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MULTIVIEW ON MOBILE PAYMENT APPROACHES

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16.1   INTRODUCTION

Since the appearance of mobile device and wireless technology, people's life has been changed. Therefore, mobile technology has been impressed by human being life style. Recently, every person feels the needs of this device which is inseparable from human life. This phenomenon encourages the scientist to start using this device in different way, for example, as money payment machine.

Mobile Payment (M-Payment) is a kind of payment for goods, bills and services with mobile devices like Cell Phone, Smart Phone and PDA (Personal Digital Assistant). They took advantage of wireless and other technologies related. Mobile devices can be used in variety of payments such as digital content (like music, video, ringtone, online game, subscription, wall paper, books, magazine and etc) or ticketing (like bus, subway, train, airplane and parking meter) [1][2].

This paper contains 6 parts, which will explain a history of M-Payment appearance, and current payment methods and also model. In contrast, it will also show the current business patterns versus M-Payment.

16.2   BACKGROUND OF M-PAYMENT

M-Payment is an innovation of E-Commerce. Earlier on, the existence of M-Commerce resisted people from using computers to

connect networks in order to buy or sell things trough it. This kind of situation has some limitations like connectivity, or availability. Thereafter, people started to use smaller devices like laptop computers, PDA and etc. However, they still facing the same problems, by then, it has been solved through new media called wireless network connection. Therefore, people could connect everywhere via this new connection method. Birth of M-Payment systems resulting people adopting faster mobility, ubiquity, convenience, instant connectivity and personalization using low cost devices.

M-Payment methods can be categorized in four primary models:
(a) SMS based Transaction payment.
(b) Direct Mobile Billing.
(c) Mobile Web Payment (WAP).
(d) Contactless M-Payment (NFC).

16.3   HISTORY OF M-COMMERCE

Mobile business has broad definitions that include communication, transaction, and different value-added services made available by using portable devices [3]. Some important accomplishments which help M-Commerce improvised are shown below:
Summary of M-Payment history and its process of growth is shown in Table 16.1:

**Table 16.1**   Brief History about M-Payment Growth

Year	Description
1997	The first M-Commerce system was installed in Helsinki, Finland. First two mobile phones are enabled using coca cola vending machines in order for users to buy things. They used SMS text messages reconfirming their payment through the vending machine. In addition, first Mobile banking services was launched in Finland by Merita Bank using same task accomplishment method too [4].
1998	First sale of digital goods was mobile ringtones which were downloadable by user's cell phones. It was launched in Finland by Radionlija. In addition, Easy park was established in August 1998 by developing a wireless solution for parking payment according to time.
1999	Mobile payment needs a standard platform to be established. First two major platforms for M-Commerce introduced by "*Smart as Smart Money*" company in Philippines and I-Mode mobile platform introduced by NTT DoCoMo in Japan. In addition, MeritaNordbanken, together with Nokia and VISA International, start a project called Electronic Mobile Payment Service (EMPS). The purpose of this project was to test new kind of payments related to services which is aimed to create global standard.
2000	Growth of M-Commerce related services continued rapidly in 2000. A company in Norway launches mobile parking, a company in Australia proposed Mobile Ticketing for trains and Japanese company offered Mobile Ticketing for airline ticketing.
2001	First conference about M-Commerce was held in London in July 2001.
2002	First book entitled M-Profit manifesting about M-Commerce advantages and usage in commerce was published in 2002 by Tomi Ahonen. Next, Mobile2Pay is a *mobile payment* initiative that was launched by Smart Concepts in *October 2002*. The purpose of this company was creating an interactive mobile sale which enables payments and delivery of goods.
2003	First academy short course was held in 2003 at Oxford University discussing about M-Commerce according to Tomi Ahonen and Steve Jones lecturing.
2004	Hereafter, Alain decided to start a new incubator for e-payment in Ireland, related to *mobile payment*. He admitted to having a lot of fun creating the new start-up, and he did this for a couple of years before joining a media group in Belgium.
2006	AMSTERDAM - (BUSINESS WIRE) - Gemalto (Euronext

