline.com) introduces a novel e-commerce application called the "demand collection system." It allows consumers to "name the price" and hence, it is consumer driven not seller driven. Besides air-tickets, Priceline.com also handles the purchase of many other products/services such as cars, hotel rooms, long-distance calls and even mortgage.

Advantages of e-commerce

E-commerce is bringing about advantages to both con-

sumers and business organisations. For consumers, it is of interest to study the advantages in terms of the buying process, namely, search, evaluate, and execute. With e-commerce, consumers can search the global market anytime, anywhere. By using search engines, consumers can easily compare products in the global market. This allows consumers to evaluate the best possible product efficiently. With certain digital goods, such as, software, consumers can execute the order conveniently and receive the goods instantly.

For business organisations, the prime objective is to manage this fundamental formula:

$$\text{Profit} = \text{Revenue} - \text{Cost}$$

Kalakota and Whinston (1997) have very aptly summed: "e-commerce is attractive because it can be used to raise profit by increasing revenue while decreasing cost." With e-commerce, a company can increase revenue by exploring new opportunities and expanding into global market. In fact, a local shop and a foreign shop are both "one click" away in the cyberspace. In other words, the geographical limitation is totally gone and international companies can compete with local companies more easily. In terms of cost reduction, e-commerce can reduce manpower and operating expenses. The use of electronic documents speeds up processing time and greatly facilitates data updating. Consequently, business organisations can make use of e-commerce to enhance productivity. If the businesses decide to invest resources to engage in electronic commerce, the benefits must exceed the costs.

M-commerce Revolution

In just a few years, m-commerce has emerged from no-

where to become the hottest new trend in business transactions. It is estimated by the Yankee Group that “50 million wireless phone users in the United States will use their handheld devices to authorise payment for premium content and physical goods at some point during the year of 2006. This represents 17 percent of the projected total population and 26 percent of all wireless users.”

Unfortunately, the total number of m-commerce transactions today is very small as compared to that of e-commerce. It is also true that m-commerce has been languishing for a few years, with no real commercial services. Nevertheless, some industry experts predict that m-commerce will give great returns in the near future, especially in the B2C sector of the industry. Telecom Trends International, an independent market research organisation in m-commerce, as reported by Kooser (2004), predicts “annual growth rates of 141 percent. The world revenues from m-commerce would grow from \$6.8 billion this year to \$554 billion in 2008.” However, such numbers typically covers a range of phone-based commerce that could range from purchasing downloadable games to paying for parking meters. In the United States alone, less than 6 percent of the roughly 132 million cellular phones have ever used a wireless cellular service. Consulting firm, Strategy Analytics, projects that by 2005 130 million consumers will execute 14 billion m-commerce purchases worth \$200 billion per year. Global m-commerce revenue projections, by Juniper Research, for 2009 are: Global revenues US \$88 billion, Ticket Purchases \$39 billion, and Phone-based retail POS Sales \$ 299 billion.

The expectations for m-commerce are very high, but slow to materialise in certain markets, particularly in the United States. There are millions of users in Japan and some Scandinavian countries, such as, Finland (home of the Nokia Corporation), which already uses their cellular phones to buy goods and services and access Web information services. Table-2 shows estimated revenues for the global m-commerce market in the early 21st century.

Table-2: Global Mobile Commerce Revenues, 2002-2005 (US Dollars in millions)				
Region	2002	2003	2004	2005
North America	0.2	0.7	1.8	3.5
Western Europe	0.5	1.7	4.6	7.8
Asia	2.6	5.0	7.4	9.4
Latin America	0.0	0.1	0.2	0.5
Other	0.1	0.2	0.4	1.0
Global	3.4	7.6	14.5	22.2
US	0.2	0.6	1.7	3.3
Japan	2.1	3.5	4.5	5.5
Source: Jupiter Research				

It is amply clear from the numbers that Europe, Asia and Japan are heading the way in the m-commerce market, and will continue to do so for a number of years. The year 2005 is projected to be a breakout year for mobile marketing, with business spending on mobile commerce equipment and integration, as per Datamonitor, spiking from US \$280 millions in 2000 to US \$5.14 billion in 2004. Though that sounds suspiciously like the online advertising hype of the 1990s, remember, the Internet is now the key to the marketing and sales strategies for most companies. Wireless represents the next frontier. Worldwide users of wireless financial payments in 2004

are 31 millions in Europe, 29 millions in Asia-Pacific, and 2 millions in US. Similarly, worldwide penetration of handheld devices in 2005 are 310 million in Asia, 62 million in Germany, 45 millions in the U.K. and France each, 24 millions in the US, 12 millions in Netherlands, 7 millions in Belgium and 6 millions in Austria (Datamonitor).

