MOBILE PAYMENT (M-PAYMENT): AN EXAMINATION OF FACTOR INFLUENCING ADOPTION IN THAILAND

BY

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ABSTRACT

Global business today has been revolutionized by an upsurge in technology where processing, packaging, and distributions as well as payment mode have practically brought tremendous changes to the way businesses are carried out or transacted. A change of the former payment took place when the internet was introduced to users who wanted to pay via electronic channels whose vendors are receivers, banks, or financial institutions, whenever and wherever they wished. However, it was mainly completed in a personal computer or a laptop and a prime concern was safety caution against fraud. Security and trust are thus important factors in M-payment adoption process. While the trends of digital and smart wireless devices have changed dramatically, there are some constraints that limit the number of M-payment users. This study will therefore explore the perception of security and trust in the service process of the M-payment adoption rather than M-payment mechanism. It will also focus on the relationship among security, trust, and customer satisfaction in M-payment adoption process as well as the factors that influence the differences among M-payment adopter stages.

In order to examine a mobile payment, this study has three objectives. Firstly, it explores the relationship among security, trust, and customer satisfaction in

M-payment adoption. Secondly, it examines the mediating effect of trust in M-payment adoption. Lastly, it explains significant differences in adopters in different stages and the M-payment adoption process, i.e. security, trust, M-payment adoption and satisfaction. Four-hundred-fifty respondents have randomly been selected from five main regions in Thailand i.e., Bangkok and central, northern, north eastern, eastern, and southern. This study utilizes a questionnaire survey for data collection. The validity measurement of the questionnaire is tested by the confirmatory factor analysis method. The techniques used in the data analysis in this study are descriptive, inferential and multivariate statistics. The result shows that trust, security and M-payment adoption, in a sequential order, have significantly direct impact on M-payment satisfaction.

However, the relationship between security and satisfaction shows a negative impact. It demonstrates that there are other related factors between security and customer satisfaction in M-payment adoption. After trust has been introduced as a mediator, the relationship turns from negative impact to be positive impact. The result shows that the customer's perception of trust can increase the level of satisfaction in M-payment adoption and security issue is not the only important factor in the adoption process. Although, this research shows significant differences among the M-payment adopters in different stages, the result claims only significant differences in M-payment adoption and customer satisfaction.

There are only a few studies in M-payment adoption that have a specific focus on security and trust in M-payment satisfaction. Besides, most of M-payment adoption studies were conducted in many developed countries because of their readiness of infrastructure and customers. Therefore, this study aims to be one of the first studies to explore the relationship among security, trust in M-payment adoption, and customer satisfaction in the context of developing countries, where their limitations and constraints are different.

Keywords: Mobile payment, Adoption, Trust, Security, Adopter Stages

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CHAPTER 1
INTRODUCTION

Advances in Information Technology have contributed substantially to today's globalization. The widespread usage of IT and its rapid changes have affected nearly every aspect of life around the world. To cope with these, many countries have to take potential factors such as social issues, human resources and technology into consideration. One of the most popular systems is mobile communication that reflects the improvement of a country development and involves everyone's daily life. As cited in various researches, the rate of the mobile communication usage is increasing every year due largely to free trade areas, the cheaper cost of mobile equipment, and more availability of service providers that is beneficial to consumers in terms of good services at satisfying prices.

In recent years, with the increasing number of mobile users, mobile applications and services have become the focus of attention of businesses and users alike. With the first generation mobile communication (1G) and the second generation mobile communication (2G), the stress on the voice transfer is not enough to cater for the user needs. Today, consumers tend to use their mobile devices for various activities and entertainment. They search for conveniences to facilitate their daily life activities, for instance, their shopping and payments due to changes of lifestyles and time constraint.Currently, Thailand is implementing the third generation mobile communication (3G) on a large-scale basis marking its formal entry into the 3G era and also developing the advance efficiency of the mobile network for the fourth generation mobile communication (4G). Based on the context of the 3G era, the country has witnessed a rapid development of various mobile transaction services such as buying, selling, payment, etc. The major activity to complete the process is undoubtedly payment. Over an extensive period of time, payment has played a significant role in the successful operation of business. While a former form of payment was a direct meeting between buyers (payers) and sellers (receivers) and emphasized on cash, favorable conveniences have later been offered by intermediaries such as banks and financial institutions. They help facilitate the payment process and

provide various options like credit cards and other non-cash payments. Obviously, the developing trend in technology and the current widespread usage of the Internet have affected our routine lives and activities. They also certainly have influenced the payment methods that suit our present lifestyles.

While mobile commerce becomes more popular, mobile payment has an increasing role in facilitating secure electronic transactions between organizations or individuals (Ondrus & Pigneur, 2006). The former form of payment was modified when the Internet was introduced to users who wanted to pay at anytime and anywhere they wished to their receivers, banks, or financial establishments. A safety caution against fraud was a primary concern since it was mainly done in a personal computer or a laptop. Sales of smartphones and tablets has increased continually for many years. The world has obviously entered the mobile device period as from 2011.Growing in sales of smartphones and tablets is clearly witnessed in America and the European continent while the growth in Asia is especially outstanding due to its large population. As a result of the new trend of lifestyles and the widespread usage of the mobile devices, the mobile payment, hereafter called M-payment, has been explored and introduced to a large number of worldwide smartphone and tablet users. For example the usage rate in USA, Europe, South Korea, and Japan is high. In contrast, a survey shows the number of M-payment users are quite low in various countries. In Thailand, for instance, mobile devices are very popular but M-payment usage is rare. M-payment should be a convenient way for payers and receivers to complete their transactions as it can eliminate several physical limitations such as location and reduce travelling expenses. An evolution from a traditional payment to a more practical and convenient way for business transactions through mobiles was commonly seen (Mallat, 2007). Remote payments through premium rate SMS, WAP billing, Mobile Web, Direct-to-subscribers' bill and direct to credit cards were typically offered. According to Gartner (2012), the transaction value of mobile payments for digital goods (such as music, games and ticketing), physical goods (such as gifts, books or consumer electronics devices) and services would exceed $721 billion with more than 450 million users throughout the world by 2017.

According to the Bank of Thailand (BOT, 2012), the contributing factors to the expansion of the M-payment usage in the future are :1) The world population of mobile device usage is 3.8 billion; 2) Two billion people have their own banking accounts that are able to access M-payment easily; 3) More than 2.5 billion people who do not currently have their own banking accounts are prospective M-payment target. According to Sullivan's IT trend analysis, the trend of the growing of the mobile device (smartphone and tablet) market is up to 66percent per year since 2014 whereas sales of personal computers tend to decrease around 7percent per year within the next 4 years. Considered by region, the Asia Pacific market only is growing 27percent per year. According to Gartner group and Jupiter research, their forecasts illustrate a leap in the growth of M-payment and mobile devices by 2017.

For Thailand, the outcome of mobile devices and the Internet growth affects the style of M-payment usage. In 2013, M-payment usage via smartphones increased145.80percent and 60.66percent via tablets whereas the payment via computers decreased 11.88percent (ATCI, 2014). Thailand ICT survey (ATCI, 2014) shows the number of mobile devices in Thailand such as mobile phones and tablets increased every year from 2011 to 2013. Moreover, the number of smart phones and the volume of mobile Internet usage have been increasing rapidly. However, only a few of mobile users have their experience with M-payment. The ratio between M-payment volume of bank and non-bank transaction usage is only 2.78percent of domestic payment transactions. In fact, the crucial reason behind the small figure of Thai M-payment subscribers is trust in payment services on the Internet via mobile devices (Tsiakis and Sthephanides, 2005; Mallat 2007). In other words, trustworthiness on security is their key concern. In this study, M-payment is defined as a payment operation in which a mobile device is utilized to initiate, authorize, and confirm a commercial transaction (Au and Kauffman, 2008). The mobile devices cover only feature phones, smartphones, and computer tablets. The study population is explores M-payment users in Thailand from 5 regions, which are Bangkok, Central, Northern, Northeastern, and Southern.

1.1 Problem Statement

According to, the most crucial factor for payment services over the Internet and mobile service is consumer trust as consumers never have a chance to meet service providers in person. The service providers, who are aware of this fact and are able to build customer trust, will certainly see the increase in their M-payment users and their profit accordingly. In this research, the factors that affect security in M-payment adoption and consumer satisfaction towards M-payment service providers will be analyzed. In the innovation adoption process, many factors that may affect customer satisfaction will be discussed. Security, one of such factors that plays an important role, will be examined. The security in this service area consists of integrity, confidentiality, and availability. A number of prior adoption theories that have looked into technology adoption are discussed. One model of the IT adoption that has been adapted in M-payment is Diffusion of Innovation (DOI), which consists of relative advantage, compatibility, complexity, triability, observability, and cost. Hence, this research attempts to explore:

1.What are the relationships among customer trust, security, and adoption factors on M-payment satisfaction?

2. What are the factors that influence the difference M-payment adopters stage in M-payment adoption?

1.2 Research Objectives

From the problem statement above, this research has three objectives as follows:-

1.To evaluate impact of trust, security, and adoption factors on M-payment satisfaction

2.To identify the influencing factors among the differences of M-payment adopters stage

3.To determine the indirect effect of trust on M-payment adoption

Finally, this research aims to find the roles that trust, security, and adoption factors play in influencing M-payment satisfaction. It is expected that this research will benefit not only the business sector but also the academic researchers, giving them a better understanding of the current situation, existing problems, solution and

further development.

1.3 Expected Contributions of the Research

As mentioned in the above section, this research aims to study the impact that trust and M-payment adoption has on M-payment satisfaction in Thailand. The relationship of influencing factors on M-payment adoption will be described. It will be the prototype study of security and trust in M-payment adoption. In addition, it is expected that the findings will contribute to both academic and the business sectors that provide mobile payment services in Thailand.

1.3.1 Contribution to Academic Community

Despite numerous studies in information technology and information system adoption, most of them use IT and IS theories to examine the relationship between adoption factors and customer satisfaction. There are only a few studies in M-payment adoption that have a specific focus on security and trust in M-payment satisfaction. Besides, most of M-payment adoption studies were conducted in many developed countries because of their readiness of infrastructure and customers. Therefore, this study aims to be one of the first studies to explore the relationship among security, trust in M-payment adoption, and customer satisfaction in the context of developing countries, where their limitations and constraints are different.

1.3.2 Contribution to Business Sector

Security and trust are one of the most important factors, which have effects on customer satisfaction in M-payment services. This research attempts to identify relevant factors that influence the relationships among security, trust, and customer satisfaction in M-payment adoption. It is expected that the findings will improve more beneficial to the mobile payment service providers in Thailand.

1.4 Overview of the Dissertation

This research is categorized into five major chapters: introduction, literature review, research methodology, result analysis and research discussion and conclusion.

Chapter 1 introduces the problem statement, research questions, research

objectives, and overviews. The research objectives focus on the impact of trust in M-payment System adoption in Thailand. The last section of this chapter discusses research contributions.

Chapter 2 is the literature review on five topics, which covers M-payment system, trust in mobile device, security, CAI security model, and the adoption of Diffusion of Innovation (DOI) theory in M-payment. The research conceptual model and research hypothesizes are also presented in this chapter.

Chapter 3 describes the research methodology. The research approach is written in the research methodology step. The methodology is categorized into three modules as follows: the scope of study, the sampling design, and the data analysis techniques with the statistics methods explained in detail. The construct definition and its measurement are demonstrated at the end of this chapter.

Chapter 4 shows the results. The data were selected from the 450 questionnaires responded by M-payment adopters in Thailand. A random data collection method was used. Three statistic techniques of data analysis i.e. descriptive, inferential and multivariate techniques statistics were applied.

Chapter 5, which is the last chapter of this dissertation, presents the research discussions and conclusions. Moreover, the recommendation, limitation and future study are indicated in the final section respectively. It is expected that this research provides knowledge for academic and practitioners alike, especially for those in the M-payment service provider sector.

CHAPTER 2
LITERATURE REVIEW

This chapter presents a literature review on M-payment, its usage, adoption concept, situation and trend. Then, it describes the conceptual definitions of the main construct, “Trust”, “Security”, and “Diffusion of Innovation Theory”. The next sections discuss about the related research, research conceptual framework, and hypotheses respectively.

2.1 Mobile Payment (M-payment)

Mobile payment (M-payment) is a trade application that allows users to pay for services and goods via mobile devices (Mallat, 2007). It also refers to payment transactions in which funds or money are handed over from buyers to sellers via middlemen or directly through electronic devices whenever and wherever they wish. Another definition defines a payment instrument as a tool for the payer to start the transfer of assets or claims on assets, to discharge a payment obligation, which pertains to a monetary claim that is accepted by the recipient (ECB, 2003, p. 61). Zheng and Chen (2003) describe M-payment as “any transaction with a monetary value that is conducted via a mobile telecommunications network”. Pousttchi (2004) defines mobile-payment as, “that type of payment transaction processing in the course of which – within an electronic procedure – (at least) the payer employs mobile communication techniques in conjunction with mobile devices for initiation, authorization or realization of payment.” Carr (2007, p. 1) defines M-payments as “any payment where a mobile device is used to initiate, authorize, and confirm an exchange of financial value in return for goods and services”. M-payment is an optional kind of payment procedure fulfilled by mobile tools and wireless communication technologies or proximity technologies to pay for goods, services, digital contents such as game and multimedia downloading, parking fees, concerts or transportation fees, etc. It can be operated via other devices, such as tablet PCs or personal digital assistants (PDAs), which have the same abilities to perform M-payment deals as smartphones (Karnouskos and Fokus, 2004). These devices and

technologies allow users to connect to servers for authentication and approval for assurance of safe arrangements prior to monetary transactions (Antovski and Gusev, 2003; Ding and Hampe, 2003b; Au and Kauffman, 2008; Dahlberg et al., 2007).

M-payment has been broadly promoted while cell phones have become pervasive buyer gadgets. In general, M-payment can be classified into two main groups as macro payments and micro payments, which can be remote or local in distance usage. All technologies proposed to users and all work organized and carried out by M-payment service providers constitute M-payment services. According to prior studies (e.g., Guo, 2008; Manvi et al., 2009; Massoth and Bingel, 2009; Mohammadi and Jahanshahi, 2008; Rahimian and Habibi, 2008), security, cost, functionalities and scalability have been improved through various recommended technology architectures and/or solutions. M-payment services include some parties that do unusual value-adding duties in the M-payment delivery chain (Dahlberg, 2007). They can also be divided into two types: payment for paying bills/invoices and payment for procurement (Karnouskos 9and Fokus, 2004). Paying the bills/invoices by using M-payment regularly gives an opportunity to an account-based payment and consists of online banking payments, direct debit tasks, or money transfers. M-payment for procurement, on the contrary, contends against cash, credit cards, debit cards and cheques. Many studies (Gao and Damsgaard, 2007; Passerini et al., 2007; Sangwan and Pau, 2005) have highlighted the selection of M-payment usage as under.