	NL0000400653 GTO), the world leader in digital security, Credit Mutuel-CIC and NRJ Mobile have joined forces to offer contactless *mobile payment* services as part of the "Nice, mobile contactless city " project.
2007	Buyers can use mobile payment option in their purchase. The cost of goods is added to buyers' phone bill.
2008	An Indian mobile operator (Airtel) proposes a service named mCheck. This system enabled users used SMS payment to top-up their account, pay postpaid bills, landing bill, flight ticket, movie ticket and toll recharge.
2009	On *October 30, 2008*, RBC, Visa and are working together on the next phase of the mobile phone payment pilot and testing secure over-the-air (OTA). The Gemalto would provide a Trusted Service Manager and Secure banking bridge by mobile phone. Starbucks introduced a mobile payment application in its top 1000 stores.
2010	Maxis, Visa, Maybank and Touch'n Go in collaboration with Nokia have launched Maxis FastTap. FastTap is an integrated mobile payment service which utilizes NFC technology. Mobile Applications join the growing list of payment options offered by Merchant Warehouse BOSTON, MA - *March 2, 2010*. Market sand Markets start a practice named BFS. It was about Analyst Briefing Presentation on Mobile Payment – Advanced Technology (NFC), Strategies and Future of Remote and Proximity Payment.

According to Google statistics, the growth of websites and articles about M-Payment is as shown in Figure 16.1. This figure depicted that, after 1996 the growth of M-Payment is enhancing rigorously. Scientists concentrated on this new technology in order to improve it towards easier usage among common people.
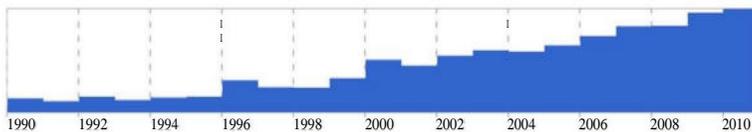
Figure 16.1   Growth of M-Payment

However, there are some opportunities and threats which affected M-Payment technology. For example, currently, most people in the

third world countries are less distinguished about this technology. Even though, they have some kind of M-Payment in their countries, thus, the usage is very low. Culture and weak adoption of new technology shade the advantage of this technology.

16.4   THE FUNCTION OF M-PAYMENT

This paper indicated mobile payment functionality into two major categories: 1- M-Payment methods 2- M-Payment transactions model. B2C M-Payment involves four actors in establishing its purchasing process, known as, 1- customer or consumer, 2- merchant or service provider, 3- bank or mobile service provider and also, 4- intermediate company [5].

(a) Customers are people who use their cell phones to pay for goods like airline ticket, or services like M-Banking services or online games payment. Method of payment is depends on user's cell phone and their expertise.

(b) Merchant or service providers are persons or company who provide goods or services which enabled sale orders by mobile payment system, like Amazon.

(c) Banks or companies enabled transactions submission and guaranteed its success.

(d) Intermediate company has a role in some kind of payment model which performs high level security using IVR or SMS to reconfirm transactions.
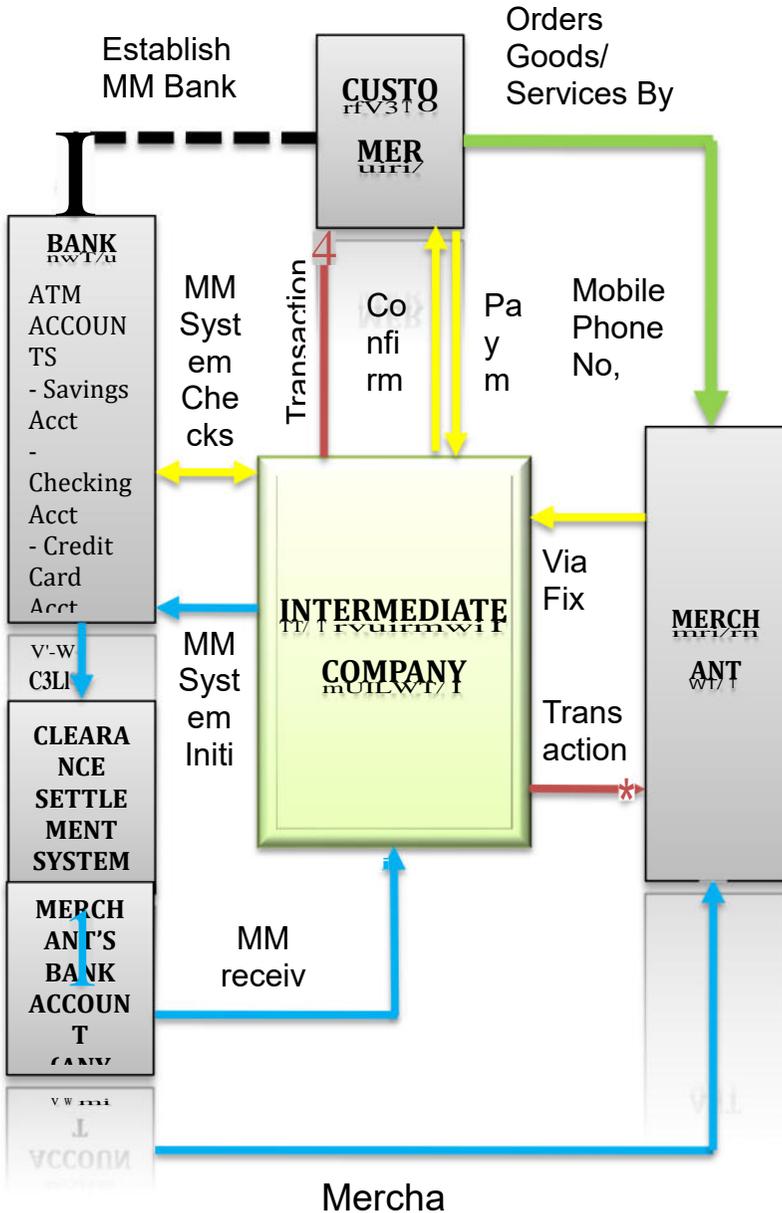
Figure 16.2   Mobile Payment Model