M-Commerce?

One of the areas of e-commerce that is rapidly growing across the globe is mobile (or m-) commerce. M-commerce, which is defined by Nansi Shi in his book (2004) as “the exchange or buying and selling of commodities, services, or information on the Internet through the use of mobile handheld devices.” The m-commerce may be defined as “Use of mobile hand-held devices to communicate, interact and transact via an always on, high speed connection to Internet.” “The idea of m-commerce,” lucidly summed up by Dr. Slyke and Belanger (2003), “is fairly simple— offers users the potential to conduct business transactions, wherever they are, using a wireless network.” Basically, any services that can be accessed using wireless handheld devices fit into this category. This includes handheld devices used to browse the Web, as well as handheld devices used by mobile workers in need of wireless connections to their offices.

M-commerce, however, was born due to new technological advances, such as, GSM networks, WAP protocols, and 3G technologies. By using ‘innovative’ technologies, mobile operators have promised to consumers more effective ways of communicating and transacting their business. The vision of transacting business remotely

A number of advanced technologies are emerging today to complement the existing technologies in providing more sophisticated e-commerce services.

is not entirely new. Actually, m-commerce was long perceived but was first introduced in the late 1990s. Despite several technological difficulties and obstacles many goods and services are already available wirelessly. The wireless protocol was originally designed to facilitate m-commerce transactions, but the most distinctive feature of m-commerce that comes into view in many of the larger mobile markets today, is the elimination of the need for “location-dependent connections.”

It should be noted at the outset that m-commerce has already shifted the traditional “4P” business model (based on Price, Product, Place and Promotion) to “5C” model (based on Consumer, Content, Community, Commerce and CRM). However, the growth of m-commerce can be attributed to a number of factors, such as the development of newer and smaller technologies, more mobile populations worldwide with connection needs, deregulation of many telecommunication markets, and the fact that implementing wireless media is often cheaper than implementing wired networks in countries where such networks need upgrading.

Comparison of e-commerce and m-commerce

Modern companies throughout the world have paid a great deal of attention to establish and maintain e-commerce services in order to establish economic relationships with customers. The ‘conventional’ way of commerce was for customers to travel to vendors. With e-commerce, now, consumers do not travel physically to vendors; with m-commerce, vendors can come to customers.

It should be noted here that m-commerce is a different commerce market than e-commerce in the sense that differences lay primarily between transactions and access of data. As Friesen (2002) observes: “E-commerce is oriented towards supporting and realising transactions, and is mostly about buying and selling, while m-commerce is expected to be largely data driven.” M-commerce, however, is based on a technology that is considered to be an extension of e-commerce with the major difference that consumers can conduct their business more effectively and efficiently at an “anywhere and anytime basis”.

It is common knowledge that e-commerce usually takes place between desktop computers that are connected physically to networks in offices and homes. M-commerce, on the other hand, is a new technological “miracle” that enables people to conduct business on the move and fulfils the needs of consumers to access services and to communicate with others in a unique way by engaging in entirely new and different activities. In addition, the ability of businesses to contact consumers at any time and at any place enhances the possibility to achieve better sales and marketing promotions.

M-commerce can also be seen as another channel that accommodates e-commerce transactions, without time and place restrictions. For example, consumers have no longer to wait to get to their office to read e-mail; they can now do this from their handheld devices, such as, their mobile phones, or their personal digital assistants. Similarly, retailers can also inform their customers of their products by using location-based services (LBS). The advantage

to forward information, when it is needed, or when a business opportunity arises, distinguishes m-commerce from e-commerce with the ability to “lure” consumers based on their needs, location, and time, while they are in motion.