2.1.1 M-payment Usage

The extent of mobile technology infrastructure in different countries is likely to have an impact on M-payment adoption and diffusion around the world. In different countries, the area of mobile technology adoption has been published in various studies such as M-commerce, M-learning, M-banking, and M-payment. Some studies emphasize the discovery of mobile technology services adoption in an individual country (Blechar et al., 2006; Lu et al., 2008; Passerini et al., 2007; Sangwan and Pau, 2005). Several models (e.g., Gao and Damsgaard, 2007; Fang et al., 2005) have been offered to demonstrate the mobile technology adoption phenomenon. The adoption of M-payment has been conducted in many countries such

as Finland and Dutch (Mallat et al., 2004), the United States (Dewan and Chen, 2005), and Switzerland (Ondrus and Pigneur, 2006). What is currently lacking, however, is a comprehensive investigation of the adoption of the technology across different countries. Diverse constituents such as infrastructure, rules, and characteristics of population may play different roles in different countries and are based on different areas, for instance, information technology, economics, psychology, and sociology(Gao and Damsgaard, 2007; Lu et al., 2008; Passerini et al., 2007; Sangwan and Pau, 2005).

The calling and sending SMS to a premium rate service number are simple methods to operate M-payments in Europe (Menke and de Lussanet, 2006). Payments for services and goods are deducted from a prepaid balance account or a prepaid airtime of a prepaid user or they are charged to a mobile phone bill of a postpaid customer. Currently, it has been replaced by smartphone payment via an Internet connection while smartphones can still perform as an access channel for the existing payment means such as payment through credit cards, debit cards, and bank accounts.

However, another option of payment is to open an account for transferring of money to be deducted for M-payment. Proximity payments, such as i-mode Felica in Japan is an example of new generation M-payment solutions. It has a different procedure from SMS-enabled payments by embedding contactless RFID (Radio Frequency Identification) chips in mobile phones (Taga and Karlsson, 2005). Existing and prospective M-payment applications cover, for instance, buying mobile content services, vending, ticketing, payments on the Internet, peer to peer fund transfers and payments for services in restaurants and shops (Kreyer et al., 2003; Taga and Karlsson, 2005).

2.1.2 Reason to Adopt M-payment

According to prior studies, a major obstacle of M-payment adoption, viewed by M-payment business companies, is the consumer acceptance (Edgar Dunn and Company, 2007). The two largest obstructions to the success of mobile payment implementation are the buyer and the user perception. One of the key issues to be asked is as to whether intended users will or will not use M-payment. Though prior studies suggest that they are interested in M-payment applications (Dewan and Chen,

2005; Kreyer et al., 2003), more research to further investigate specific factors that influence their decision is nevertheless needed.

2.1.3 Worldwide M-payment Situation and Trends

2.1.3.1 Previous Worldwide M-payment Adoption

Many studies focus on the adoption of M-payment trends in several countries. According to Lee et al. (2005), fifty millions of wireless phone users in the United States planned to use handheld devices to make their payments (17 percent of total projected population increase, and about 26 percent of all wireless users). Sweden and Finland are considered as the mobile explorers in all mobile services adoption (Aarnio et al., 2002) while in other countries the adoption of M-payment has also been significant. In 2004, 56 million people in Italy are the users/owners of mobile phones, 2 million and 5 million of whom have used M-payment in 2004 and 2005 respectively (Dholakia et al., 2006). The M-payment adoption rate in Thailand, Vietnam, and Hong Kong are resemble. In the early year of 2000, banks in Thailand started proposing M-banking services (Dholakia et al., 2006). The center of M-payment applications is developed in Russia (Dholakia et al., 2006).

Laforet and Li (2005) studied the mobile/online payment situation in China. The result demonstrated that mobile banking and services are at their beginning point. Fees, population factors, and security were main obstacles to M-payment adoption. Kreyer et al., (2007) conducted a study in Europe and found that out of a total of 16,000 respondents, about two-thirds stated that they would use or consider using M-payment. According to Dholakia and Dholakia (2002) study is ranked 25 chosen North American, European, and Asian countries for the adoption of M-payment. Hong Kong was in the first place followed by Finland and Sweden respectively. The United Kingdom ranked 14th, Australia ranked 17th and the United States ranked 19th. A study related to the adoption of M-payment in Australia by Teo (2005) showed that M-payment adoption was still not widely accepted.

2.1.3.2 Worldwide and Thailand M-payment Trends

Trends of M-payment have been investigated by academic researchers and by the industry globally to foresee the spread of mobile services comprising of M-

payments/M-banking. According Gartner (2012) survey, the worldwide M-payment users were 74.4 million in 2009, 70 percent increment over the 43 million users in 2008. The Gartner, a famous commercial research company, forecasted that the number of mobile payment users for buying merchandise and services worldwide would be double by 2012. The increasing of M-payment adoption will be the highest in the Asia Pacific region and Japan followed by Eastern Europe, the Middle East, Africa, Latin America, the United States, and Western Europe (Hamblen, 2009).

In fact, from 2010-2011, a number of M-payment usages grew up continuously. The number of users was up to 40 percent, or double in volume of the value amount (Gartner, 2012). In year 2012, the growth rate of M-payment usage is increasing 62 percent from 2011. The trend of M-payment growth is still rising continuously. As there are many service providers of payment via mobiles, the survey comparing a number of M-payment users and the worldwide volume between 2012 and 2013 conducted by Statista (2014a) shows that the number of users increased by 22.11 percent and the usage increased almost 45 percent as shown in Table 2.1:

Table 2.1 Statistics of Worldwide M-payment Users and Volume in 2012 and 2013

M-payment Users and Volume Worldwide in 2012 and 2013		
Year	**Users(million)**	**Volume (billion U.S. dollars)**
2012	200.8	163.1
2013	245.2	235.4

Note: Includes mobile payments via SMS, Unstructured Supplementary service Data (USSD), WAP/mobile Internet and near-field communications (NFC), Source: Statista survey (2014)

Table 2.2 shows the ratio of M-payment users in each continent in 2012 and 2013. Asia Pacific has the highest number of users. The second highest number of users is Africa (Statista, 2014).

Table 2.2 Statistics of Worldwide M-payment Transaction Value by Region in 2012 and 2013

M-payment Transaction Value Worldwide by region in 2012 and 2013				
Year / Region	**2012**		**2013**	
	Users (millions)	**% of value**	**Users (millions)**	**% of value**
Europe and Middle East	28.20	13.28	37.00	14.15
North America	32.80	15.45	46.50	17.45
Asia-Pacific	85.00	40.04	102.10	38.31
Africa	57.80	27.23	69.70	26.15
Latin America	8.50	4.00	10.50	3.94

Source: Statista survey (2014)

Due to the tendency for M-payment users to increase from 2013 to 2017, it is forecasted that the usage will grow up from 235.4 billion US dollars in 2013 to 721 billion US dollars in 2017 and the number of users will increase from 245.2 million users to 450 million users respectively (Statista, 2014) as shown in Table 2.3.

Table 2.3 Statistics of Worldwide M-payment Volume in 2013 and Trend of Worldwide Mobile Payment Volume in 2017

M-payment Transaction Volume and User in 2013 and Trend Worldwide in 2017		
Year	**Volume (billions)**	**Users (million)**
2013	$235.40	245.20
2017	$721.00	450.00

Source: Statista survey (2014)

Several research institutions speculate that within 4 years (from 2013 to 2017) number of M-payment users will increase tremendously. The worldwide amount of M-payment will be up to 600,000 million US dollars with 450 million users within

2016. In 2017, it will be 1.1 trillion US dollars (IDC, 2012). The high amount of the above M-payment market volume results from the growth of mobile device (smartphone and tablet) market, the development of communication technology, the trend of M-commerce, and other technologies, such as Near Field Communication technology (NFC), that support the use of M-payment (eMarketer, 2013). The United States is the first country that widely uses M-payment and it has the most usage volume in the world. Its popularity arises from the fact that several pioneers of M-payment businesses, such as Square, Intuit, are in the United States. People feel familiar and secure with M-payment usage. Furthermore, there are a lot of M-payment providers in the country. A quarter of the total number of mobile device users in the United State and Western Europe within 2017 is willing to use M-payment via NFC instead of credit cards due to its conveniences. For Asia, China currently becomes the biggest M-payment market. In 2103, the growth rate is up to 317.56 percent compared with 212.86 percent in 2012 (People Bank of China, 2014). The amount of M-payment, constituting a high volume, is growing from 1.67 billion US dollars in 2012 to 1.59 trillion US dollars in 2013 (Juniper, 2013). Gartner Group (2012) forecasts that in Asia, especially China, we will see the highest number of M-payment subscribers due to its largest number of mobile device users among other regions.

However, M-payment is not yet popular among Thai people. Paysbuy, which is a subsidiary of DTAC Company and one of the M-payment service providers in Thailand, states that the number of M-payment users via smartphones in 2013 rises 145.80 percent and 60.66 percent via tablets compared with the number of users in 2012 (Bangkok post, 2014). In contrast, the number of M-payment users via PC computers drop 11.88 percent compared with the figure in 2012 (ATCI, 2014).

2.1.4 Types of M-payment

2.1.4.1 Remote M-payment Application

M-payment solutions, also called as the remote M-payment applications as they can be done remotely and independently from the user location, are transactions facilitating applications. They include three different types of payments. The first type covers the mobile content and service payments made directly through the mobile

service providers, for example, for purchase of news, ringtones, and location information, including low-value payments such as the approach of “pay-per-click” or “pay-per-view” charging. The second type includes online item purchasing payments, which can be done through the mobile device web browser. The third type involves P2P (person-to- person) M-payment applications, which facilitate the financial transmission from one to another via the mobile devices on the network of mobile service providers (Funk, 2004; Karnouskos and Fokus, 2004; Varshney, 2002).

What they have in common is the transferal of money via a mobile service provider to the specified recipient subject to prior authorization from the account holder. Examples include the Orange M-payment system that allows mobile subscribers to make the financial transactions through credit cards from elsewhere, or Paypal that launches Paypal Mobile to allow the transactions from distance, or Vodafone m-pay and Mobipay in UK and Spain respectively. It is important to note that the above three modes of the remote M-payment applications in general require client's pre-provided detail of account to securely prevent the trouble from account information transmission for each payment. However, many limitations come from the devices such as small size texts and problematic visual display. They can be charged via either the regular monthly bills or directly debited from the holder’s bank account.

2.1.4.2 Proximity M-payment Application

Proximity M-payment applications are transaction facilitative solutions that enable mobile devices to communicate locally with automated teller machines (ATM) and points of sale (POS). Transactions are made through the use of low power wireless connectivity protocols like Bluetooth or other similar technologies in this communication field. Examples are ATMs money withdrawal, parking payments, and POS payments. They also include a micro-payment application that works in the same way as a POS. Through this application, there is a communication between a mobile device and a ticketing kiosk or a vending machine in order to buy the desired items (Varshney, 2002). The monetary value is kept either in a form of digital cash or in a non-contact smart card in a mobile device. Moreover, users can be charged on a credit card by their mobile service provider (Funk, 2004). The Finnish wireless provider

"SONERA" was one of the very first firms that provided the solutions via micro-payment for soft drink purchasing from vending machines in the early of 1997.

2.1.5 M-payment Technology

M-payment solutions for average mobile phones may apply different techniques to transmit data. These include SMS, USSD, voice and inbuilt Internet connection (4G LTE/3G/GRPS/EDGE) adoption, depending on the applications housed in the client's mobile device. They may be embedded into the mobile phone memory or issued from the mobile network operator (MNO), commonly known as a Subscriber Identity Module or SIM card.

Table 2.4 M-payment Solutions

M-payment Solutions	Description
SMS	Short Messaging Services are normally employed in the purchasing of pictures, ring tones, video clips, and enter competitions.
USSD	Unstructured Supplementary Service Data provides quicker response rate compared to SMS.
4G LTE/3G/GPRS/EDGE	Internet M-payments that enable the users to fill in their credit/debit card details to complete the transaction.
IVR	Interactive Voice Response technology enables the user so complete the transaction through the specified number dialing and applying voice for the particular desired service selection.

2.1.5.1 SMS

Short Message Service (SMS) seems to be the most popular M-payment technology. Originally, this service is designed to enable the short message sending by subscribers to other subscribers with up to 160 characters. MNO servers, so called as SMS centers, are employed to distribute messages to subscribers on the same or different network. SMS is adopted worldwide and is mostly used for remote micro-payments for digital contents. The core solution applied is the MNO billing system,

which is used to buy pictures, ring tones, and video clips as well as to participate in competitions. While SMS rates are charged for the services, premium SMS rates, which are paid by the user of the recipient phone rather than the message sender, are more expensive.

2.1.5.2 USSD

M-payment based on Unstructured Supplementary Service Data (USSD) is also popular in many countries. It is unique to GSM networks and is an additional data transmission channel. A USSD string is something appears as "*120*777#". It is a session-based that gives quicker responses compared to SMS. However, this solution type is more complicated to implement as it is actually aimed by the content/service provider for the MNO internal connection. An example of a USSD service is menu providing for users. After "*120*777#" has been dialed, the users will receive service lists to subscribe and the transaction can be initialized from billing cycle activation.

2.1.5.3 4G LTE/3G/GPRS/EDGE

The mobile device Internet capabilities are applied in some M-payment solutions to enable the implementation of 4G LTE (Long Term Evolution), 3G, General Packet Radio Service (GPRS), or EDGE (Enhanced Data for GSM Evolution) web-based M-mobile payment solutions. Most of customers were designed to apply EDGE at the beginning. (Carr 2007, p. 3, 4). This M-payment solution can be seen, for example, in one that enables the 4G LTE, 3G, or EDGE. Firstly, users have to login to buy various goods or services such as event tickets by debit or credit cards and then fill in the card details via the keypads of their mobile devices to complete the payment.

2.1.5.4 IVR

M-payments can be externally done from the Interactive Voice Response (IVR). This technology helps clients to apply their mobile phone's keypad and voice to form the mobile payment. It is popularly used in M-payments, airline ticket reservation, and mobile banking (Mallat et al. 2004, p. 44).

2.2 Trust and its Applications

The bond between the public and the organization has relied on trust as the vital aspect (e.g., Bruning and Ledingham, 1998; Grunig et al., 1992; Hallahan, 1994; Huang, 2001). In this online decade, trust has become even more critical and it can shape up the Internet future as well (Luo, 2002). Luo (2002) also asserts on the crucial issue of trust by exploring in this area. Trust has been put forth on so many terms such as "reliance upon the characteristics of an object, or the occurrence of an event, or the behavior of a person in order to achieve a desired but uncertain objective in a risky situation" (Giffin, 1967, p. 105), "an expectancy held by an individual or group that the word, promise, verbal or written statement of another individual or group can be relied on" (Rotter, 1971, p. 444), and "confidence in an exchange partner's reliability and integrity" (Morgan and Hunt, 1994, p. 23). The concerns of online trust normally challenge the firms that need to shift into an e-business (Luo, 2002), including e-banking market. Absence of trust usually is noted as the unwilling reason for consumers to purchase online, which hinders an online relationship exchanging formation in several organizations and businesses (Cheung and Lee, 2001; Rodgers and Harris, 2003).

