

M-COMMERCE

MYTH OR REALITY?

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INTRODUCTION

One term has increasingly dominated technology news and also attracted many investors recently is M-Commerce. There has been several debates on the exact meaning and scope of M-Commerce. M-Commerce derives from E-Commerce that has dominated the Internet Age. Although M-Commerce stands for a broad umbrella of terms, experts have laid out few definitions. Few of these definitions are listed below.

Definition:

1. Purchase of goods that are originated from a mobile terminal
2. Wider context – Services over mobile which enables commercial activity by the form of subscription or purchase of items or even timely and location-independent delivery of information with a sufficiently high perceived value for the customer

Durlacher Research Inc predicts a Cumulative Average Growth Rate of 136% in Europe for M-Commerce market from 1998 to 2003 and reaches a figure of 23Billion Euro at end of 2003.

M-Commerce, like E-Commerce influences a variety of players in the telecommunication and financial sectors (apart from host of other sectors). These market players form a value chain that holds the key for development of the industry

M-COMMERCE VALUE CHAIN

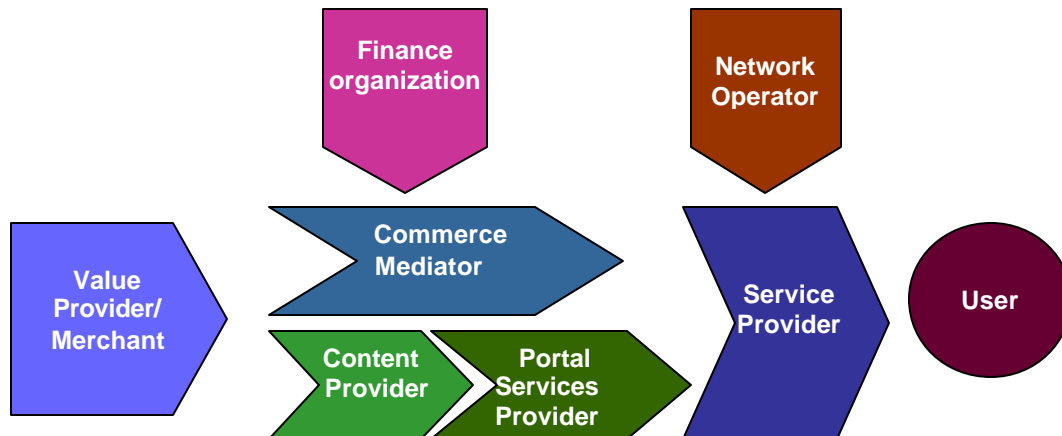


Figure 1: Provides the M-Commerce Value Chain

Players

The following are the different players in the M-Commerce value chain.

User

User is defined as a person who is authorized to use his Personal Trusted Device (PTD). Every user of M-Commerce is associated one or more PTDs. Users of m-commerce can be divided into two main categories:

- ✍ End users or system users: Retail subscribers of mobile phone services who uses mobile phones for commercial activity comes under this category. Here the benefit or the end-result is received by the subscriber
- ✍ Customer or suppliers: In this category the end-result or benefit is obtained by an organization that utilizes M-Commerce for increasing the productivity and efficiency of its activities.

Network Operators

Network operators offer the transport facility for data to pass across from the end-user to the destination and vice-versa. Operators enable this by providing network infrastructure with technologies such as GSM, PDC, GPRS and 3G.

Service Providers

Service providers typically involve in activities that develops new services on the common platforms providing standardized functional interface to application developers, and utilizes the network infrastructure provided by the Network Operator to provide the data in a consistent and user-friendly format for the end-user.

Content Providers

Content providers aggregate mobile device content from different sources. They also link up with Commerce Mediators to handle the payment activities.

Commerce Mediator

Any organization that provides payment solutions or services comes under this category. These organizations act as mediators between content providers and financial industry. This category also includes firms providing security solutions for payment.

Finance Organizations

Any commercial transaction on a media requires framework and infrastructure to complete it with payment for the item transacted on. Financial industry has unique positioning and role in M-Commerce value chain. It provides necessary facility to carry out such a transaction.