Figure 16.2 shows common steps of purchasing orders in mobile payment including all actors. Users can submit their order via phone, fax, website and email by giving their cell phone numbers to the merchant. The merchant payment request will be send to intermediate company or bank. Next, after typing T-Pin, the transaction confirmation will be send to users' cell phone. If there is an intermediate company intervened, it will check customers' bank account for approval.

After users' transaction was reconfirmed, the intermediate company receives its transaction fee and the merchant gets paid in a few days. In this process, the bank received account information about the merchant and customers from intermediate company. However, this payment model is not covering NFC payment method.

16.4.1   M-Payment Methods

16.4.1.1   SMS Based Transaction Payment

According to this method, payment instructions were done by consumers was requested using SMS or USSD. The charge will be applied via their phone bills. In other hand, if they have mobile wallet, the charge will be applied to it. The merchant will be informed the payment is done, thus the goods are released. The advantage of this system is that it is easy to be used by everyone using common or simple cell phones. In contrary, the disadvantages of this system are:
(a) The payments will not be successful until the SMS text is not delivered to the machine.
(b) Sending message is too slow resulting transaction delivery will

come undone.
(c) High costs are constructed by operators in order to install, run and support transactional payments.

16.4.1.2 Direct Mobile Billing

Mobile billing options usually used in websites which embedded E-Commerce such as online games or online ringtones. Consumers used this option to make their payments. A pin number will be sent to the customers' cell phone. After confirmation, consumers' mobile account is charged due to payment accomplishment. Therefore, this method does not need customers' credit/debit cards or online registration payment solutions. This type of mobile payment is extremely popular in Asia. Thus, banks and credit card companies are bypassing in the payment process.

There are two factors of system security in this method: 1-Authentication 2- Risk Management engine which can prevent fraud. In addition, users do not need to register on any website including new mobile software to use it. Another advantage of this system is that users can choose other options during checkout process. Rapid transactions are completed in this system. According to http://billmymoby.com web site, 70% of all digital goods used this payment method for online purchasing.

16.4.1.3 Mobile Web Payment (WAP)

According to WAP, customers use web page or additional application which is downloaded to their cell phones to make a payment. Wireless application protocol is used as its underlay technology. There are advantages and disadvantages of WAP. The advantages of this method that users can use URL which is easily revisit the website or internet and also, they can share their findings with their friends. Quick and safe payment of this method can easily satisfy customers' needs which are familiar to online

payment web pages. Next, users can also use different actual payment mechanisms like Direct operator billing, Credit Card and Online Wallet.

16.4.1.4   Contactless M-Payment (NFC)

NFC is a type of payment which used goods in physical store or transportation services payments. In this case, customers use a special cell phone which has a special smart card. Users keep their cell phone near a reader module and the transaction will be done. NFC usually does not need authentication because the transaction is secure by chip which is installed on users' cell phones but in some cases users set up a pin code for transactions. After they want to accomplish the purchase, the pin code should be entered and confirmed by intermediate company.
This method is commonly used for parking and toll. The payment can be deducted from bank account directly or charge to the mobile devices.