A survey conducted by the Conference Board Survey found that a financial transaction process in buying products online generates top anxiety among Internet users (Gonsalves, 2005). Therefore, trust is not only the short-term issue, but also the very crucial long-term obstacle hindering the engagement of clients in E-commerce, and M-commerce (Grabner-Kraeuter, 2002). Gefen and Straub (2004) agreed that trust in E-commerce is more important than in the traditional commerce due to limited chances to regulate customs and rules from the online environment. A similar kind of tangible assurances grasped from the traditional way of trade are usually not provided from online transactions. Since the concerns of consumers seem to be the security level on the sensitive or the private information sharing online. This was suggested from Warrington et al., (2000) that E-businesses find the way to provide cues to encourage customers to trust the firm. It seems that a website is the primary promotional tool that has been employed to mediate organizations and customers relationship (Grabner-Kraeuter, 2002). These could be indirect cues to facilitate trust environment in the firm's website and might consist of privacy, name recognition,

security policies, and the availability of address and telephone number of the firm. Trust at its core is an interpersonal phenomenon, where customers need to feel connected with an individual not the website (Koehn, 2003).

Range of trusting cues presented on the firm website is an organizational strategy employed to signal the firm's direct intent to engage with individuals. The openness between consumers and organization communication could be another element for online trust fostering. Actually, “there is a constant reinforcing between trust and communication” (Luo, 2002, p. 115). Phishing plague examining over the E-commerce, E-business, and M-commerce regarding the risk on communication crisis might provide additional clarity for the public relations role. For example, organizational crises have been defined by Seeger et al. (1998) as “ an unexpected, particular and non-routine series or situation that boosts up the high level of uncertainty and perceived to threaten on the firm’s high priorities goals” (p. 233).

“Only in the risky and uncertain situation where trust exists, it may not be required if the actions could be completely done without risk in certain way” (Grabner-Kraeuter, 2002, p. 44). Encouragement for openness in an organization and the candid information exchange regarding the associated risk nature will result in the stronger trust level. Also, risk communication could strengthen the trust between an organization and consumers. This will educate consumers on phishing associated risks and this precaution can help them in suspicious e-mails information sharing. In other words, the awareness on the information and the education has become crucial and be the first defense to cope with phishing.

According to Williamson and Craswell (1993), trust is crucial and complex with several meanings. Many of researchers attempt to provide definitions either in conceptual or operational terms (Anderson, and Narus, 1990; Moorman, et al., 1992; Morgan and Hunt, 1994; Doney and Cannon, 1997; Ellen and Mark, 1999; Birgelen et al., 2001; Chiou et al., 2002). However, in the specific context, trust is mentioned in a study conducted by Atuahene-Gima and Li (2002) that trust is not a global trait. Kumar (1996) said it may not be easy to generalize the former definitions into other contexts, including the relationship with consumer marketing service (Ellen and Mark, 1999). In common, not only that trust is crucial for the interpersonal interaction in normal product buying, but also for the close interpersonal relationship (Fleeson

and Leicht, 2006). Individuals are indicated by Deutsch (1958) to have trust on the occurrence of an event if their expectation leads to their behavior that is perceived on the negatively vast motivational results. Therefore, Deutsch (1962) defined trust as actions to raise one's vulnerability to another. This term is also defined by Rotter (1967) as the anticipation that can be relied on by another individual or group. According to these terms of references, trust means one party's expectation to believe on another party for the mutual good between the two.

2.2.1 Nature of Trust

In the broad agreement, trust is referred to as the psychological and social phenomenon. There are so many diverse perspectives according to the way people locate trust in each of socio-psychological space. Prior study divided trust into four levels, which are the level of individual, personality trait, interpersonal, and social interaction (Chopra and Wallace, 2003). When one actor has relationship with another, it is the emergence of mutual relationship, societal property or the community feature as a whole. The individual level can be defined by the statement of "I trust", the interpersonal level enlarged into "I trust you", the relational level broadened further into "You and I trust each other" and, lastly, the societal level expanded into "We all trust." Purely, psychological attribute has been treated on an individual trust; a generalized expectancy is based on a cumulative experience of one's toward others (Rotter, 1971).

However, the criticism for this approach is that the reductionist fails to consider the social context where the specific instance of trust takes place (Lewis and Weigert, 1985). Psychologically, it is unlikely that trust itself, but rather a trust propensity, that affects individuals' perception to broaden their trust in a specific instance (Mayer et al., 1995). The most general approach treats trust as a specific social tie between trustor and trustee (Mayer et al., 1995). Very often this relationship is defined as the trustor's attitude toward trustee, for example, anticipation to be confidence on the competence of the trustee (Blomqvist, 1997 ; Giddens, 1990), generosity (Blomqvist, 1997 ; Hardin, 2001; Rousseau et al., 1998), ethical behavior (Barber, 1983), or actions in the future (Anderson and Weitz,1989; Gambetta, 1988; McAllister, 1995; Zaheer et al., 1998). Trust in the relational perspective is not treated

as a behavior or an attitude that is directed from one person to another but it is the whole relationship of an emergent property.

Trust is described as the social glue for social relationship to carry on for lack of role expectations (Seligman, 1997) or as a developing habit that derives from the relationship over a period of time (Solomon, 2000). Trust as societal models puts emphasis on its significance to make a society function properly. A functional account of trust is brought forward by these models, focusing on its role to help people handle social complexity (Luhmann, 1979). This type of trust has been named "system trust" (Lewis and Weigert, 1985; Giddens, 1990; Luhmann, 1979) or "social capital" (Uslaner, 2000). It is a required prerequisite for social institutions and mechanisms, for example, economy (Fukuyama, 1995), science (Luhmann, 1979), and government (Braithwaite and Levi, 1998).

2.2.2 Trust in Mobile Devices

M-banking and M-payment provide financial transaction services from one to another account, retail sales, and loans (Loretta et al., 2008). Clients can obtain their balance information through SMS on their mobile devices. Clients can access to a large service range via 4G LTE, 3G, and EDGE to purchase the items by M-payment, stock trading, or to process the financial transfer from one to another account via mobile devices. In Europe, the popularity to adopt M-banking and M-payment seems higher, while due to the absence of trust on M-banking among clients in the United States, these services have been closed by the banks.

Security and convenience are the key factors of advancement in M-commerce, M-payment, and M-banking, (Mallat et al., 2004). Because the nature of online processing financial transaction that has no face to face interaction, trust then becomes the most significant factor for M-banking. Business partners form up confidence through trustworthiness on the conformance on business rules (Chou et al., 2004; Zhou and Li, 2010). Technologies acceptance and the willingness to conduct the financial transferring transaction would also depend on clients' trust. Lower trust on M-banking and M-payment among clients seem result from some insecurity issues, cost, and convenience to adopt the process of M-banking and M-payment.

2.3 Security

Security is required in order to protect potential damage from cyber attackers who attempt to hack into the system either accidentally or intentionally to provoke failure in order to grasp benefits. These attackers normally benefit from system or network damage by manipulating the objects into the system or the network for harmful results. The manipulated objects that can be inversed into harm, therefore, have value to be protected. Stakeholders establish the security goals for the objects in the system context either in tangible such as cash, or intangible like data with direct or indirect value as they wish to preserve. Security goals are hence established by stakeholders in the system context, whether they are tangible (such as cash) or intangible (such as information), with direct or indirect value they wish to maintain.

The value is direct when the object has underlying valuable quality. It is indirect when its quality originates from the context in which it resides. Either with direct or indirect value, the object is referred to as assets (ISO/IEC, 1999). In fact, the stakeholders need to guard themselves from all potential harms from assets abuse. For instance, the attackers might destroy the tangible assets, modify, or steal them; in this case, loss of assets is the harm on the asset itself (direct value). For the data assets, it could be modified, revealed, or destroyed; the harm here might be the modification and loss of asset (direct value) or asset exposing in consequence (indirect value). Security requirements put security goals into operation and outline conditions under which the possibility of intended caused harm is reduced to an acceptable level (Charles et al., 2006).

2.3.1 Computer Security Objectives

The computer security objectives in the past are commonly summarized as the availability, integrity and confidentiality which collectively known in normal as C-I-A triad (Lehtinenet.al, 2006). As the times pass by, most practitioners in security field have become to recognize on this incompleteness triad. They attempt to offer new objectives that additionally include with the authenticity, accountability and non-repudiation. In Parker (1998), Parkerian hexad was introduced by Donn B. Parker to add three more objectives into C-I-A triad: authenticity, utility, possession (control). Next, the section will briefly discuss on each of these objectives and establish the

scopes of them respectively (Gollmann, 2005; Anderson, 2001; Bishop, 2002).

2.3.2 CIA Models

Information Security Management Handbook has concluded on several of computer security models, where most of them focus on the remaining of data integrity and confidentiality without concerning to refer to the disciplines in criminology and psychology concepts. Bell-LaPadula model for instance, was firstly introduced to access into the objects (data and information), and subjects (users or other data modifiable processes) at the assigning levels in 1973 (LaPadula, 1996). The model grants permission for storing objects reading at/or below their access level by the subjects. It also grants the permission for objects reading-writing at/or above their access level (Krause and Tipton, 1998)

Based on the integrity model by Biba, this is the first model where integrity has been addressed with confidentiality dealing at the similar manner to Bell-LaPadula model (Krause and Tipton, 1998). However, the unmodifiable data storing processes are required from Biba model at higher security levels, since it could become a threat for those data that have already been kept within higher level (Krause and Tipton, 1998).Clark-Wilson model also addressed on integrity together with the segregation of duties and well-formed transactions (Krause and Tipton, 1998). Goguen-Meseguer model, Southerland model, and Brewer-Nash model are the other recognized CIA models (Krause and Tipton, 1998), where every of CIA model offers the different degrees of protection against cyber terrorism, however there are restrictions from these goal-oriented models on the defense of computers misuse (Bort, 2002).

2.3.3 Security Threats in Mobile Devices

Some of the factors affecting the mobile devices' security are unauthorized access, malwares, theft, loss of mobile devices, and improper disposal. By nature the mobile phones have small size with high possibility of being lost, stolen, misplaced, or being a target of theft, thus it requires to have proper measures to prevent and restrict the unauthorized access into sensitive mobile data and the exposure to theft (NIST, 2008). A survey with taxi companies in Australia, Denmark, France, Finland,

Germany, Great Britain, Norway, Sweden, and the United States reported about tens from thousands digital devices such as mobile phones that were left behind by mistake(Checkpoint, 2005). Notwithstanding the compromising on logical and physical data, active services on mobile phone like mobile money service may be accessed without authorization and the money in the mobile wallets could also be stolen.

Furthermore, mobile phone itself has value, it can be simply reused from the manual restored to original settings by removing all the content of previous user (NIST, 2008). The authentication mechanism attached from the mobile phones factory is only the first defending line for an unauthorized access prevention via passwords, PINs, and patterns. They are not a foolproof, however mobile phones and contents accessing can be merely forged or guessed from the authentication credentials, or the authentication mechanism bypassing (NIST, 2008).

It is interesting that most of mobile phone users face with difficulties in their mobile phone built in security mechanisms employing. They may be able to use it, but normally setting for easy guessing number such as 1234 or 0000 (Knijff, 2002). Exploitation can also result from weak authentication method, since some devices provide with a built-in master password while the authentication mechanism that grants for unlimited access like security lock bypassing set by the user (Knijff, 2002 & NIST, 2008). Available mechanisms that require for master passwords are those with direct calculation from the identifier equipment (Jansen & Ayers, 2007) or backdoor bypassing for part of or every control mechanism (Withers, 2008).

Additionally, forensic tools are promptly available to bypass mobile phone built-in security mechanisms and content restoration (Ayers et al., 2007; Breeuwsma et al., 2007 and Troy, 2008). Another mobile device security treat in the communication networks is malware. It transfers viruses and malware in other forms into mobile phones from Internet downloading, or attached with SMS and Bluetooth messages. The users' sensitive information in the mobile phone will be seen and stolen by malware as it grants for attacker access (NIST, 2008).

2.4 Diffusion of Innovations (DOI) with Trust in M-payment

Diffusion of Innovations according to the theory by Rogers (1995) is described as the adoption of the IT innovations via the rational theories that originated from the theory of sociology, communications, and economics. Incidentally, these adopted decisions concern the well-defined innovations (e.g. pesticide adopting by farmers), and the amount of innovation adopting population is homogeneous to the specific scope as a set. Questions are posed from the assumptions set in case of the complex network, for instance, one that is brought up from M-payments technology. Due to the existing factors like demographics, vendors, and regulators, it requires that M-payments are socially and economically constructed.

Not only the clients that are included as stakeholders, but M-payment also involves with the service providers, manufacturers, and many of regulatory bodies. In addition, the diffusion of an innovation may not have to be a sequential process like Roger's assumption. It is likely that for the global adoption of M-payments to be successfully achieved, consideration on the existing infrastructure may be required. Likewise, in the case of M-payment, only a function of push and pull forces according to Rogers' (1995) ideas about adoption rates, may not necessarily be true. Taking into account just the technology features as the key pushing sources does not allow us to see the comprehensive picture. In this case, other co-existing factors, e.g. banks and mobile phone service providers, need to be focused to work collaboratively in order to provide services to consumers.

Moreover, consumer's reasonable choice may not always impose pull forces. The reason for consumer to use M-payment might depend on many factors such as none of choice provided. This research theoretical background has been drawn from the innovative diffusion theory (Rogers, 1995) augmented from the network externalities constructs (Economides, 1996; Hove, 1999), security and trust (Gefen et al., 2003; Jarvenpaa et al., 2000) and factors from situation (Lee et al., 2005).

From the study by Rogers (1997), there are five categories or stages of the social system adopters based on their innovativeness, which is the degree to which an individual or the other unit of adoption is relatively adopting the new ideas earlier than other members of a social system. The explanation of the adopter types is presented in the table below:

Table 2.5 Adopter stages and their descriptions

Adopter Stage	Description
Innovators	Innovator is the first 2.5 percent of individual in a system who welcome for innovation. Theirs preference on new ideas encourage them to go beyond the local network of peers circle and get in touch with the more universal society. It is common for the patterns for communication and friendship in the innovators' circle, though they may have far geographical distance. There are number of prerequisites as an innovator. It is helpful to adopt the control of substantial financial resources in order to lower the potential of unprofitable innovation loss. . Innovator should possess the understanding on the complex technical knowledge and be able to adopt and cope with strongly uncertainty of innovations during the time of use. It may not lead to the respect among social system members, but the major task of innovators in the diffusion process is to launch the new system idea that retrieved from external boundaries of the system. Thus, a gatekeeping role belongs to the innovators to feed new ideas into a system.
Early Adopters	Early Adopters refer to another 13.5 percent of system individuals that adopt an innovation. Comparing to innovators, they become a more integrated part of the local system. More than other, in most systems this adopter category comes with the greatest degree of opinion leadership. Early Adopters are joined by potential adopters for innovation information and advice. In common, the adopter in this category will find out for a local missionary to urge the diffusion process by change agents since the early adopters are still close to the innovativeness individuals in average. A role-model for many other social system members is serving by them since they have gained peers' respect and being an embodiment of success from the separate use of new ideas. It is known by the early adopters to keep earning this colleagues' esteem and remain on a central position in the system communication networks, while the judicious innovation-decisions shall be processed.