Today, a number of advanced technologies are emerging to complement the existing technologies in providing more sophisticated e-commerce services. Currently, e-commerce systems are based on client-server architecture. While this architecture is simple to use, it may not be effective in certain situations. Mobile agents are mobile software programs that can move across the Internet for performing specific tasks automatically. Due to their flexibility and mobile function, they can complement the existing client/server-based system to provide more advanced e-commerce services. It is expected that the current WEB (Web-based Electronic Business) will evolve to become MEB (Mobile Electronic Business)—by turning the W upside down to become the M! Table-3 shows the advantages of this compared with the client-server approach. The mobile-agent based system, in summary, can reduce unnecessary network traffic, provide better reliability, support more advanced services, and utilise the resources more effectively.

M-commerce can be viewed as the medium of replacing “cash and credit cards” with mobile phones and other mobile devices. Software companies that have already developed products for the e-commerce market are currently developing new software applications that will enable mobile users to make payments through their mobile phones by using “digital cash”. Exist-

Table-3: Comparison between E-Commerce and M-Commerce Approach

E-Commerce (Client/server) Approach	M-Commerce (Mobile-agent) Approach
The searching process may be boring because you need to repeat it at many different sites.	you need to specify only the requirements and the mobile agent can do the searching for you.
The search process ties down your resources, while you visit each site in turn.	The search process, if conducted by a mobile agent, frees up your resources.
If the network goes down during the searching process, you may need to search it from the beginning.	It is less dependent on the network condition as the searching is done at the remote sites by mobile agent.
This is time-consuming because you visit the sites only one by one.	This is more efficient as the search can be proceeded in parallel by sending out multiple agents.
<i>Source: Chan, Lee, Dillon and Chang, "E-Commerce: Fundamentals and Applications," John Wiley & Sons, Ltd., England, 2001, pp. 252-53.</i>	

ing e-commerce applications already enable consumers with desktop and laptop computers to make payments from the Internet via secure routes by using digital cash. In this context, Telephone IP News reports: "E-Pocket software is one of these companies that are currently working on an agreement to enable e-payments through mobile phones. With its already existing customers, e-Pocket believes that the service will become a "killer application" in the m-commerce market. This mobile phone option could be considered "hot" in the current market and probably be sold to mobile phone users around the world as an extra-cost option above the standard license cost of the initial service." Finally, mobile commerce can be considered as the "on going physical redistribution of commerce within the society that could take place wherever people can access products."

In business-to-consumers markets (B2C), new promising ideas, such as, location-based-services (LBS) started

to appear recently in the European markets. Some operators (like Vodafone and Orange) have started their own "find-my-nearest" type applications, the first type of these services to be launched in the UK. The arrival of such services signals that LBS and other similar services have finally become a commercial reality. According to Steve Page, the CEO of Mobile Commerce (an LBS platform provider), the interest from brands and operators in LBS is growing very fast. Time-Out, for example, has recently made its first serious entry into the mobile arena, launching its first location-based services (Pearse, 2002).

However, m-commerce changes the basic nature of space and time in the context of consumer behavior. Its superiority to traditional e-commerce lies in the advantage for consumer services to be offered without 'space' and 'time' limits. E-commerce, as opposed to m-commerce, relies on 'wired' networks and time restrictions, and is location specific. With the ability

to relay information over distances with wireless applications, 'wireless' technology can be embedded in consumer and industrial devices ranging from vending machines to heavy-duty machinery. Blue-tooth technology, for example, can be used in home appliances where short range of wireless communication is essential. On the other side, Wireless Application Protocol (WAP) and 3G technologies can be used in remote locations where standard communication structures cannot cover certain geographical area. Traditional e-commerce systems are inferior in the development of such systems because they cannot provide economic returns in cases where consumers are mobile.

Governments also are getting into the m-commerce environment. The Chinese government, for example, is using the mobile technology to distribute lottery tickets through the mobile phones of people, enabling buyers to bypass street vendors (Xinhua, 2003). Comparison-shopping through Internet is another model that can be easily transferred from the technology and ideas of e-commerce to the m-commerce industry. Technology will be able to transfer this already working model to m-commerce, by using applications that locate consumers' mobile phones and based on availability of products or services present price comparison and product offers. M-commerce can facilitate receiving information on demand.