16.4.2   M-Payment Existence Payment System

16.4.2.1   Account-based payment systems

• Mobile phone based payment systems

This type of M-Payment uses mobile phones in different ways such as: 1- Multi application chip card (SIM & WIM), 2- Dual-SIM phone, 3- Dual-Slot Phone, 4- External WIM card reader, 5- Payment Software. However, problems infested in this solution, therefore, user needs to have special cell phones in avoiding problems using Overcharge SMS system. This mechanism is known as Premium SMS. This system calculated the cost of each SMS as equal to price of goods plus price of an SMS. Nowadays, this new platform based on WAP is flourishing.

● Smart card payment systems

This type of payment enabled users having prepaid debit card which will cover all transactions during their purchase by M-Payment. This project start with Swiss banks and the first smart card named Maestro card.

● Credit-card payment systems

In this method, users use their credit card as a backup account. Whenever they purchase goods by M-Payment, the expenditure of the goods will be withdrawing from their credit card.

16.4.2.2   POS payment systems

This mode of payment enabled users using POS terminal to complete their transaction. This terminal managed the process of sale through accessible interface by the seller. Whenever the transaction is succeeded, a printed receipt is given to the customers. The POS payment can categorize in two groups as the following:
(a) Automated POS payments.
(b) Attended POS payments.

The disadvantages of this system are users' cell phone is required to be modified and installed with a chip or application which is related to the merchant payment system including prepaid account.

16.5   ADVANTAGES   VS   DISADVANTAGES   OF   M-PAYMENT

Mobile commerce delivering right information at the right time to

the right place. It helps users to have accessible Internet reaching every place and time. This new business venture has an ability which was not available in traditional e-commerce [6]. Some advantages of M-Payment are shown in Table 16.2 as below:

Table 16.2   Advantages of M-Payment

Ubiquity	• Ubiquity is the primary advantage of mobile commerce. Users have access to the information that they need everywhere through the Internet using their mobile phones. They can buy goods, manage their account and top up their cell phone anywhere [6].
Suitability	• As frontline technologies are involved, it is reasonable that technical issues receive a lot of attention in academic literature. However, since insufficient user acceptance has long been an impediment to the successful adoption of any new payment system, it is imperative to consider what factors drive users (consumers and merchants) to adopt new MPS or inhibit them from doing so. The three principal forces which determine user uptake are dealt with in the following sub-sections: 1- Habit, 2- convenience, 3- price and acceptability [7].
Security and Regulatory Concerns	• Security is an important prerequisite for any type of monetary exchange. A secure environment in the traditional sense requires four elements to be addressed: Authentication, Confidentiality, Data integrity, and Non-repudiation. When applied to transactions over mobile networks security issues regarding device limitations and network immaturity have also to be addressed [7].
Personalization	• An enormous number of information, services, and applications are currently available on the Internet, and the relevance of information users receive is of great importance. Since owners of mobile devices often require different sets of applications and services, mobile commerce applications can be personalized to represent information or provide services in ways appropriate to a specific user [7].
Dissemination	• Some wireless infrastructures support simultaneous delivery of data to all mobile users within a specific

geographical region. This functionality offers an
efficient means to disseminate information to a large
consumer population [6].

Mobile device usage can be characterized by:
(a) Limited user attention given to the device and application
    (interactions with the real world being more important)
(b) User's hands being used to manipulate physical objects other
    than the device
(c) High mobility during the task, with the adoption of a variety of
    positions and postures
(d) Context dependent interactions with the environment
(e) High speed interactions with the device, driven by the external
    environment

Table 16.3 summarized some limitations of mobile device
that restricted users from performing mobile commerce activities
as the following:

Table 16.3 Disadvantages of M-Payment

Limited Memory	• Most mobile devices have limited memory storage. The insufficient memory capacity does not support the application of mobile commerce.
Limited processing power	• In order to conduct mobile commerce, the sufficient processing power is needed in order to ensure that application run smoothly. The processing power offer by mobile device does not same like personal computer does.
Different technologies and standards	• Another limitation is different technologies and standards. In this case, mobile device vendors use different technologies and standards in which some of mobile commerce's application do not supports by certain mobile devices. Different vendors apply different standards.
Small keyboard and input method	• The most limitation of mobile device is all about the small keyboard. In this case, it is bring difficulties for user to interact and navigate to the internet or conduct any mobile commerce application. Even