Adopter Stage	Description
Early majority	Early majority are the next 34 percent of system individuals who focus on new innovation ideas and technologies rather than the average system members' adoption. This is one among the two categories of most adopted with one- third members in a system. The early majority frequently interacts to their peers with seldom leadership opinion holding for a system. It has unique position between the relatively late and the very early adoption of the vital link in the diffusion process. The early majority gives the interpersonal system networks an interconnectedness, where sometimes it might be uneasy to complete on some fresh ideas adoption. The early majority tends to fit for those who are not the first to trial on new item, nor the last to let aside the old item. They tend to follow the deliberate willingness to adopt innovation with infrequent lead.
Late majority	Late majority refers to 34 percent of system innovation adopting individuals. This group of individuals adopt new ideas right after the average member of a system. Similar to the early majority, the group of late majority is one-third of the members in the system. The reason for their adoption could result from the higher pressures from peers in the network. A Skeptical and cautious air are used to approach innovations, where the late majority will not apply it until most have been done by people in the system. An innovation should have weight in the system norms before it can convince on the late majority, while peers' pressure is crucial for their adopting motivation. With the resources that quite rare, it reflects the high uncertainty to remove the new idea in order for the late majority to feel safe with the adoption

Source: Rogers, 1995

2.5 M-payment Satisfaction

Adoption as defined by Rogers (2003) is the full use of decision on an innovation; however, several researches termed adoption as the usage, utilization,

implementation or satisfaction. This study investigates the influential factors over M-payment adoption and applies satisfaction as the single measure of adoption with boarder use. A large number of studies normally use satisfaction as the IT success dependent variable (DeLone & McLean 1992, 2003; Montazemi, 1988; Raymond, 1990). Satisfaction is selected for investigation in this study as it is a two-fold surrogate measure for adoption. Firstly it has the high degree of face-to-face validity that can hardly be rejected for the system success from the users' preference. Secondly, satisfaction is widely adopted to measure success (DeLone & McLean, 1992 2003; Liu & Guo, 2008; Mahmood et al., 2000; Zviran & Ehrlich, 2003) and also the post adoption of M-service (Park et al., 2011).

2.6 Research Conceptual Model and Hypothesis

The theory of CIA security, trust, and DOI provide us with so many variables that are required to be tested among the factors of security, trust, M-payment adoption and M-payment satisfaction, and mediating effect of trust between the relationship of M-payment satisfaction and security. Hence, the author wishes to present the conceptual framework of this research as follows:

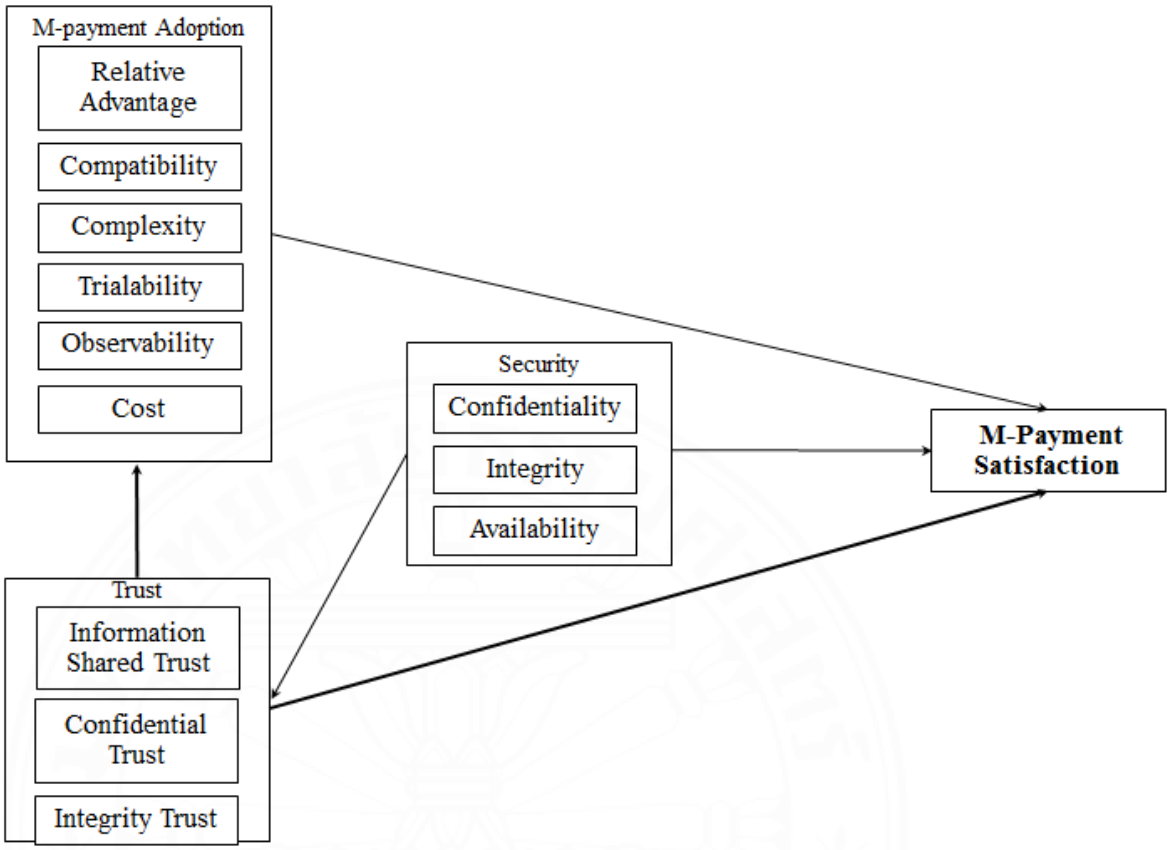


Figure 2.1 Research Conceptual Model

2.7 Diffusion of Innovations (DOI) in M-payment

Innovation Diffusion is a multi-disciplinary theory that is frequently applied in IS research. It is a theory that is supported by empirical study on its prediction applicability in various information system adopting such as spreadsheets (Brancheau and Wetherbe, 1990), WWW (Agarwal and Prasad, 1997) and operating systems (Karahanna et al., 1999). This theory is found to be widely used in a variety of financial and mobile technology adopting including the adoption of smart cards (Plouffe et al., 2001; Szmigin and Bourne, 1999), mobile commerce (Teo and Pok, 2003), and mobile banking (M. S. Y. Lee et al., 2003). The process of innovation-diffusion as explained in Rogers (2003) is “an uncertainty reduction process”, where the innovation attributes have been proposed to help lessen the innovative uncertainty.

In comparison with the TAM model adopting technology (Davis, 1989; Davis etal., 1989) which was created for end-users to predict for IS acceptance within the

organizations, the diffusion of innovation was originally deemed to be more proper for the research since the subjects are consumers not organizational users. Five innovation characteristics with effects on the adoption are determined by the diffusion of innovation theory, which includes relative advantage, complexity, compatibility, trialability, and observability (Rogers, 1995, p. 212–251). Among these constructs, the most consistent factors in IS adoption, as well as mobile adoption research (Teo and Pok, 2003; Wu and Wang, 2005), are relative advantage, complexity, and compatibility (Tornatzky and Klein, 1982) This is why it is applied in this study. Rogers (2003) stated that perception of "individuals" toward these characteristics can forecast the innovation adoption rate.

2.7.1 Relative Advantage

Traditionally, IS research is adopted to investigate the organizational context where the factors of relative advantage consist of performance measures such as the increase of performance effectiveness and time savings (Davis, 1989; Moore and Benbasat, 1991). In the context of payment and mobile commerce, former research suggests that the key attribute that has effects on the mobile technology and service relative advantage is their time and place independence (Carlsson et al., 2006; Constantiou et al., 2006; Jarvenpaa and Lang, 2005). According to Rogers (2003), he defined relative advantage as the degree in which we perceive the innovation as it is better than the preceding idea. Cost and social status also co-exist in relative advantage as a motivating factor for innovation adoption.

For example, an early adopter and an early majority of the innovators find it more status-motivated for innovation adopting than a late majority and a laggard perceive. Rogers also categorized innovation into two types: preventive and non-preventive (incremental) innovations. "A preventive innovation refers to a new idea that is currently adopted by an individual in order to eliminate the possibility of an unwanted event in the future" (Rogers, 2003). Normally, the preventive innovation has a slow adoption rate; therefore, it is prominent that its relative advantage is uncertain. A non-preventive (incremental) innovation, on the contrary, offers useful outcomes over a short period of time. A business dictionary defines a non-preventive innovation (or an incremental innovation) as "a series of small improvements to an

existing product or product line that usually helps maintain or improve its competitive position over time. Incremental innovation is regularly used within the high technology business by companies that need to continue to improve their products to include new features increasingly desired by consumers."

Through M- payments, customers will be offered with the possibility for ubiquitous payment, timely access to financial assets and choice for cash payments. For example, they can remotely pay for the transportation tickets or car parking by not having to go to the ticketing machine, a parking meter, or an ATM (Mallat et al., 2004). M-payment relative advantage in comparison with traditional payment tools, hence, seems to add the possibility for time and place independent payment.

2.7.2 Compatibility

Consistency among innovations and experiences, values and needs of prospective adopters are captured by compatibility (Rogers, 1995). In the research with IS adoption, technology compatibility in common has been evaluated in relation to the prospective tasks of an adopter (Moore and Benbasat, 1991; Taylor and Todd, 1995). According to Lee et al., (2003), consumers' ability to integrate payment systems into their daily life is a key aspect of compatibility, which is found to be a key mobile technology and service adoption determinant (Teo and Pok, 2003; Wu and Wang, 2005). M-payment compatibility between consumers' purchasing transactions and their behavior is likely to be anticipated as the corresponding adoption impact. Some of the diffusion researches stated that the compatibility and relative advantage were seen as the same, though they were diverse in concept.

As stated by Rogers (2003) "compatibility is referred to as a degree in which we perceive an innovation in consistence with the past experiences, the potential adopters' needs and the existing values. In the IT, the absence of compatibility on an individual's needs might influence an individual's IT usage in a negative way (McKenzie, 2001; Sherry, 1997). Hoerup (2001), as cited in a literature review, explains the influences from each innovation on beliefs, values, opinions and teachers'view in their teaching. If we find compatibility between an innovation and an individual's needs, it will reduce the uncertainty and will increase the innovation adopting rate. Thus, naming an innovation is also a crucial part of compatibility.

2.7.3 Complexity

In the theory of diffusion of innovations, we determine complexity as a degree that we perceive the difficulties of innovation to understand its usage and adoption (Rogers, 1995). Again as mentioned in Rogers, as opposed to other attributes, complexity shows a negative correlation with the adoption rate since the excessive innovation complexity is a key barrier on its adoption. A technological innovation may have to encounter with a challenge from the faculty members who shift their approach to integrate their instruction with an innovative technology (Parisot, 1995); therefore, it might come with complexity at various levels. According to Martin (2003), if it is a user-friendly hardware and software, people might successfully adopt the course material delivery. Usability problems and complexity direct toward the low adoption in many payment systems as well as in M-banking and smart cards (Laukkanen and Lauronen, 2005; Szmigin and Bourne, 1999).

At the same time, convenience and ease of use are found to influence consumer mobile service and technology adoption (Jarvenpaa et al., 2003; Nysveen et al., 2005; Teo and Pok, 2003). In common, we expect M-payment to add more convenience for consumers as it reduces coins and cash required in the small transactions as well as expands more possibility in payment availability (Mallat et al., 2004). Restrictions on mobile device features, however, limit the mobile technology usability (Siau et al., 2004). Included as the typical restrictions are a small keypad, a short battery life, and a limited speed of memory and transmission.

2.7.4 Trialability

Trialability has become a key feature as a means for potential adopters to lessen their uncertainties on unfamiliar products or technologies (Weiss and Dale, 1998). This is agreed by Rogers (2003) that prospective adopters, who have a chance to try on the innovation before their adoption, will become more comfortable with it and tend to recommend it for the adoption (Agarwal and Prasad, 1997; Tan and Teo, 2000). Trialability, which is definded as a degree for an innovation to be experimented on a limited basis (Rogers 2003), seems to correlate in a positive way with the adoption rate. The more consumers have trials on an innovation, the quicker the adoption will be.

In the implementing stage, discussion is made on the innovation-decision process while during the trial, when an innovation may be modified or adjusted by a prospective adopter, this could lead to a reinvention. More reinvention can generate quicker innovation adoption. Another key factor is the vicarious trial that is particularly helpful for the late adopters. Rogers states that the earlier adopters view the innovation trialability attribute far more vital than the later adopters.

2.7.5 Observability

Some innovation results can be simply observed and communicated to others, while some seem hardly to be explained. Rogers (2003) defined observability as a degree which the innovation is visible to others. The main motivational factor here is the role modeling (or peer observation) of adoption and technology diffusion (Parisot, 1997). As same as the relative advantage, compatibility, and trialability, there is the positive correlation between observability and the innovation adopting rate.

2.7.6 Cost

Traditionally, the research on adoption has incorporated cost as a construct of relative advantage (Rogers, 1995). In this study, cost is treated separately as another factor to clearly distinguish it from the time and place independence relative advantage. As found by Kim et al. (2007), fee perceiving can have a significant impact on the mobile Internet perceived value. Perceived service cost is found to be a key determinant for consumers' adoption of wireless financial services (Kleijnen et al., 2004), M-banking (Luarn and Lin, 2005), and transaction through M-commerce (Wu and Wang, 2005). In the context of M-payment, the price of the purchased item normally contains the M-payment transaction cost. The cost of a soft drink paid at a vending machine, hence, can be higher if paid via M-payment instead of cash. Therefore, cost seems to reflect a crucial impact on the adoption of M-payment.