Hindrances in m-commerce Growth

The m-commerce penetration in the world economy will not be an easy affair in the near future. The physical constraints of mobile devices, the difficulty of technology

Unfortunately, the total number of m-commerce transactions today is very small as compared to that of e-commerce.

applicators to bring easy-to-use inexpensive and secure technology, the consumers' resistance to change their payments habits, and the delay on the standardisation of the mobile technology, etc., are the important factors that may hinder the m-commerce growth.

The first major problem is the lack of widely agreed-upon technology standards for conducting m-commerce internationally. In the United States, numerous standards for wireless services have been developed over the last few years. As companies are evaluating the best routes into wireless services, they try to determine which standard will be commercially viable and recognised. A wrong move, unfortunately, into the wrong standard can mean wasted investments in money, time and future wireless technologies. Therefore, the businesses have the unenviable choice of moving too soon into a losing standard, or too late into a lasting standard.

This has considerably slowed down the growth of m-commerce in this market. Conversely, in Europe there was an early agreement on the technical standards for wireless services. This resulted in less risk of making a wrong technological choice. Hence, they invested in technologies and services that followed the agreed upon standards because they believed it would not change for many years. Innovative designs and new technologies were, therefore, brought to market, and m-commerce has grown substantially and quickly in the European markets.

The Second leading issue with the growth of m-commerce is the interface for users on handheld devices. While a cellular phone can be made small (with advanced battery technology) and lightweight, a web-browsing interface requires a minimum screen size to be effective and efficient. Similarly, keyboard functions on a cellular phone are often awkward, especially for

men with bigger hands. As the screens cannot be made as wide as computer monitor screens, only portions of Web pages, or long e-mail messages can be seen easily on the phone. However, there are several practical constraints in wireless technology too. The lack of user-friendliness devices, such as, the small size of mobile phone screens, and the unpractical keyboards on information input in such devices have been keeping consumers away. Cell phones and mobile devices, such as PDAs, cannot provide the same quality of Internet access as when a PC is connected to local area networks. A study conducted by Cliff in 2003 in a number of countries (like France, Germany, Spain, Italy, the UK and the US) showed that only 12 per cent of consumers intended to make payments and to engage in mobile payment transactions by their mobile phones mostly because of lack of "friendly use".

The Third problem with m-commerce networks worldwide is the limited bandwidth available from wireless media as compared to achievable speeds on line-based networks. Thomas (2003) points out: "Most wireless networks today use cellular technologies, which often run at only 14.4 kbps and can have spotty coverage in non-urban areas. Thus, slow network bandwidth will concern consumers in choosing mobile devices to transact their business." In a typical mobile computing environment, one or more of the transacting parties are based on some wireless handheld device. Because electronic transactions conducted over a mobile platform communicate through wireless networks, network bandwidth is slow compared to wired networks.



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Last, but not the least, mobile computing needs to be safe and secure. Security over the mobile platform is more critical than that of wired networks operating in e-commerce, due to the open nature of wireless networks. Also, it is more difficult to implement security on mobile platforms because of the resource limitation of mobile devices. For example, the physical memory that a typical mobile phone can accommodate is not enough for memory hungry applications, such as e-mail, picture and sound storage. Therefore, solutions to these problems need to be found immediately. Security mechanisms for protecting traditional computer communications in e-commerce need to be revisited to ensure that electronic transactions involving mobile devices are secured and implemented in an effective manner. In addition, the existing security infrastructure for electronic commerce systems should be extended to the wireless Internet in such a way that would meet the security needs of different mobile platforms. Setting equal standards in the mobile commerce application, communication software and hardware could also prove essential for supporting multiple dissimilar platforms.

Reliable security mechanisms for protecting electronic transactions conducted over mobile platforms are practically unusable today. Proposed working security mechanisms could prove that there is practically real deployment. For example, developing secured digital cash software for cell phones and mobile phone devices will enable consumers to make safe financial transactions with their mobile phones. Cliff (2003) de-

scribes these developments in the following words: "E-Pocket is a software company that currently enables desktop and laptop computers to obtain and transfer digital cash in e-commerce applications. This type of software can be extended and be used for mobile commerce transactions." Furthermore, it could be licensed for example to banks and other payment institutions. Mobile phone applications could then be marketed and sold to mobile phone users at an extra-cost.