PTD

The predictions are that mobile phones with always on internet access will soon outstrip the number of fixed line internet terminals. For M-Commerce, the mobile phone is regarded as a user centered Personal Trusted Device (PTD). The mobile phone is small, personal, familiar, secure and available at all times. As a PTD, the mobile phone will be able to handle all transaction-related functions in both the online world and the physical world. This PTD may include mechanisms for user verification, an area for secure key storage and cryptographic processing, a certificate database, and a transaction database.

Environment

A Mobile device enables M-Commerce in three different environments. The functionalities for each of these environments are different. Hence it may require different functional elements to be added to the mobile device.

- ✍ The *remote* environment (or mobile internet)
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- ≠ The *physical or local* environment by facilitating payment services in shops, identifications services (e.g. at work).
- ≠ The *personal or home* environment by working with Bluetooth technology to access and process internet content with a PC, but use the PTD for identification, authentication, and authorization of transaction services, for example.

Interfaces

There are three interfaces defined for M-Commerce.

The *service registration* interface defines how the PTD subscribes to a service. It includes steps for requesting and delivering the service certificate for a particular service.

The *service execution* interface defines how the PTD accesses a service for transactions. It includes functions such as secure session, authentication, and authorization by the user.

The *user interface* is somewhat different in nature to the other two, but crucial for mass acceptance. It addresses technical and usability issues. Elements of this interface specified so far include: flexible service selection, awareness of used service / brand, awareness of the security environment (level; of security in use), user verification awareness of digital signing, access to digitally signed contracts, access to delivered objects (such as receipts and tickets).

Security

Fundamental security services defined for M-Commerce are:

- ≠ Confidentiality
- ≠ Integrity
- ≠ Authentication of origin and recipient
- ≠ Digital signing for authorization.

It currently specifies the use of the security layer protocol WTLS and a security element such as a tamper resistant WIM.

5 major steps characterize any M-Commerce transaction

- ≠ Initialization
- ≠ Registration
- ≠ Establishment of a secure session
- ≠ Authentication
- ≠ Authorization by the user

Usage

M-Commerce activities can be categorized into

- ≠ Consumer to consumer
 - ≠ Business to customer or
 - ≠ Business to business
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Successful M-Commerce Initiative

NTT Docomo's i-Mode is an example of close integration of different key players in M-Commerce field to provide a one stop entertainment, information and communication services for its subscribers. The impressive growth rate of these services provided indicate the success of the model.

Drivers

Standardisation

Standard organizations have started to show keen interest in M-Commerce and have initiated activities in this path.

ETSI

ETSI has been in the forefront in specifying standards for mobile world. ETSI has been successful in bringing operators, vendors, service providers and other industry players on to a common platform. GSM specifications have been received well in the industry, proven by its enormous popularity. With new initiatives in 2.5G and 3G through 3GPP, ETSI is in a great position to provide a comprehensive standardized platform. However, as far as the WG2 is concerned, the aim is to make a standard that will work on any transport mechanism.

MeT

Ericsson, Motorola, and Nokia have clubbed together to found the MeT Initiative. MeT is defining a Framework for developing M-Commerce applications and services. The Framework defines logical and physical devices and systems and the functions they perform. This highlights critical interfaces for interoperability. MeT embraces and extends existing industry standards wherever possible. For example, it draws upon WAP for WTLS (Wireless Transport layer security), WIM (Wireless Identity Module) and WPKI (Wireless Public Key Infrastructure) and embraces Bluetooth wireless technology. MeT concentrates more on the specifications on the terminal side.

Contribution from Forums/ standards

Some of the other standardization organization and forums actively involved in promoting M-Commerce are:

- ✍ American National Standards Institute (ANSI)
- ✍ Global Mobile Commerce Interoperability Group (GMCIG)
- ✍ Global Mobile Commerce Forum (GMCF)
- ✍ Information Society Standardization System (CEN/ISSS)
- ✍ WAP forum
- ✍ GSM Association
- ✍ Smart Card Forum
- ✍ European Committee for Banking Standards
- ✍ Mobey Forum
- ✍ Euro Banking Association – EBA

Technology

Application Function

Few application function technologies currently in use and likely to have a significant impact on M-Commerce are:

- ✍ WAP
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- ⌘ i-Mode
- ⌘ SMS

Transport Functionality

For transport functionalities, the following technologies are available

- ⌘ GSM
- ⌘ PDC
- ⌘ GPRS
- ⌘ 3G
- ⌘ Alternate Technologies: WLAN

The growth of M-Commerce enabling technology has a high correlation with the growth of infrastructure technology. There would be a high growth of specialized devices for m-commerce during the period from 2002 to 2006. This is evident in 2002 with Nokia providing dual-chip GPRS phones which can enable mobile payments. More devices are expected to arrive in 2003 and this trend to continue with increased focus on this segment by the device manufacturers. This has been captured in figure 2.