Thus, a hypothesis on M-payment adoption and M-payment satisfaction can be proposed as follows:

Hypothesis 1: *The adoption factors have impact on satisfaction in M-payment adoption.*

2.8 Trust in M-payment

Trust is highlighted on its cruciality in M-commerce and payment due to the spatial and temporal separation between sellers and buyers, for instance, in the situation where buyers are asked to provide delicate private information, such as credit card number or telephone number to sellers (Grabner and Kaluscha, 2003). As found in the former studies, trust is a key determinant that has impacts on consumers' willingness in conducting E-commerce transactions (Gefen et al., 2003; Jarvenpaa et al., 2000). As well, the former studies proposed the same perception on security and trust of vendors with payment systems as the major M-commerce success determinant (Siau et al., 2004; Xu and Gutierrez, 2006). Also, trust shows positive influence on customer satisfaction and loyalty of M-commerce (Lin and Wang, 2006). The concerns of consumers on M-payment security and their privacy seem generally related to the issues of confidentiality and authentication. In addition, the concerns are on the unauthorized access to and the secondary use of user data and their payment. (Dewan and Chen, 2005). The perception of trust and security is therefore anticipated to influence M-payment adoption.

Trust as described in Mayer et al. (1995) is the trustor belief that the trustee is capable to fulfill their expectations and will not take advantage over their vulnerabilities. McKnight et al. (2002) stated that in the online transaction scenario, we conceptualize trust as the consumers' belief that allows them with willingness to be online vulnerable with anticipation from vendors' characteristics on their duly service. In the transaction between sellers and buyers, trust has long been a catalyst that leads the buyers to have high expectations in relationship exchanging (Hawes et al., 1989). This has been empirically showed by Jarvenpaa and Tractinsky (1999) that trust has a positive effect on consumers' buying intention. The significance of trust is stressed by Gefen (2000) on the user acceptance of Internet-related technologies. The absence of trust from consumers is said to be a long-term significant obstacle to a success of E-commerce and E-payment systems (Keen, 1997). Although M-payment systems have developed from E-payment systems, some constituents are different, in particular, the involvement of mobile service providers and the limitations of mobile devices. Despite all of these differences, E-payment and M-payment have similarly confronted with several uncertainties in their operation and environment. In such a

scenario, user trust could be among the mechanisms to help them win over the uncertainties and recognize the system operational usefulness which, in turn, facilitate the adoption.

Trust concept is defined in several disciplines, for instance the theory of organization, philosophy, psychology, sociology, and transaction economics. Trust, in the sense of social psychology, is believed that people will respond in predictable ways; to be said in short, trust refers to a belief that one can rely on when another makes a promise (Pavlou, 2003). In the E-commerce context, beliefs and trust include the beliefs and expectation of online consumers on trust related to online seller characteristics (McKnight and Chervany, 2002). The needs of online consumers are that the online sellers should intend to act on their interest with honest transactions by not divulging their private information to other parties and ship the orders to them as promised. With regard to psychology and organizational behaviors, many trust studies concentrate on interpersonal relationships while the strategy and economic fields concern the relationship of inter-organization. However, trust analysis in the E-commerce context should be regarded as the aspect of an individual and firm relationship, where Internet is the key technology that is considered as the trusting object (Shankar et al., 2002). Accordingly, we will consider the online environment as an object of trust.

2.8.1 Confidential Trust

In a market research, Moorman et al. (1993) define confidentiality as “the researcher's perceived willingness to keep proprietary research findings safe from the user's competitorsep proprietary research could intend to act on their interest with honest transactions by not divulging their privateAccording to this, it can be concluded that confidentiality is one of the characteristics of trust between intelligent users and providers (Birgelen et al., 2001). From the consumer research by Parasuraman et al. (1985), in order to conceptualize a model of service quality, they indicate that privacy or confidentiality during a transaction is an extremely important attribute in every banking and security brokerage focus group. In psychology, Corcoran (1988), Posey (1988), and Aguilar (1984) also confirm that confidentiality has a positive relationship with trust, and acts as a critical component as well.

2.8.2 Information Shared Trust

Information has been widely acknowledged as an important element for effective decision making (Naveh and Halevy, 2000; Birgelen et al., 2001). Information sharing, trust in particular, has therefore been underscored as the most important factor for successful relationship management, (Bowersox, Closs, and Stank, 2000; Birgelen et al., 2001; Handfield and Bechtel, 2002). Doney and Cannon (1997) indicate that information sharing involves the extent to which suppliers share private information with their customers. They also suggest that buyers will trust suppliers who share confidential information due to a considerable amount of investment in managing a supplier and a risk. In contrast, buyers who hesitate to trust suppliers tend to behave in an untrustworthy manner by passing along this information to others (John, 1984).

Strub and Priest (1976) indicate that the extent to which a supplier shares information with a buyer also provides a signal of "good faith" to the buyer. So a disclosure pattern is used to establish trust by providing tangible evidence to show the supplier's willingness to make itself vulnerable. From a consumer's perspective, information sharing implies the intimacy level of relationship and the level of trust as well (Havard, 2003). This is consistent with the research of Nexhmi et al. (2003), who suggest that information sharing provides more reliability and trustworthiness of banking services. Also, Veronica and Inger (2002) indicate that information sharing is vital for the development of trust in business-to-consumer service firms.

2.8.3 Integrity Trust

Prior studies indicate the relationship between integrity and trust. For instance, Birgelen et al. (2001) indicate that integrity is the characteristic of trust. Moorman et al. (1993) conclude that users tend to trust researchers who demonstrate integrity because they can expect them to adhere to higher standards and thereby remain more objective throughout the research process. In a business-to-consumer relationship, integrity is indicated as a key dimension of trust (Hennig-Thurau, Markus, and Ursula, 2001; Chiou et al., 2002; Hennig-Thurau et al., 2002). The studies by Hennig-Thurau and colleges confirm that a service provider will be trusted if a customer perceives that it has a high degree of integrity (Hennig-Thurau et al., 2002).

An example can be seen from trust that students have in a university because of its high degree of integrity (Hennig-Thurau et al., 2001). In general, Deutsch (1958) believes that integrity is seen as personal characteristics which are "the strength of internalized value in regard to responsibility, the ability to prevent or resolve conflict under responsibility, and the ability to take the goals of others as a goal of one's own" (p.288).

2.8.4 Perceived Trust in M-payment

Trust of consumers in payment systems is defined as the belief of consumers that the online payment transactions will be run according to their anticipation (Tsiakis and Sthephanides, 2005; Mallat 2007). Rational decision can be made by consumers based on the potential reward knowledge of trust or distrust. Trust allows higher gains whereas distrust means potential loss avoidance (Linck et al., 2006; Kousaridas et al. 2008). The attitudes of consumers toward online payment systems seem related to the perception on the system security. To be said also, the consumers' perception on the principles of security enforcement boosts up their trust in security, and trust contributes toward their perceptions of E-transactions. As argued by Kniberg (2002), it is more likely that users and merchants tend to apply the insecure payment system with the firm they have trusted rather than the secure payment system from the company without trust. In consistence with the result of former studies by Tsiakis and Sthephanides (2005), and Mallat (2007), it has suggested the more importance of trust over security. Without trust from customers, M-payment would extremely hard to obtain the widespread usage.

Thus, a hypothesis on trust, as perceived by consumers, that influences M-payment satisfaction can be made as follows:

Hypothesis 2 : *Trust factors have impact on satisfaction in M-payment adoption.*

2.9 CIA Security Model

According to Whitman & Mattord (2004), the level of information security system can be described from the CIA security model. This term is synonymous with the CIA Triad and the CIA Triangle (Brunette & Mogull, 2009, Greene, 2006;

Whitman & Mattord, 2004). According to Gilliam (2004), the acronym for CIA stands for confidentiality, integrity, and availability. Electronically stored data in the computers are the firms' valuable assets that are required to be guarded from unauthorized tampering, unauthorized disclosure, availability obstructions and destroying. Greene (2006) states that when there is an attack on these items or only one of them, it is considered as an attack on organizational information security.

One of the most critical factors for success in M-payment field is security since clients are aware of the risks related to theft and viruses. A note is made by Varshney (2002) on some of similar critical security challenges, including confidentiality and availability, encountered by M-payment.

2.9.1 Confidentiality

Confidentiality refers to the ability of information access controlling that must be secret to the groups or individuals with unauthorized access (Pfleeger & Pfleeger, 2007; Whitman & Mattord, 2004). Moreover, Whitman & Mattord, (2004) states that not only the individuals who show the desire may access such materials but the information confidentiality is also considered in term of privacy or secrecy(Pfleeger & Pfleeger, 2007). According to Gilliam (2004), confirming the secrecy or confidentiality of the sensitive assets like the intellectual property or health records is a major issue. Various enterprises give more consideration on their valuable intellectual property rather than physical assets, so they establish and implement mechanisms and policies to protect their intellectual property rights as the key step to remain competitive with the market (Liu & Kuhn, 2010). Organization's failure to make believe on the data confidentiality as stored in an electronic system leads to the embarrassment, bad reputation and possibly the legal ramifications (Stoneburner et al., 2002).

Information disclosure to unauthorized processes, devices, or persons is a key concern. This is assumed that only the comprehended sender and receiver can transmit messages in the clear text. Usually, this is done through the cryptographic encryption computer based. The key attacks to confidentiality are the eavesdropping, traffic analysis and man-in-the middle attack. Concerns from consumers are on the protection procedure of M-payment against the passive monitoring on details of

payment. Confidentiality as stated in Merz (2002) is the information system that guarantees non-unauthorized access during information transaction.

2.9.2 Integrity

Information integrity consists of the following three conditions. Firstly, unauthorized persons or systems cannot alter the information. Secondly, authorized persons or systems cannot force unauthorized persons or systems to alter the information. Thirdly, the information must have the internal and the external consistency. The data internal structures must be consistent and the data relation to the outside world must also be consistent (Krutz & Vines, 2010). Moreover, integrity relates to the quality of stored information to assure its uncorruptedness and its existence in whole (Whitman & Mattord, 2004). Lack of integrity in data assets can come from accidental or malicious damage, destruction, alteration, corruption or other tampering (Gilliam, 2004; Whitman & Mattord, 2004). If the loss of data integrity is not amended, continuedly using these questionable data can result in incorrect business decisions, other inaccuracies, or even fraud (Stoneburner et al., 2002)

Integrity refers to unaltered systems and data from the unauthorized or the external parties (Merz, 2002). Integrity for data transaction can be enhanced from including the secure electronic signatures into messages. Included as the attacks to integrity are the replay attacks, man-in-the middle attacks, and session hijacking; these threats can take place while the unauthorized party accesses to change the information stream (Merz, 2002). Transactions without protection are open to integrity violations. Customer data in all businesses adopting the M-payment system must be protected and it should be a key promise for which the firms must be responsible to satisfy their customer expectation (Litan et al., 2007).

2.9.3 Availability

Availability means the ability to easily access into the information processing service by the systems or authorized users (Whitman & Mattord, 2004). It is even harder to provide the definition for the availability compared to confidentiality and integrity, since it implies as data and data processing services accessing. (Pfleeger & Pfleeger, 2007). System availability can be confirmed from : (a) timely response to

the request, (b) equally response to every of requestor, (c) applying fault tolerance to lower the downtime from hardware failure, and (d) Prompt of proper mechanism to access into the system in response for the deadlocks, instantaneous, and private access (Pfleeger & Pfleeger, 2007). CSPs give meaning for the term availability in cloud computing realm as linking capability between network services (Habib, Ries, & Muhlhauser, 2010).

Metaphorically, availability is the library user who can access the particular materials after having identified himself or herself or having gained authorization (Whitman & Mattord, 2004). Any data availability degradation can automatically have the impact on efficiency and operational effectiveness of an organization when productivity is expected from end users (Stoneburner et al., 2002). An example of availability loss can be seen from a case that a staff changes an important file name in a credit union's computer system. Though the file is still under the credit union, it cannot be reached from the computer system and all production has to be stopped from this (Bosworth, 2002). Ranges of loss of availability can come from the temporary access loss all the way up to permanent and complete data destruction without any chance of recovery (Bosworth, 2002).

According to Merz (2002), users' verification procedures must be provided when they request to make transactions. This is normally confirmed by applying PIN and Passwords for provider authority validation to the services or for requesting to perform transactions. This is to confirm that the transaction parties are trusted and not impostors (Merz, 2002). Before any business transactions are performed, the joining entities should confirm each other identity through the authentication protocols-based network and PIN. According to Merz (2002), authenticity attacks includes session hijacking, replay attacks, and man-in-the middle attacks. On the aspect of consumers, authentication refers to the level of comfort obtaining with a claimed identity, the comfort level of which is likely to vary depending on transaction value and risks. For credit cards, information exposure by the unknown vendors or hackers is still a major security concern among consumers.

2.9.4 Security and Trust in M-payment

Lack of trust and security perceived by consumers in a mobile environment for payment systems and vendors has become a key obstacle to mobile and electronic commerce transactions (Siau et al., 2004). Electronic environment requires the secure financial transactions with information confidentiality, integrity, non-repudiation and authentication (Shon & Swatman, 1998). At the same time, other important security factors for consumer system adoption are privacy and anonymity, which is related to the policies on individuals' information and buying data records (Jayawardhena & Foley, 1998; Shon & Swatman, 1998).

Thus, a hypothesis related to security-perceived roles and trust in M-payment system using can be made as follows:

Hypothesis 3 : *Security factors have impact on trust factors in M-payment adoption.*

2.9.5 Perceived Security in M-payment System

According to Linck et al. (2006), perceived security means the subjective evaluation by customers toward the security of the online system. Clients of diverse expectations and experiences may have dissimilar attitudes towards the online transaction security. However, the assurances are provided by M-payment in regard to all customers' security requirements (Stroborn et al. 2004). As stated by Tsiakis and Sthephanides (2005), if the security perceiving level towards M-payment is too low, clients tend not to join in the transaction before the solution to their fear is implemented. For M-payment customers, their major concerns are security and trustworthiness, these two of which are closely related (Guan and Hua 2003, Peha and Khamitov 2004, Linck et al. 2006). Then, this leads to the following hypothesis:

Hypothesis 4: *Security factors have impact on satisfaction in M-payment adoption.*

Prior studies by Grabnerer & Faullant, 2008; Ke et al., 2009; Qureshi et al., 2009; Sarkis et al., 2010 demonstrate the mediating effects on trust and other contexts, for example, online customer repurchasing intention, the adoption of self-service bank channels, the adoption of an electronic supply chain management system, and consumer acceptance of Internet banking. Therefore, a hypothesis can be

proposed as follows:

Hypothesis 5: *Security factors have indirect impact on M-payment adoption.*

Finally, many researches present the differentiation among the adopter groups of innovation adoption in various contexts such as mobile banking, Internet banking, and other electronic transaction systems (Marez et al., 2007; Menachemi et al., 2004; Mahajan et al., 1990; Sheikh et al., 2011). According to the study by Rogers (1997), we can categorize the M-payment adopters into 5 stages using his criteria.