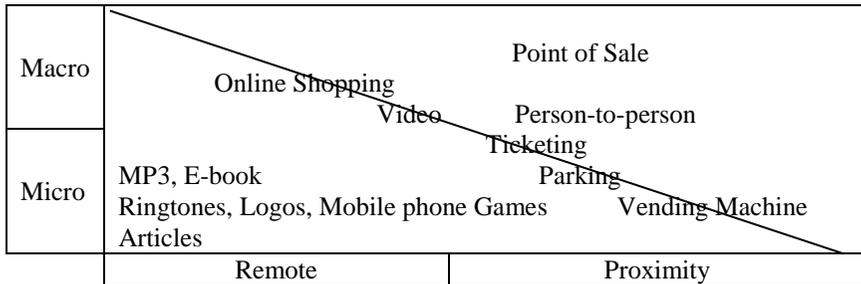|	
	though mouse replaced with pen-based interaction (stylus pen) it's still limits the usage of mobile device.
Screen size and color	• Another limitation is screen size and color. The small screen resolution limits the amount of information can be display in screen. This is a main challenge to design mobile application in which developer need to fits all the information into small screen devices.
Battery consumption	• Batteries are important for the mobility and portability of mobile devices. The issue of battery consumption is important while a person on the move has no time to recharge the battery.
Simplicity of user interface	• As people on the move, they have no time to read the instruction or use such a difficult or complicated application. In this case, the application definitely must be friendly and easy to use.
Limited bandwidth	• In order to conduct the mobile commerce application; there is need of sufficient bandwidth to transmit the information through the mobile devices.
Stability, dropout & connectivity	• The issues of connection as people on the move; mobile devices need to have some ability to save and minimize the loss of data while conducting the transaction.

Prior information given stated above acknowledged the author's overview of mobile business and mobile commerce in understanding their environment concerning definitions, attributes, drivers, categories and limitations as initial findings and considerations towards mobile application development. Next section of this paper is discussing mobile user interface to further understand human mobile interaction.

16.6   M-PAYMENT VS BUSINESS

There are three most common specifications in defining goods according to the types of commerce: price of goods (Micro & Macro), types of goods (Digital & None-Digital) and types of payments (Remote & Proximity). Figure 16.3 shows digital goods

are below the diagonal line and none digital goods are above it.

Macro	Online Shopping Point of Sale	
	Video Person-to-person	
	Ticketing	
Micro	MP3, E-book Parking	
	Ringtones, Logos, Mobile phone Games Vending Machine	
	Articles	
	Remote	Proximity

Figure 16.3 Business VS Mobile Payment

For example, video can be digital and also non digital good or else, point of sale can be defined as non digital goods and macro payment. Proximately users paid for this type of goods, or ticketing whether they are macro, micro or remote, proximity or digital or else, non digital. For example, E-Ticket for airplane is macro, digital and remote payment, but a cinema ticket, is a micro type. Nevertheless, all goods which are purchased in M-Payment can be categorized according to these categories.

16.7   CONCLUSION

Problems stated above are holding users from using mobile payment. Firstly, major problems should be fixed by proposing a standard model for M-Payment which can cover all types of customer needs and different types of businesses involving M-Commerce. This current model can be integrated with previous models in solving most of previous disadvantages. Another suggestion is developing a standard model based on package application which has different options in order for the users can easily adopt it in a different manner.

M-Payment is a new technology which is not possibly adopted by varieties of users and business due to restrictions such

as low payment goods and most contacts are involving young people with special educational level. For further leverage, this business needs to be pervasive by proposing models and methods which are more acceptable by various users. In some countries, because of technology restrictions and lack of devices, they could not adopt this technology in their business or in their purchase. The future plan is to find most popular payment method that most people in different countries can use and adapt to it. The acceptance of this business in developed countries is easier than third world countries. However, these countries like to join and be part of this new technology. The context should be provided for them. Nonetheless, the next important suggestion is system standardization. Users are most likely get confused if they are interfacing different types of systems.

Customers do not like to be obliged in buying new mobile devices in order to adapt this system. They need a system that is easy to handle and responds quickly which is acceptable by large number of merchants for further usage. We should design a system which can cover all these customers' needs. Development of M-Payment system requires developer to highlight the importance of customer comforts and easy access to the system, safe money transmissions to attract them and also, decrease users' frustration while they are using mobile technology.

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