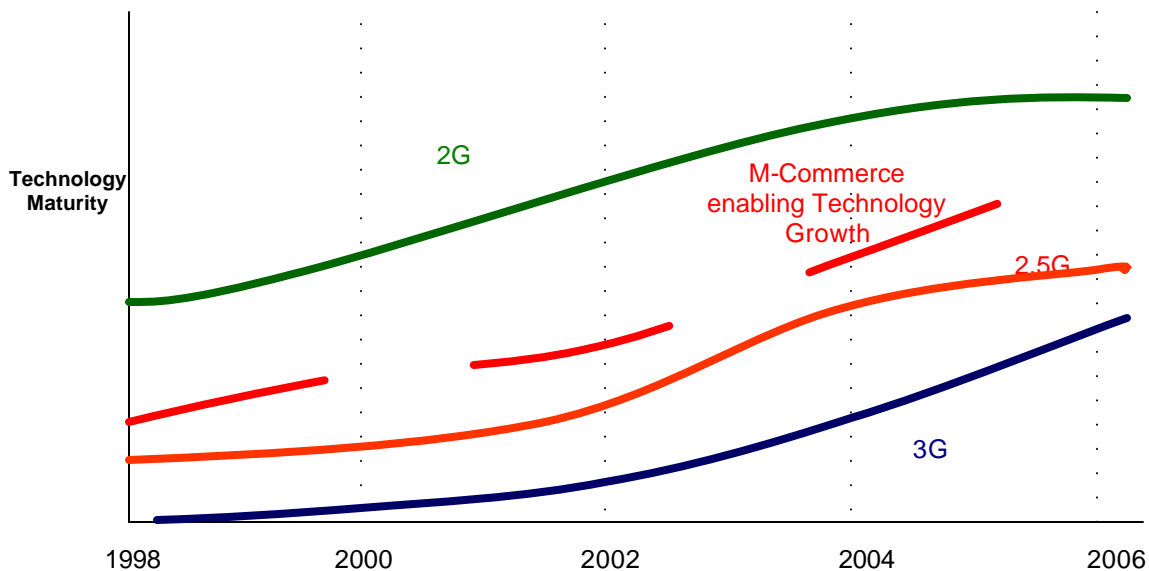


Figure 2

Devices

In past few years there has been a significant growth of wireless handsets. Few of these are listed below

- ⌘ Improvised devices like dual slot GSM phones
- ⌘ Dual-chip GPRS handsets
- ⌘ WAP Handsets
- ⌘ 3G Handsets

A question of debate is whether to use the SIM card as an authentication device. For a standard set of functionalities to be defined for a handset required for a M-Commerce transaction, it is necessary to freeze few parameters.

Also in debate are questions like whether telephone subscriber has to be separate from the person paying by putting credit card / e-wallet into the phone.

In this case, the organization, which owns the user identity, has the opportunity to make money from M-commerce.