Then, we can propose the hypotheses on M-payment adopters and the adoption factors as follows:

Hypothesis 6*: The different stages of M-payment adopters can be differently resultted on the adoption factors in M-payment adoption.*

Hypothesis 7: *The different stages of M- payment adopters can be differently resulted on trust in M-payment adoption.*

Hypothesis 8: *The different stages of M- payment adopters can be differently resulted on secuirty in M-payment adoption.*

Hypothesis 9: *The different stages of M- payment adopters can be differently resulted on satisfaction in M-payment adoption.*

CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

In the previous chapters, discussions focus on the origin of this dissertation, the relationship of trust, security, adoption of the conceptual model, and the hypotheses of the study. This chapter presents the research design and methodology, which are employed to obtain and analyze the data. This chapter also provides the sampling plan, the survey questionnaire, and the data collection procedure. As mentioned in the earlier chapters, our model development procedure is adapted from the study of Shih and Venkatesh, 2004, Thong, 1999, and Thong et al., 2006. Following this, the procedure covers all necessary steps to specify the domain of construct, item generation, purifying measurement, reliability testing, and validity testing.

3.1 Research Design

A conclusive research, which is designed as a descriptive research in order to identify and describe a user's trust in M-payment service within the area of M-payment adoption in Thailand in particular (Malhotra, 2004). This research design is guided by the hypotheses described in Chapter 2. Descriptive research is widely used in management field because it provides an accurate snapshot of some environmental aspects of management (Aaker, D. A., Kumar, and Day, 2007). Survey research is employed in this study because it is the most favorable methodology in management and education research (Abe, 2004). The data collection is a cross-sectional design, which uses self-administered questionnaires to conduct a survey on Thai users. This self-administered technique will reduce the cost of interviews, and also provide usefulness in the case of having closed-ended questions, allowing the respondent to better interpret complex questions (Aaker, D. A. et al., 2007). Then, the researcher can use that experience survey or a focus group to generate a sample of items. Next, data collection is needed in order to purify a measure using factor analysis. Data collection should be in order to assess reliability and validity. Finally, the researcher develops norms of measurement by summarizing the distribution of scores. Because of its

complexity, this study will be categorized into three main distinct sections: item generation, model development, and model evaluation (Hinkin, 1995; Fornaciari et al., 2005). This procedure covers all suggested steps in model development studied by Shih and Venkatesh, 2004, Thong, 1999, and Thong et al., 2006. Each step will be elaborated for more understanding. Figure 3.1 shows the three sections together with the required tasks of each section.

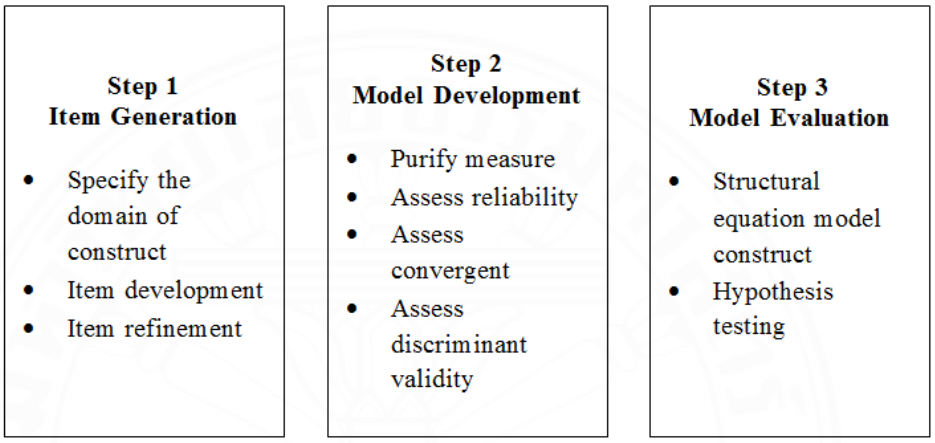


Figure 3.1 Research design

From Figure 3.1, Step 1 shows item generation. This stage consists of three important tasks (specify the domain of construct, item development, and item refinement). They must be finished before moving to the next stages. The domains together with items are generated from a literature review. Then the questionnaire is launched to collect data from Thai M-payment users. Step 2 is purify measure and test of model reliability and validity. Consequently, trust, security and adoption, are used as a parameters to measure trust and security of Thai users in M-payment adoption. Internal consistency, which is concerned with the homogeneity of the items within a scale (DeVellis, 2003), is examined. Then, convergent and discriminant validity are assessed based on Confirmatory Factor Analysis (CFA). As a rule of thumb suggested by Hair et al. (1998), the scale will have a convergent validity if the standardized loading is greater than 0.5, the extracted variance is higher than 0.5, and the construct reliability is higher than 0.7. For discriminant validity, they suggested that an extracted variance estimate for two factors has to be higher than the square of their correlations. Step 3, which is the final step, is the model evaluation. Structural

equation modeling is employed to test the relationship among trust and related variables. Then, our hypothesizes are tested. Finally, the results of structural equation model and the hypotheses are concluded.

3.2 Scope of Study

This study focuses on the willingness to use a mobile phone for M-payment transactions by the consumer whose money is transferred to a merchandiser for buying of products or services. For this study, mobile payment (m-payment) is defined as all payments in which a mobile device is utilized to initiate, authorize, and confirm a commercial transaction (Au and Kauffman, 2008; Mallat, 2007; Ondrus and Pigneur, 2005). This study primarily based on (primarily on) the Diffusion of Innovation (DOI) model, with additional constructs adapted for the study of M-payment such as cost, security and trust. (We classify the survey) The questionnaires are distributed to by 5 areas in Thailand namely, Bangkok Metropolitan Region and central, northern, southern, eastern and northeastern regions.

3.3 Sampling

This study targets Thai M-payment users. A sampling scope includes males and females who are at least 18 years old and have used M-payment services. A quota sampling, a nonprobability judgmental sampling technique (Joppe, 2001; Aaker, D. A. et al., 2007), is used to distribute samples by gender, and age as shown in Table 3.1. This sampling technique eliminates gross biases (Aaker, D. A. et al., 2007) and ensures that the sample is representative sampling of the population in the same proportion (White, 1998; Churchill and Iacobucci, 2005). Therefore, the result from the sample of this study can be partially inferred to as the population (Aaker, D. A. et al., 2007); refer Table 3.1.

Table 3.1 2013 Thailand Population classified by age group and gender

Age group (years)	Male	Female	Total
0-5	2,465,779	2,345,333	4,811,112
6-10	2,352,246	2,267,063	4,619,309
11-14	1,960,265	1,873,816	3,834,081
15-19	2,561,338	2,439,836	5,001,174
20-24	2,677,901	2,567,954	5,245,855
25-29	2,666,250	2,578,377	5,244,627
30-34	2,681,749	2,633,982	5,315,731
35-39	2,671,441	2,736,992	5,408,433
40-49	5,257,870	5,652,230	10,910,100
50-59	4,249,261	4,642,568	8,891,829
60 years and over	3,861,654	4,950,326	8,811,980
Whole kingdom	33,405,754	34,688,477	68,094,231

Source: Statistics from Thailand National Statistic Organization (2013)

According to Table 3.2, National Statistic Organization (2013) shows that a number of the total M-payment users are 20,781 persons in Thailand. A ratio of female users almost doubles a ratio of male users. Moreover, Table 3.2 shows the data that consists of 5 regions, categorized into Bangkok, Central, Northern, Northeastern, and Southern areas. Bangkok has the highest number of M-payment users, followed by Southern, Central, and Northern areas respectively. Male users in Bangkok and the Southern area make up the highest number of users whereas female users in Bangkok and the Northern part are the majority who pay for goods and services through M-payment. The number of male and female users are mentioned in a Figure 3.3 and 3.4 respectively.

For the data collection method, the sample group are Thai mobile service subscribers to the mobile service providers in Thailand, namely AIS, DTAC, True with True Move H , and others. The sample size is approximately 450 in the study (Bartlett, 2001; Kotrlik and Higgins, 2001; Warner, 1965; Kaplowitz et al., 2004).

Table 3.2 2013 Thailand M-payment usage classified by region and gender

Mobile - payment usage to pay for goods and services			
Region	**Male**	**Female**	**Total**
Bangkok	1,888	5,281	7,170
Central region	1,553	2,168	3,721
Northern region	322	3,298	3,621
Northeastern region	1,288	1,020	2,308
Southern region	1,872	2,089	3,961
Whole kingdom	6,923	13,856	20,781

Source: Statistics from Thailand National Statistic Organization (2013)

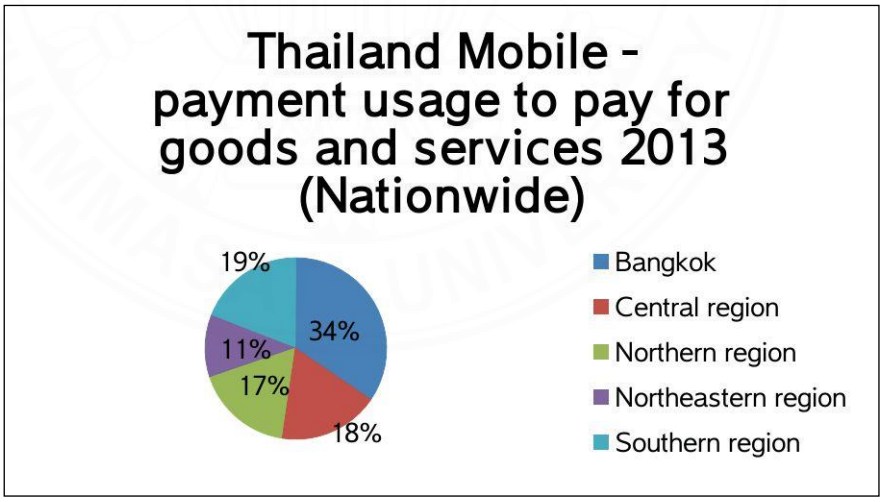


Figure 3.2 Thailand M-payment usage to pay for goods and services in 2013 (Nationwide)

Source: Statistics from Thailand National Statistic Organization (2013)

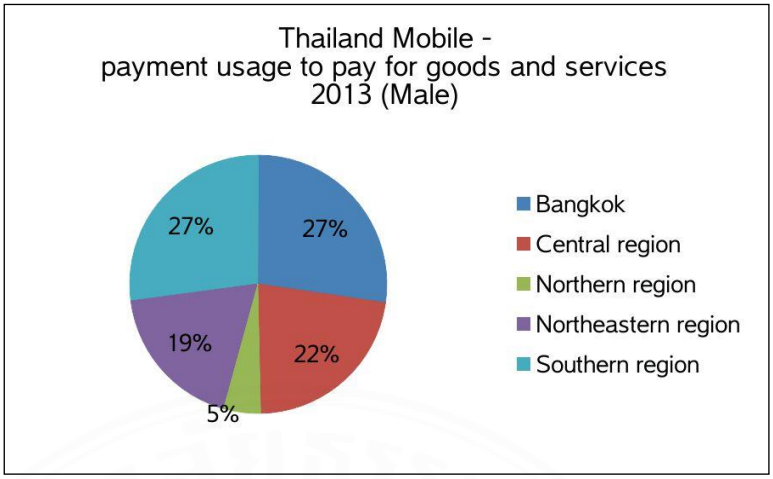


Figure 3.3 Thailand M-payment usage to pay for goods and services in 2013 (Male)

Source: Statistics from Thailand National Statistic Organization (2013)

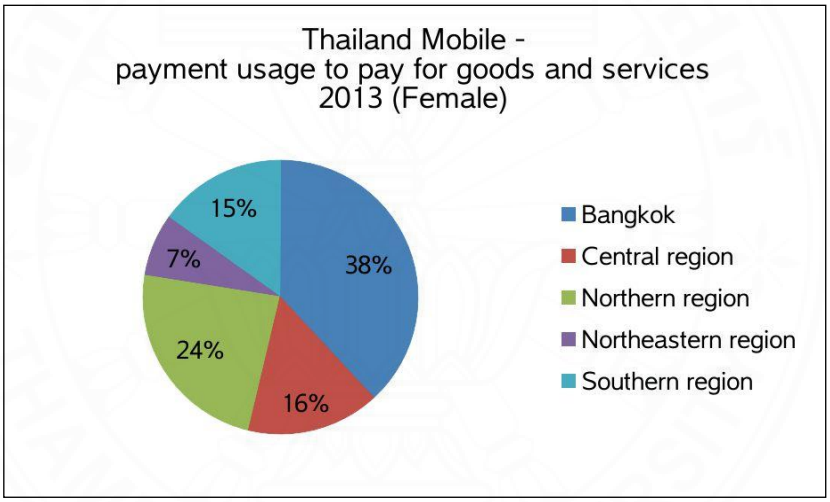


Figure 3.4 Thailand M-payment usage to pay for goods and services in 2013 (Female)

Source: Statistics from Thailand National Statistic Organization (2013)

3.4 A Survey

Although the questionnaire design is an important part of every dissertation (Simmonds-Moore, 2006), it is only briefly discussed here as this study focuses on model development. As such, item generation, which is mostly provided here, will be presented again in detail in the next section. Because of the length of our questionnaire, a self-administered design allows the respondent to answer in their own time (Hair, Robert, and David, 2006b). The introduction part of questionnaire shows

an objective of this study in order to reassure that the result of this study is used for only educational aspect. Then, the respondent is monitored to check whether he/she has used his/her M-payment services. The screening questions ensure that the respondent still recognizes his/her M-payment service experience. The rest of the questionnaire focuses on the development of a model to measure the level of M-payment adoption, consumer trust, and security. It contains the 6 adoption variables (relative advantage, compatibility, observervability, complexity, trialibility, and cost), 3 trust variables (confidentiality, integrity, information sharing), and 3 security variables (confidentiality, integrity, availability). The questionnaire has 44 questions consisting of all variables with rating scales.

Then, it will be pretested with the 40 respondents. and will display the analysis of reliability with correlation. Some variables in a trust part need to be adjusted based on a factor analysis and some items will be deleted to correspond to an objective of this research because the respondents may be confused with their judgment. For trust and adoption of construction group, the outcome of the analysis of reliability with correlation and the factor analysis are agreeable. Next, a new version of the questionnaire is developed and distributed to the respondents. Each item from the previous trial is reconsidered and the new items are deleted to increase the face validity of the construct.

The revised version is divided into five main sections: (1)general information, (2) M-payment usage screening, (3) adoption, trust, and security, (4) satisfaction, and (5) suggestions and recommendations. As usual, the general information section consists of the questionnaire introduction and the demographic information. The next section is M-payment usage screening that consists of other screening questions in order to obtain a respondent who has used and has not used M-payment from his/her main service provider. It ensures that the respondent still recognizes his/her last mobile payment experience. The adoption, trust, and security sections will be developed. These three sections contain the operational definitions and 12 constructs of measurement items, which are originally based on the conceptual definitions and the items established in the Western literature. These 12 constructs include 6 adoption observed variables (relative advantage, compatibility, observerability, complexity, trialibility, cost), 3 observed variables of trust (confidentiality, integrity, information

sharing), and 3 security observed variables (confidentiality, integrity, availability).