The European Commission that regulates the m-commerce market in Europe, however, allows for Internet companies and mobile operators to issue electronic money. This could be considered as an advantage for mobile operators in Europe (like Vodafone and Orange) to start investing into m-commerce applications that will be used for financial transactions. However, research done by Plunkett Research Limited in 2003 shows that "consumers are not yet ready for mobile payments through their mobile devices." Mobile commerce still has a low share in the commerce market.

Extremely popular abroad, SMS is gaining popularity in the United States. Building brand awareness by SMS is a very effective tool compared with other types of advertising. Enpocket agency reports show that SMS is 130 per cent more effective than radio advertising.

It is heartening to note that many European markets are very close to implementing 3G technologies, but user awareness of these services remains low. As per a recent research, almost 80 per cent of mobile phone or Internet users in Europe are "unaware"

or "poorly informed" about wireless mobile technology. In the United States, this number is as high as 89 per cent. According to Sadeh (2002), his research across markets to gauge user interest of these new services brought responses from consumers that they were "simply not interested in using wireless Internet technology." However, technology terms "WAP", "Wireless Web" and "3G" have lost popularity in recent months as businesses in this arena have fallen prey to delays, poor implementation and low consumer interest. There are several reasons to explain why m-commerce is losing ground to popularity.

Global Prospects in Future

Fuelled by the explosive growth of cellular phones and the growing demand for mobile Internet services, there is a compelling need for accessing the Internet through mobile devices. Henry Chan (et al, 2001) cautions the business leaders as: "It is expected that the current WEB (Web-based Electronic Business) will evolve to become MEB (Mobile Electronic Business)." Currently, the key enabling technology for realising the MEB is the Wireless Application Protocol. It allows users to access Internet services in general, and mobile commerce services in particular through portable terminals.

As the current Web technologies are primarily designed for desktop computers working under a wired-network environment, they cannot be applied directly to mobile devices, such as, cellular phones and palm computers. In fact, these devices are relatively less powerful in terms of CPU speed, screen size,

Mobile computing needs to be safe and secure. Security over the mobile platform is more critical than that of wired networks operating in e-commerce, due to the open nature of wireless networks.

memory, input device capability, and battery life. Moreover, there are other operational constraints in wireless networks, viz., limited bandwidth and unstable operating conditions. Hence, new solutions are required for providing Internet access to these devices.

M-commerce, however, is developing at different rates and in different directions depending on the region. A report prepared by the Research and Markets (www.researchandmarkets.com), says in its conclusion: "The European market, with its high mobile penetration, is currently developing along SMS lines, while in the Far East (in particular Japan and South Korea) the technology has already gone a few steps further towards wireless-enabled transactions. The extent of the business conducted in these two regions suggests that m-commerce has already gained a momentum."

It should be noted that the United States population is basically 'credit' oriented with 'disposable' culture. Americans, therefore, prefer credit accounts rather than pre-paid or directly debited transactions from the checking account. This is in sharp contrast to the European culture. Wireless carriers should figure out how to allay the concerns about unlimited costs of the average consumers in order to bring them on board. "Critical mass", is thus the name of the game and no one is going to get there without offering plans (pre-paid or flat rate) that average consumers will embrace gladly.

Japan has already embraced the wireless Internet because of its cheaper availability and benefits. The desktop Internet access is more costly in Japan than wireless access. The enabler for this has been

Businesses have the unenviable choice of moving too soon into a losing standard, or too late into a last-ing standard. This has considerably slowed down the growth of m-commerce in this market.

Japan's I-mode. It has proven to be such a great success that i-mode is being seen as a potential 'killer' of European Wireless Application Protocol (WAP). The product of NTT DoCoMo Inc., I-mode has gained over 15 million subscribers to the service delivering cartoons, horoscopes, and entertainment along side the usual news, stock updates, and weather reports.

The vision of m-commerce applicators is to "place the Web on every phone". However, the market is still not ready to offer this product. Further developments need to be made to ensure that mobile transactions will be safe, easy, and inexpensive.