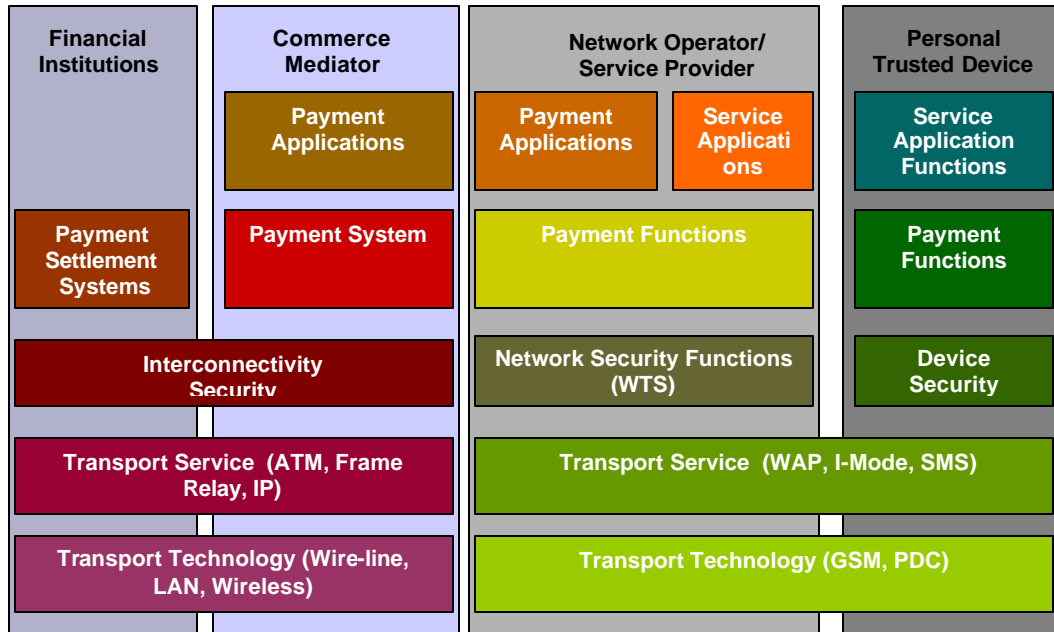


Figure 3: M-Commerce Framework

The figure 3 shows a M-Commerce framework that includes different players in the value chain. It is clear that, due to different interfaces between the players, it is possible to have several different technologies and systems among different players. Also this gives an opportunity to use various products which are currently available for E-commerce or its modified versions. These products are mature and can easily be deployed.

Issues

M-Commerce industry is currently undergoing a dramatic phase in which most of the issues are being brought out and efforts are on to solve these. Few critical issues are listed below:

Security

There are security issues at several levels.

Data Security: One of the concerns is the data security among the different entities. There are no standard interfaces which have been defined till now. This has slowed down the developments in these areas.

Device Security: A Personal Trusted Device has limited liability for a subscriber. The question is, if a user can use someone else's phone (he pays the browsing costs) but pays for the purchase of goods/services. According to the operators, this is today illegal, as the SIM identifies the user. SIM is a legal identity, as the subscriber signs a contract with the operator. The operator owns the card (like a bank card is owned by the bank). If the equipment cannot be legally used by multiple people, then this would put a restriction on the popularity.

Service Security: Additional security features apart from what is provided by the standard protocols are needed for commercial organizations and other entities to entrust their applications on mobiles. For e.g.,

banks want personal devices with a second control (e.g. a PIN number) to ensure that the person who pays can confirm his willingness to pay the amount displayed/negotiated.

Technology Bottlenecks

WAP: M-Commerce hoped to piggyback on the WAP popularity and usage. But WAP as a technology failed to provide a mobile internet platform. Long connection times, dialup access speed, together with lack of handsets during the nascent stage of development of WAP, all added to the failure of WAP technology. Moreover the lead-time taken to provide meaningful applications on WAP reduced the chances of success for WAP.

Customised display characteristics: Current handsets do not provide any display or e-commerce friendly features that can be utilized. From the banks point of view, for certain products like an e-purse, where the money is immediately transferred from the bankcard, there is a “strong” need for a trusted display to verify the value of the transaction that is being signed/agreed for.

Micro-payments: Micro-payments are difficult to address through a mobile handsets with all the security features. Costs of data to clear the payment may be greater than the value of the payment. E.g. road tolls: may not request authorization and assume the risk of the loss. This calls for pre-authorization of several activities like a micro-payment “purse”. Currently there are several technology bottlenecks in storing pre-authorized information on a mobile phone.

Lack of applications: There have not been any killer applications that can trigger off heavy usage. Although there are numerous opportunities, very little development has occurred in this field.

Infrastructure Limitations: Narrowband or slow speed 2G network have provided little motivation for using mobile phones for commercial activities. Related with this limitation, there have not been applications that take this factor into consideration.