Being reviewed by the management academic professors, the items pool will contain 44 items, which are 20 of adoption, 12 of trust, 7 of security, and 5 of Satisfaction. A five-point Likert scale will be employed because it facilitates respondents to answer the questionnaire (Abe, 2004). It is also the best for self-administered research design (Hair et al., 2006b). The respondents will be asked to show their degree of agreement with the statements by using such categorized markers as: strongly disagree; disagree; neither agree nor disagree; agree; and strongly agree. Finally, questions of suggestions and recommendations will be developed. In this section, opened-ended questions will be used. Before the questionnaire is administered, it will be carefully translated into Thai version, which is the native language of the respondents. In order to avoid translation errors, the questionnaire will be translated back to English to compare with the original English version. It was suggested by Behling and Kenneth (2000). Through this arrangement, the language misunderstanding is managed and the questionnaire in a Thai version is ready for use.

3.5 Data Collection

After the questionnaire is revised, and the unfamiliar wording, ambiguous meanings, double-barreled questions, leading questions, confusing instructions are addressed (Aaker, D. A. et al., 2007), the online questionnaire system via Google document service, instead of the mail questionnaire, is launched. Through this service, we can avoid any mistakes that may occur during the data collection process. In addition, we can primarily check if the answers are completed before submission to researcher. The number of survey is followed by the studied distribution quota, which equals to the proportion of Thailand's population structure as reported by the National Statistic Organization of Thailand (2013). The respondents are at least 18 years old with Thai nationality. They have various educational backgrounds and many careers for example company staffs, government officers and students. Moreover, all of them have to use M-payment services. There are 624 prospective online questionnaire respondents. 174 prospects are not qualified, thus 450 eligible respondents are used in

this study. The data collection area covers the main provinces of Thailand such as Bangkok, Chiang Mai, Khonkean, Chonburi, Rayong, Songkhla, Phuket, Nonthaburi and Pathumtani.

3.6 Data Analysis Approach

In Step 1, the item pool will be generated from the literature review and all of its items are reviewed by two management professors (Spake et al., 2003) because one person should be involved in this stage of a questionnaire development. The unclear items are discussed and adjusted while the weak items are deleted. Pilot study is conducted to check its reliability and clarity. Then, the item pool are re-considered and some new items are added.

Step 2, after data collection from the samples has been completed. For purification of the measure, the data is coded and screened for missing values, inconsistent response, skewness, and kurtosis. It is tested by using the assumptions of multivariate analysis as suggested by Hair et al. (2006a). The Statistical program is employed to complete this task and all descriptive statistics are presented simultaneously. Then, factor analysis, correlation and reliability are analyzed. Exploratory Factor Analysis (EFA) is also analyzed by using Statistical statistical software. A basic statistic for determining the reliability is coefficient alpha, but test-retest reliability should not be used because of the respondents' memories. Then, Confirmatory Factor Analysis (CFA) is employed (Joreskog and Sorbom, 1996) for convergent and discriminant validity testing (Gerbing and Anderson, 1988; Peter et al., 2002). However, the need is to calculate construct reliability as recommended and it is done based on a formula suggested by Hair et al. (2006a). For convergent validity, they suggested that standardized loading estimates should be 0.5 or higher, and ideally 0.7 or higher, and that extracted variance should be 0.5 or higher, and coefficient alpha for construct reliability should be 0.7 or greater (Nunnally, 1978). To provide evidence of discriminant validity for the total scale, they also recommended the rule of thumb that the variance extracted estimates for two factors should be more than the square of the correlation between the two factors. Finally, in Step 3, Structural Equation Modeling (SEM), which is a preferable technique for testing the structural model and measurement model. Then, the hypotheses and F-value are tested

to examine the significance level of the proposed relationships.

3.7 Descriptive Statistics

Frequency distribution refers to specified data presenting from the observing percentage at each or group of data points. This method is productive for the relatively frequency expression from survey or other replies data. Descriptive statistics analyze for percentage, standard deviation, and arithmetic mean.

Chiefly, a psychometric response scale is used for preferences and the agreement degrees retrieving from a statement or set of statements in the questionnaires. A non-comparative scaling technique with unidimensional such as Likert scales that can only measure on a single trait. It will ask the respondents to give an ordinal scale from their agreement degree.

Each item or specific question response can be separately analyzed, or being summed with other relevant items to give a score for a group of statements. Here, it is a reason that sometimes Likert scales are called as summative scales (Bertram, 2007). Typically, responses from subjects will be treated like ordinal data, though the relative position comes from the response levels. However, it cannot be presumed that participants will perceive on adjacent levels in diverse ways, equal, or with interval data requirement. Practically, many researchers treat on response data from Likert scale as the interval data; however, according to a statistical standpoint, this could be harmful (Bertram, 2007). There is no way to confirm on the different views of participants if they "agree" or "strongly agree". In the same way, it is unable to notice the differences between "agree" and "neutral." "The average of ‘fair' and ‘good' does not mean ‘fair and a half'; this is true, though when assigning the integers to represent for ‘fair' and ‘good' " (Jamieson, 2004).

The interpretation of mean score and the standard deviation has been set by value between 1.00 and 5.00 (between the lowest and the highest). The following is the level of the scores used to describe the importance levels (Likert, 1932).

5 = Strongly Agree
4 = Agree
3 = Neutral

2 = Disagree

1 = Strongly Disagree

Generally, 5 point scales ranging from "Strongly Disagree" on one end to "Strongly Agree" on the other with "Neither Agree nor Disagree" in the middle as can be noticed. However, some practitioners are found using 7 and 9 point scales enhance additional granularity (Bertram, 2007).Sometimes a 4-point scale (or other even numbered) is adopted to form up an ipsative (forced choice) measure with the unavailable of choices. Coding or numeric values assigned to each level of scale normally begin from 1 and incremented by one for each level.

As a bipolar scaling method, Likert scaling measures on both negative and positive responses about the statement (Elaine and Seaman, 2007). Sometimes, it adopts an even-point scale that does not provide the middle choice for neither agree nor disagree. Sometimes, when the neutral option is removed, it is called as a "forced choice" method (Bertram, 2007). This study adopts Likert scaling technique for values measurement as below.

$$\text{Interval (I)} = \frac{Rang(R)}{Class(C)}$$

R = Highest score - lowest score = 5-1

C = Interval Scale = 5

$$\text{Interval (I)} \quad \frac{5-1}{5} = 0.8$$

Interpretation measurement

The score among	1.00-1.80	means	Strongly disagree
The score among	1.81-2.61	means	Disagree
The score among	2.62-3.41	means	Neutral
The score among	3.42-4.21	means	Agree
The score among	4.22-5.00	means	Strongly agree

3.8 Inferential Statistics and Multivariate Statistics

3.8.1 Exploratory and Confirmatory Factor Analysis

Factor analysis refers to a set of techniques that mostly applied in the field

of behavioral sciences. It is a primary technique used by many researchers to conduct assessment-related studies. Factor analysis holds on basic logic and mathematics firstly described by Charles Spearman (1904b). Among the statistical multivariate procedures, factor analysis is unique, since it is mainly developed by psychologists to test hypotheses with correspondence of indicators, observed variables, scores, or hypothetical constructs (latent variables), or factors, presumed to have influence on the scores(Groth-Marnat, 2009). Spearman and his contemporaries (e.g., Thomson, 1920) worked on factors analysis on models of the nature and organization of intelligence evaluation. Factor analysis remains largely used in mental test studies at recent just like in many areas of research as a means to explore and identify on latent variables, then provide the initially sole sample covariance among a set of indicators (Mulaik, 1987).

Factors analysis can be seen from thousands of published studies over the years (e.g., Costello & Osborne, 2005).It is undeniable that factor analysis has impact in term of sheer volume in research literature. Whether or not the typical factor analytic study can cause a substantive contribution where the matter is an enduring debate (e.g., Furfey & Daly, 1937). A challenge comes from many decision points of factor analysis. This is a difficult part of the technique for the beginners to navigate the analysis through a myriad of choices in sampling and variable selection, factor extraction method, form of data input, and interpretive strategies The results can be compromised from a series of bad choices and default options in some computer procedures does not help and not actually a good choice for factor analysis in many studies. Based on the critical reviews of factor analysis adopting in different research areas (e.g., Fabrigar, Wegener, MacCallum, & Strahan, 1999; Watson & D. Thompson, 2006), the factor analysis studies if not most come from a single serious flaw, too small sample size will be a common problem included with it fails to report the results with sufficient numerical in which the studies cannot be critically assessed.

Factor analysis contains exploratory (EFA) and confirmatory (CFA) as the two broad categories, while the differences of these two techniques can be explained below.

1. EFA has estimated on the unrestricted measurement models, while it becomes the restricted measurement models in CFA, which means that it requires the

researcher to explicitly address for indicator-factor correspondence in CFA. However, there is no room to do so in EFA.

2. EFA does not identify the unrestricted measurement models, since none of the unique set of statistical estimates exist for such model. It concerns on the rotation phrase as part of most EFA applications. On the contrary, CFA needs to identify it prior to the analysis, since it has an only one exclusive estimates set. Therefore, CFA has no rotation phase.

3. EFA assumes that the particular variance of each indicator has not been shared with any other indicators, but CFA as depending on the model, allows for the estimation on what is the specific variance to be shared between the pairs of indicators.

4. CFA output from computer procedures contain numerous of values that fit for the statistics to evaluate the whole data model. On the contrary, fit statistics can rarely observed in the standard model of EFA including with the principle axis factoring and the principle components analysis. Computer programs do not carry on the general statistical analyses like SPSS (IBM, Corp, (2012)) and SAS/STAT (SAS Institute, Inc., (2012)). However, Mplus (Muthén & Muthén, 1998-2012) and other specialized computer programs may print the certain fit statistics types for particular EFA methods.

5. EFA procedures are available in different computer tools for general

statistical analyses, for instance SPSS and SAS/STAT, but CFA needs the more specialized computer tools for Structural Equation Modeling (SEM) since SEM technique will be applied to estimate the restricted measurement models. SEM computer tools with largely adoption are LISREL (Janalyse & S& Sly, 2012) and Mplus (e.g., Kline, 2010). Both EFA and CFA can be analyzed by Mplus program. Whether to process on factor analysis, the decision is normally uncomplicated since the straightforward explanation on the basic purpose-description of latent variables technique. EFA may provide better choice of technique with less mature research areas that not yet resolved the basic measurement questions. Fewer priori assumptions are required compared to CFA that hypotheses will be tested harder than EFA. EFA in an assessment research seem being used in the early of the studies, while CFA is used in later studies on similar area. EFA or CFA selection reflects more point specific

decision on each technique in which will later be explained in this chapter. Next, the researcher discusses on both EFA and CFA adopting decision.

3.8.2 One-Way Analysis of Variance

The one-way ANOVA is relied on the idea that data variability can be partitioned into diverse sources for instance, the residual or unexplained variability, so called random variability between individuals within groups and variability due to diverse systematic between groups Under the null hypotheses that contain the same means, between and within variances are also anticipated to be similar as well. By the way, if found between groups with systematic differences, it can be expected that between groups variance would be larger than within groups. Test can be processed based on these two variances' ratio in which known as F statistic. For the significance test, critical values can be retrieved from F-distribution tables, however, it the degrees of freedom (df) is needed to be specified to do so. The degree of freedom is in two types: df from between groups' variability (df = number of groups −1) and df from within group's variability (df = total number of groups or observations).

In F- statistics calculation, each group shall count on the number of observations (n), the mean for the variable of interest (y), the sum of the observations (T), and the sum of the observations squared (S). Then, across the group each of these quantities needs to be summed for instance, the calculations of groups data are displayed in Table 3.3.

Table 3.3 Assumptions underlying one-way ANOVA

Assumptions underlying one-way ANOVA
1. The data are independent.
2. The data are Normally distributed in each group.
3. The variance is the same in each group.

Once the above quantities have been calculated then construct an analysis of variance table to obtain the F statistic are presented in table 3.4.

Table 3.4 The abbreviation and construct in one-way ANOVA

	Sum of squares (SS)	**Degrees of freedom**	**Mean Squares (MS)**	**F statistic (variance ratio)**
Between	$\sum_{i=1}^{k} T_i^2/n_i - T^2/N$	*k-1*	*SS/df*	$MS_{between}/MS_{within}$
Within	S - $\sum_{i=1}^{k} T_i^2/n_i$	*N-k*	*SS/df*	
TOTAL	$S - T^2/N$	*N-1*		

This is then compared to tabulated critical values of an F statistic on k−1 and N−k degrees of freedom to obtain a P-value.

3.9 Hypothesis Testing

Normally, hypothesis-testing is the term that address for the statistical hypothesis-testing. It generally refers to the probability of application to help in decision making based on the truth or falsity in one or more conjectures. Hypothesis-testing has been in the most part since the early of 20th century. This associated to the name of Jerzy Neyman (1894-1981) and Egon Pearson (1895-1980), while the significance testing phrase that closely related to the statistical concept is normally linked with the likes of Ronald Aylmer Fisher (1890-1962). In general, they are recognized as the modern hypothesis-testing methodology pioneers

Bayesian paradigm is the third and contesting approach to hypotheses testing named after Thomas Bayes, a Presbyterian minister (1701-1761). Most of the empirical researches in the field of psychology have been dominated by a hybrid of Fisherian significance testing and Neyman-Pearson hypothesis-testing. Though, there is the higher popularity among the quantitative oriented scientists in Bayesian paradigm (e.g., Gill, 2007). Bayesian approach which is called as a prior probability to the research hypothesis of interest allows the scientist obtains data from the investigation. Then, revise on the prior into what known as a posterior probability. The posterior probability is expected to be risen related to the prior, if the data have strongly supported for the research hypothesis in order to express the higher relatively

belief in one's theory.

Normally, the Bayesian statisticians believe that probability is best conceived since a degree of belief of one's on the theory usually endorse a subjective probability interpretation. Fisherian or Neyman-Pearson approach supporters assume that probability has a relative frequency (so-called frequentists), where they often at odd with the choice of Bayesian. The discord results from that Bayesian paradigm requires the research hypotheses with the initial prior probability to be a point to start expressing onewhere they o degree over the investigating theory. The frequentists usually hold these as the unsound, philosophically and methodologically weaknesses, or even impossible to attain.

Literature has not universally defined for the hypothesis-testing, where its most common definition is revolved around a null hypothesis that normally assumes as true until having the contradict evidence (e.g., Clapham and Nicholson, 2005).). Should the hypotheses contradict by the evidence, it usually assumes an alternative hypothesis for the null rejection. The substantive alternative hypothesis inferred normally comes with some sort of rational explanation why null is rejected. Typically, it roots into the very purpose that carried out by the researcher in that experimental or non-experimental study.

For example, in a study that compare treatment effectiveness with the control condition, a null hypothesis could be that both groups have similar weight loss within 4 weeks period. In conducting a classic significance test, it seeks to reject the null hypothesis, while trying to conclude if the treatment condition would lead to more weight loss than the control. If it is uneasy to explain by chance (or sampling error) on the difference of means between the treatment and control samples, or to appropriately conducted experiment with essential experimental controls, one normally infers that the means of corresponding population are unequal. This inequity usually points out to the fact that none of treatment on the other group.