Despite some obstacles across the world, mobile operators and software applicators have spent a considerable amount of time and money searching what type

of services would be the ideal startups for boosting transactions and profit in the m-commerce B2B industry. In the U.S., pioneer companies in m-commerce (like ActiveCore Technologies, ePocket, Network365 and Paybox Solutions AG) have already started making announcements about their products and services in the B2B mobile commerce industry. In addition, leading carriers, handset makers and infrastructure providers are ready to take advantage of this potential market. Alcatel, Alsthom, and SK Telecom have announced plans to combine their mobile payment products. Panasonic recently announced the completion of a micro drive prototype that will be used in the future in mobile phones to facilitate the easy and massive storage of digital images and videos (Memmecke, 2003). Leading mobile



operators, Orange, Vodafone, T-Mobile and Telefonica, recently teamed to create "Sim-pay", a joint venture to create a common payment platform in Europe. Nokia Corporation recently conducted a payment trial with MasterCard International. Also, in the automobile electronic market, companies are providing satellite radio and in-car shopping services.

Following the United Nations Commission on International Trade Law (UNCITRAL) "Model Law on E-Commerce," the Government of India had enacted the "Information Technology Act" in June 2000. The Act facilitates e-commerce and e-governance in the country. The new law makes e-commerce, online transactions, and digital signatures legally binding. The law allows India to join the "digital dozen," a club of 12 nations that have a legal framework for e-commerce. Because e-commerce is now legal in India, violators can be taken up in a court of law and all forms of electronic communications can be used as evidence. The Act also establishes a regulatory framework and lays down punishment regimes for different cyber crimes and offences. Business groups says that India's new e-commerce law which blesses electronic signatures and e-transactions, will change the way Indians do business and advance the country's position as an emerging superpower in the global high-tech industry.

The opportunities of the medium to business include advertising space to strengthen brand equity coupled with lower infrastructure costs, unlimited shelf space, a global audience that can be catered to without the restrictions

of time zones and working hours. Some factors that may delay the e-commerce boom in India include: lack of Internet infrastructure, low PC penetration, lack of customer demand, unfair competition, government regulation, etc. However, some of these problems also create opportunities for service providers. The good news is that the Indian market is large and virtually untapped. Due to its huge population, India is an attractive target for both e and m-commerce. It offers significant opportunities although not without risk. Companies are realising that careful planning is essential and that the challenges multiply as online transactions become more complex.

The U.S. has already provided a three-year moratorium to not levy any tax on e-commerce transactions. The Government of India has also formed a high-powered committee on e-commerce and taxation under the Central Board of Direct Taxes. This committee is reviewing the various aspects of e-commerce transactions and technology transfer, and evaluating whether these should be subject to income tax. NASSCOM has already recommended a five-year moratorium on e-commerce transactions and suggested a comprehensive study on the various issues involved, before a final decision is taken to tax e-commerce. In fact, due to the global nature of e-commerce, it is suggested that India should support a permanent ban on taxes on Internet access, a permanent ban on custom duties on electronic transmissions, international tax rules that are neutral, simple and certain, simplification of state and local taxes.

The fruits of mobile commerce will depend to a great

degree on succinct, hyper personalised wireless content that directly relates to the act of being away from home/office. How quickly the hand held functionality converges with the cell phones and at a low price will be another factor that will play an important role in boosting mobile commerce. . Of course, all this will depend upon how soon the "Killer Applications" can be developed. Currently, m-commerce does not seem to have a killer application to spur its use. A killer application is the one , which will immediately lead to critical mass and certain success.

Nowadays, various m-commerce applications are increasingly enhancing enterprises' abilities to offer mobile services that are easily accessed by a mobile device 'anytime' and 'anywhere'. The crucial challenge (or success factor) to modern organisations is whether they are able to provide enough useful m-commerce applications that consumers can 'access' and are 'willing' to use. However, constructing mobile applications has some inherent complexities and architectural issues as m-commerce embraces many emerging technologies.

Brodsky, very optimistically portrayed the current situation as: "Mobile commerce barely survived the Internet bubble. But some emerging 'niche' applications could add up to something big. Since there is no 'single' killer application, vendors must support a range of applications." So, we predict that m-commerce will not live up to its promise until a commercially successful killer-application emerges. What will that killer application be? Only time will tell, we certainly do not know. □