There are few additional questions on the commercial activities. Few of these are listed below

- ∞* Does the system need to differentiate between payments time. This is relevant if payment has to be done before receipt of the goods or services. If so, the security/integrity requirements will be different than when the payment is done when the goods/services are received (e.g. an airline ticket).
- ∞* As any purchase/service there is a contract, questions on whether the laws of the buyer or the seller are met
- ∞* Are requirements the same for goods or services
- ∞* Issues with payment of sales taxes

Analysis

In this information age, organizations have been able to communicate the benefits and expectations of a upcoming technology or development to the end-users. One side of the coin is the increased awareness among the possible benefits and advantages. On the other hand, it has also created a “hype” which sometimes backfires on the industry. Due to various practical difficulties, organizations are not always able to live up to these artificially created “hype” and fail to meet the expectations of the end-user. This leads to the “failure” of the technology.

Growth of any technology can be represented by the growth curve. As represented in the figure 4. There have been tremendous developments in the initial two years. Along with these developments, there was an increase in market hype that created “expectations” which could not be met with the current development activities. This leads to the second stage of the development where there is a disappointment in the market and the market returns to “reality”. At this stage it is important that standardization organizations and other relevant organizations step up their activities so that there sufficient activity in the area to provide motivation for organizations which intends to take advantage of the technology.

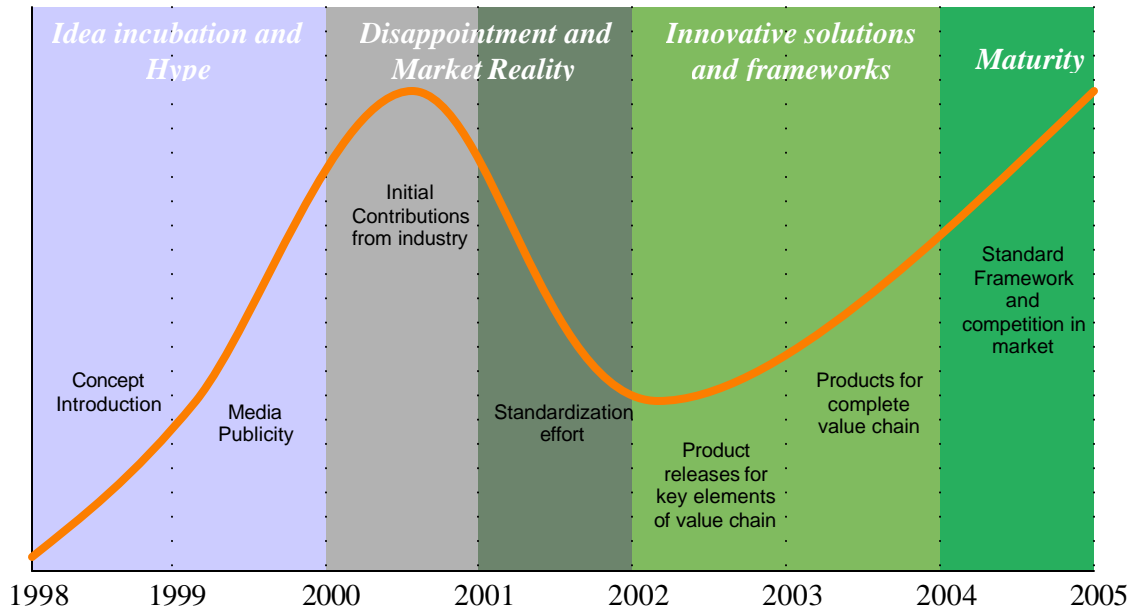


Figure 4

For the technology and the market to grow, it is necessary that certain key products and applications are released in the market. These products would lay the foundation for a steady growth in the number of products and the activities in the field. Initially, products are more likely to be targeted at key entities in the value chain. This is followed by companies coming up with products for other entities of the M-commerce value chain.

At this point of time, there is enough choice and opportunity for service providers to deploy their services on a mass scale.

The last segment of the growth curve indicates sharp growth with large number of companies contributing innovative solutions for the different problems existing in the solution.

Another factor that would help in the growth of the sector is the development of underlying technology, i.e., more developments in the fields of 3G and WLAN giving motivation to provide more powerful applications and services.

In this stage the market also starts to attain maturity with quality of service and products playing a key role. At this point only the strongest of the players would be present. It may also see activities in the other sectors that could eclipse the growth and development in this field.

Some of the factors that could influence the growth and acceptance of M-commerce applications and services are:

- ✍ *Stage of end-user market:* Mobile market and related markets like handset and infrastructure needs to be considered. Growth in all these related markets would determine the developments in M-Commerce market. Also more mature these markets are, M-commerce would witness better growth.
- ✍ *Availability of technology:* New mobile access technology and handset technology needs to be developed which takes into account the different requirements for M-commerce.
- ✍ *Availability of services/applications:* New applications are required to attract the mass subscriber base. More important factor is development of these applications that are suitable for bulk end-devices like 2G mobile devices which would dominate the handset market for some more years.

- ✂ *Data usage pattern:* Data usage pattern of mobile subscriber influences the rate at which they adopt the new services and applications, especially services which are closely related with data usage.
- ✂ *Addressing security concerns:* There are several security concerns currently with the different services and applications. It is necessary to address these issues so that mobile users easily accept it.
- ✂ *Support from handset vendors and operators:* For the market acceptance of the new services and applications, it is necessary that the mobile service providers extend their support in defining the interfaces. Also handset vendors also need to develop solutions that can accommodate M-commerce solutions.
- ✂ *Price and availability of handsets:* New handsets are more likely to provide features suitable for M-commerce. In order that subscribers use these, these have to be available to them at competitive prices.
- ✂ *Micro-payment solutions with guaranteed trace ability:* Any transaction on the mobile device should be traceable. There is an issue of “higher cost” in case of micro-payments as there is a risk of payment amount being lower than the transaction cost.
- ✂ *Payment Security:* For all payments today, there needs to be a “signature” or another type of authorization/authentication” such as PIN (on-line issuer PIN verification or off-line PIN verification). Banks authorize credit card payments without signature below a certain financial limit (e.g. toll lanes etc.), and cover the risk with a fee. Similar kind of arrangement is required initially till a total security framework is defined and employed.
- ✂ *User confidence:* Notes/coins are difficult to forge. Electronic messages through mobile devices need to develop the same confidence. Today, the most closely comparison is the usage of a cheque. There needs to be a guarantee that the bank of the merchant can reclaim value from consumer’s bank.

Way Forward – Managing expectations

Technology Growth

Perceived Security: Perceived security is important for success of M-Commerce. People are willing to give a credit card in a restaurant but will not pay by card over internet. This would reflect more in the case of M-commerce where the user gets lesser information compared to internet. However, mobile phone is more secure than a PC and hence require lesser security systems.

While total security is very expensive, lowest security that we can live with is best. But determining a security level is highly important task. It needs evaluation of risks of each element in the value chain. The total security is always the security level of the least secure element or the link.

Security Overhead for M-Commerce security: Initial systems must be highly conservative in terms of security overheads for transactions. Already these type of solutions have been introduced in the market. The Telenor solution uses SMS or a data call as a bearer to send authentication (PKI certificates) from a mobile to a server (concatenated SMS messages).

Even in a high-bandwidth service, it may be better to limit the overhead caused by security if possible.

Variations in security policies

Different security policies have to be formulated according to scenarios. For e.g., for “small payments” using a mobile device, an user would not like to tolerate a long authentication procedure. For large payments (e.g. airline tickets), a more comprehensive security system would be appropriate.

M-commerce using wireless technology

There is an increasing tendency to associate M-commerce with mobile technology alone. There is a definite roll for fixed wireless systems like WLAN and also short-range communication systems like a Bluetooth protocol device.

Development of applications

Data usage of 2G system (for e.g. GSM) is less than 10-15%, as the applications are often difficult to use. It was noted that the GSM bandwidth of 9.6kbps would be the user's experience for several years to come. Due to heavy investments necessary for 3G networks, solutions developed today are likely to be around for several years thereafter (back-ward compatible solutions).

Hence applications needs to be created for two categories of users:

- ✍ Users having low bit rate connectivity or narrow band connectivity: All 2G mobile users would come in this category. For e.g., a GSM end-user can obtain a data rate of upto 9.6kbps.
- ✍ Broadband mobile connectivity: This category would involve all 2.5G and 3G users. The data rate of this category of users would vary between 20kbps to 365kpbs depending on the technology and network.

The application for the first segment needs to come out immediately. Complex and sophisticated applications can follow with developments in device technology and network infrastructure. These developments require more aggressive development work and alliances among the application developers and content aggregators. Market needs have to be thoroughly studied and application needs should be identified.

Easy entry into market

In order to motivate companies to invest and innovate new technologies and framework, there should be low entry barriers for all players. There shouldn't be any restriction on product companies as well as the operators who actually provides the service.

Market Growth

Looking world wide, there are few key geographical areas where we expect high growth for M-Commerce in the recent future.

- ✍ *Europe:* Europe has seen high developed and matured mobile market. There is also a high number of mobile users having data experience. However internet penetration is comparatively low in this area.
- ✍ *US:* In US, there is a highly mature internet market. However mobile market is not very strong. The mobile market is not dominated by data users.
- ✍ *Asia:* This region has pockets of high growth, maturing mobile and internet markets like Japan, China and Singapore.

Typically, M-commerce is likely to pick up faster in regions where Internet penetration is lower and mobile penetration is higher. Europe and Asia are the key regions which would lead in developing new solutions for M-commerce growth.

Opportunities

M-Commerce offers highly lucrative opportunities for all entities in telecom sector. Some of the key opportunities are listed below. These have to be communicated so as to develop interest and motivation for organizations to contribute to the development of M-Commerce.

- ✍ *Network Operators:* With increase in data traffic, there would be increased efficiency in the network. This can be catered to by the current systems. Mobile operators can also provide technical support for financial services across their network.
 - ✍ *Equipment Vendors:* With increase in data traffic there is more demand for upgrade and next generation products. This would trigger development of more innovative products which could handle data traffic more efficiently.
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- ✍ *Service Providers:* M-commerce provides an opportunity for service providers to move up the value chain by providing data and commerce applications. This also opens up a new value chain for service providers.
- ✍ *Mobile Virtual Network Operators:* MVNOs have had limited area of operation till now. M-commerce provides them more space in strategizing new applications and services. This also provides retail giants to enter this market with proprietary and standard payment methods.
- ✍ *Content aggregators:* M-Commerce can take place only if sufficient high quality content is available. Content aggregators have very important role to play
- ✍ *Financial Sector:* There is increased for financial institutions and banks that can provide additional services and also expand their reach. It also give more opportunities for other related organizations to assume additional roles of a Commerce mediator.
- ✍ *Billing and Customer care vendors:* New billing systems and customer care systems are required for the new systems developed. There is a Herculean task of developing highly efficient billing systems for the equipments.
- ✍ *Other wireless equipment vendors:* WLAN and short term wireless vendors can find new applications for their products. This would increase the usage and hence boost the industry.
- ✍ *Terminal equipment vendor:* Terminal devices can introduce new features that can enable payment and other M-commerce activities.

Conclusion

There are definite conclusions that can be drawn from the analysis provided in the earlier section

- ✍ M-Commerce is here to stay and high growth would be seen in period from 2003 to 2005.
- ✍ New roles would be assigned to various players in the market like service providers, network operators, financial organizations and content providers.
- ✍ New payment schemes and techniques would be developed.
- ✍ There would be significant improvement in terminal device technologies.
- ✍ New companies would emerge which would provide innovative solutions for payment enabling mobile commerce applications for 2G and 2.5G networks.

Growth of M-commerce would be heavily dependent on the supporting technologies and services. Hence its growth would require development activities from the industry.

- ✍ Small and effective applications which can introduce users to M-Commerce
- ✍ M-commerce should complement the “Desktop Web” but avoid replicating it, and online ventures should build offerings around the immediacy of mobile interactivity
- ✍ Contribution from standardization bodies and industry forums would be a key factor.

Glossary

GSM – Global System for Mobile

GPRS – General Packet Radio Service

PDC – Packet Data Circuit

PTD – Personal Trusted Device

PIN – Personal Identification Number

SIM – Subscriber Identity Module

WAP – Wireless Access Protocol

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WLAN – Wireless Local Area Network

WTLS (Wireless Transport layer security)

WIM (Wireless Identity Module)

WPKI (Wireless Public Key Infrastructure)

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