3.10 Variable Meanings and Measurements

The following table shows the meaning and measurement of variable in this study.

Table 3.5 The variable meaning and measurement in this study

Variable	Meaning	Measurement
Relative advantage	Relative advantage is the degree to which an innovation is perceived as being better than the idea it supercedes (Rogers, 1995) To the degree that the customers perceives M-payment as offering more advantages relative to their life style, it is more likely to be adopted.	To determine relative advantage of M-payment adoption when compare with other methods for example cash, debit or credit card.
Compatibility	Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences and the needs of potential adopters (Rogers, 1995).	To determine ease-of-use, convenience, and efficiency level of M-payment.
Trialability	Trialability is the degree to which an innovation may be experimented on a limited basis (Rogers, 1995). A new innovation will be adopted more quickly if it is trialable and has less uncertainty.	To determine the degree to which M-payment can be experimented with on a limited basis.
Observability	Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995). Knowledge of the benefits	To determine the visibility of M-payment adoption such as time.

Variable	Meaning	Measurement
	of m-payment is likely to be seen and understood if it is observable.	
Complexity	Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers, 1995). In this context, m-payment may be perceived by customer as something complex that it may not be applicable to their businesses.	To determine familiarity, past experience and the simplicity characteristics of mobile payments are to the user.
Cost	In the M-payment context, the transaction costs of M-payments are often included in the price of the purchased item (Wu and Wang, 2005).	To evaluate how cost will affect the adoption of mobile payments such as device cost, service cost.
Confidential Trust	Moorman et al. (1993) define confidentiality as "Trust the researcher's perceived willingness to keep proprietary research findings safe from the user's competitors" (p.84)	To determine confidential trust of M-payment adoption, privacy or willingness to keep their information safe from the others.
Integrity Trust	Moorman et al. (1993) define integrity in a market research relationship as "a researcher's perceived unwillingness to sacrifice ethical standards to achieve individual or organizational objectives"	To determine integrity trust of M-payment adoption, and unwillingness to sacrifice ethical standards to achieve individual or organizational objectives.

Variable	Meaning	Measurement
Information Shared Trust	Doney and Cannon (1997) indicate that information sharing involves the extent to other people share private information with their counterparty.	To determine information sharing trust of M-payment adoption, and see how much people involve to others' extent.
Confidentiality	Pfleeger & Pfleeger (2007) describes as the capacity to control the information access that should be hold secret to individuals or groups from whom are not authorized to access that information.	To determine level of confidentiality of M-payment from user's point of view regard on the violations of secret or privacy.
Integrity	Krutz & Vines (2010) Integrity consists of 3 conditions which are 1) unauthorized systems or persons are not able to change data; 2) authorized persons or systems are not able to force unauthorized systems or persons modify their data and 3) the data is both internally and externally consistent.	To determine level of integrity of M-payment from user's point of view regard on the quality of information which should not be corrupted.
Availability	Whitman & Mattord (2004) describes as the ability that authorized system or user able to access data or other information processing services without any difficulty.	To determine level of availability of M-payment from user's point of view regard on the ability to access data and processing services.

Variable	Meaning	Measurement
M-payment Satisfaction	Rogers (2003) defined M-payment satisfaction is the full use of decision on an innovation. It is used to measure in innovation or technology adoption success (DeLone & McLean 1992, 2003; Montazemi, 1988; Raymond, 1990).	To evaluate the success and satisfaction of adoption when customer adopt M-payment technology such as SMS, USSD, 4GLTE 3G / GPRS/EDGE, IVR, etc.

CHAPTER 4
RESULTS

This chapter demonstrates the result of the study which includes result presentation and hypothesis testing result. There are three sections as follow descriptive statistics, the measurement model, and SEM model.

The research on Mobile Payment (M-payment): An Examination of Factor Influencing Adoption in Thailand was studied by the data collection using questionnaire. This study has gathered the information from 450 respondents who utilized M-payment and residents in any of five regions in Thailand. The data obtained from the questionnaire was separated into three main parts.

Section 1 relates to the general information which consists of profile information of the respondents.

Section 2 relates to the utilization of mobile phone and the use of M-payment.

Section 3 comprises of the factors of adoption, trust, security, and satisfaction in M-payment.

4.1 Descriptive Statistics

The profile information of respondents was collected. In addition, the descriptive statistic was employed to gain frequency and percentage of each category which explain the characteristic of the M-payment users. The demographic information of the respondents is presented in Table 4.1.

Table 4.1 Demographic information of the respondents

Item	Category	Frequency	Percentage
	Male	216	48.0
SEX	Female	234	52.0
	18-25 years	166	36.9
	26-33 years	145	32.2
AGE	34-41 years	78	17.3
	42-49 years	37	8.2
	Over 50 years	24	5.3
	Under Bachelor Level	7	1.6
Educational Level	Bachelor Level	312	69.3
	Graduate Level	128	28.4
	Other	3	.7
	Government Officer	46	10.2
	State Government Officer	50	11.1
Occupation	Private Company	173	38.4
	Business Owner	40	8.9
	Student	134	29.8
	Unemployed	5	1.1
	Other	2	.4
	Management Level	75	16.7
Position Level	Knowledge worker or specialist	86	19.1
	Operational Level	160	35.5
	Other	129	28.7
	Bangkok and surrounding	250	55.6
	Northern	46	10.2
Living Region	North Eastern	32	7.1
	Southern	94	20.9
	Eastern	28	6.2
	Innovator	186	41.3

Item	Category	Frequency	Percentage
Adopter type	Early adopters	108	24.0
	Early Majority	103	22.9
	Late Majority	38	8.4
	Laggards	15	3.3

According to Table 4.1, it is found that group genders take part in this study consisting of 52 percent of female and 48 of male. Mostly, their ages are in the range of 18-25 years old at 36.9 percent, followed by 26-33 years old about 32.2 percent, 34-41 years old for 17.3 percent, 42-49 years old for 8.2 percent and over than 50 years old for about 5.3 percent respectively. On the aspect of education level, the highest education level of the respondent is Bachelor Level for 69.3 percent, second by Graduate Level for 28.4, under Bachelor Level for 1.6 percent and other for 0.7 percent respectively. For the occupation aspect, most of the respondents consist of staff from Private Company for 38.4 percent, second by student for 29.8 percent, State Government Officer for 11.1 percent, Government Officer for 10.2 percent, Business Owner for 8.9 percent and Unemployed together with others for 1.5 percent. Not only occupations, but also job positions were taken into account on adopter information. On the aspect of job position, most of the samples work in the Operational Level for 35.5 percent. The second group defined as others for 28.7 percent which possibly they are the group of students. Then, the groups of knowledge worker or specialist and Management level are 19.1 and 16.7 and 16.7 percent consecutively. When consider at the residential area, the biggest group of adopters, 55.6 percent, live in Bangkok and surrounding area. People who live in southern is the second biggest adopter group with 20.9 percent. And the rest are the groups who live in northern, north-eastern, and eastern with percentage of 10.2, 7.1 and 6.2 respectively. The final item is the classification of adopter types. The most of the respondent's adopter type is the innovator for 41.3 percent, second by early adopters for 24 percent, early majority for 22.9 percent, late majority for 8.4 percent, and laggards for 3.3 percent respectively.

In section 2, the study of factors on the part of mobile phone utilization and the use of M-payment consist of the significant information as follows:

The experience of respondent on using mobile phone is one of the important criteria for using M-payment. The interview of 450 mobile phone users revealed that the fewest using experience is one year and the longest years of experience is 20 years. Therefore, the average utilization period of the user is 11.49 years.

Table 4.2 Mobile usage and M-payment usage

Item	Category	Frequency	Cumulative Frequency
Activity used in mobile phone	Voice communication	443	443
	SMS or MMS services	358	801
	Entertainment (such as song and game downloading)	300	1,101
	Internet and e-mail Service	386	1,487
	Payment Service	199	1,686
	Credit Card	232	232
Payment transaction type that always used	Debit Card	86	318
	ATM	193	511
	Payment Provider such as PayPal	89	600
	E-Wallet or NFC	10	610
	Other	43	653
The M-payment application	M pay by AIS	54	54
	M cash by AIS	18	72
	True money by True	26	98
	Touch SIM by True	4	102
	ATM sim by DTAC	61	163
	GSM mobile paywave by AIS	12	175
	KTB online mobile	117	292
	SCB easy net	179	471
	K Mobile banking	105	576
	TMB M-banking	24	600
	Krungsri mobile banking	37	637

Item	Category	Frequency	Cumulative Frequency
	Bualuang i-banking	70	707
	UOB cyber banking	10	717
	Other	20	737
Device for m-payment	Feature phone and Smartphone	439	439
	Tablet PC	234	673

Mobile phones are used for voice communication mostly as shown in Table 4.2. According to Table 4.2, it is found that the most activity used in mobile phone of the respondent is on voice communication for 443 users, followed by Internet and e-mail service by 386 users, SMS or MMS services by 358 users, entertainment (such as song and game downloading) by 300 users and payment service by 199 users respectively. Many types of payment transactions are employed by respondents. The most two popular transactions are credit card and ATM while the PayPal and debit card are following and E-wallet or NFC combined with other types are the lowest. The M-payment application that have the most users are SCB easy net for 179 users, second by KTB online mobile for 117 users, and K Mobile banking for 105 users. For M-payment application that has the fewest users at the two last ranked are M cash by AIS and Touch SIM by True service with 18 and 4 users. It is also found that M-payments are used on feature phones and smartphones by 439 users while 386 adopters utilize tablet PCs. Among all M-payment users, some are both smartphone and tablet PC users.

According to 450 M-payment users, the average value per transaction is around 1,000 baht. The lowest value per transaction can be less than 100 baht while the highest one can possible be in the range of 10,000 baht.

Table 4.3 M-payment Operators and Frequency of using

Item	Category	Frequency	Percentage
Mobile Service Provider	AIS	157	34.90
	DTAC	201	44.70
	TRUE and TRUE move H	89	19.80
	Other	3	0.70
Frequency of M-payment usage	Everyday	20	4.44
	5-6 times per week	11	2.44
	3-4 times per week	36	8.00
	1-2 times per week	130	28.89
	Less than 1 time per week	253	56.22

The mobile service providers and frequency of M-payment transactions are presented in Table 4.3. DTAC takes the most number of mobile service providers at 44.7 percent. 34.9 and 19.8 percent of adopters use AIS and True and True move H while only small number of adopters use others operators. In terms of frequency of use, more than half of M-payment users employ the system less than once a week, while only around 4 percent of users make M-payment every day.

Table 4.4 Reason for using and not using M-payment

Item	Category	Frequency	Cumulative Frequency
Reason for using mobile payment	No bank note or coin available	0	70
	Convenience of buying goods and services	38	508
	Easier than paying cash	48	756
	Trying new technologies	34	890
	easy to learn and simple to use		986

Item	Category	Frequency	Cumulative Frequency
		6	
	Better quality obtained	00	1,086
	Other		1,095
Reason for not using mobile payment	Dislike paying service fee Prefer not to pay service fee	98	298
	Lack of Proper security	37	635
	Easier to pay with cash	02	737
	Easy to use but registration is too troublesome	07	944
	Try new technology later	7	971
	Don't want to change how things are usually done.	6	1,047
	Don't like sending text message	2	1,089
	Don't know how to send text message or using new technology	4	1,123
	Other		1,126

According to Table 4.4, it is found that the reason for using M-payment mostly results from the convenience in buying goods and services. Secondly, the users feel that using M-payment seems to be easier than paying cash. Thirdly, the group of adopters who are the new generation or working age wants to try new technologies. On the other hand, the reason for not using M-payment mostly results from the lack of proper security. Some people also don't want to pay service fee for M-payment and

they think that it is difficult to make registration. Moreover, most of the users feel that it is easier to pay by cash rather than using M-payment.

Section 3 is the factor relates to adoption factor of M-payment, trust, security, and satisfaction.

To justify all factors, the questions were categorized into 5 levels of Likert scale based on the mean score values of those factors. The factors which used for the research in this study are described in Table 4.5.

Table 4.5 Mean Score value and the criteria

Mean score	Criteria
1.00 – 1.80	Strongly disagree
1.81 – 2.60	Disagree
2.61 – 3.40	Neutral
3.41 – 4.20	Agree
4.21 – 5.00	Strongly agree

Table 4.6 Mean Score and the criteria of Adoption Factors in M-payment Adoption

Item	N	Mean	SD	Criteria
Relative Advantage	450	3.93	0.60	Agree
Complexity	450	3.81	0.67	Agree
Compatibility	450	3.74	0.76	Agree
Observability	450	3.45	0.70	Agree
Trialability	450	3.75	0.70	Agree
Cost	450	3.73	0.71	Agree
Total M-Adoption Factors	450	3.74	0.51	Agree

4.1.1 Adoption Factors in M-payment Adoption

According to Table 4.6, it shows that the adopters of M-payment pay attention to 6 aspects of adoption factor consisting of relative advantage, complexity, compatibility, observability, trialability, and cost. The results from all aspects are on the significant level. Overall, Adoption Factor impacts on M-payment adoption in

high level at the average of 3.74.

Table 4.7 Mean Score and the criteria of Security Factors in M-payment Adoption

Item	N	Mean	SD	Criteria
Security Confident	450	3.49	0.79	Agree
Security Integrity	450	3.44	0.73	Agree
Security Availability	450	3.52	0.68	Agree
Total Security	450	3.49	0.67	Agree

4.1.2 Security Factors in M-payment Adoption

In our study, there are three aspects on security factor which compose of confidentiality, integrity and availability. According to Table 4.7, it shows that all three security factors play important role on M-payment adoption. All of them exhibit significant level and the overall result in high level for security in M-payment with the average mean score of 3.49.

Table 4.8 Mean Score and the criteria of Trust Factors in M-payment Adoption

Item	N	Mean	Std. Deviation	Criteria
Trust Confident	450	3.99	0.61	Agree
Trust Integrity	450	3.73	0.62	Agree
Trust Information sharing	450	3.66	0.67	Agree
Total_Trust	450	3.79	0.54	Agree

4.1.3 Trust Factors in M-payment Adoption

The mean scores of trust factors including confidentially trust, integrity trust, and information shared trust are presented in Table 4.8. It reveals that the users of M-payment have concerned about all issues of trust. Our study indicates that all aspects lay on the significant level. As a result, all trust factors result in good agreement on trust in M-payment adoption in high level with the average of 3.79.

Table 4.9 Mean Score and the criteria of all Factors in M-payment Adoption

Item	N	Mean	Std. Deviation	Criteria
Total M-payment Adoption	450	3.74	0.51	Agree
Total Security	450	3.49	0.67	Agree
Total Trust	450	3.79	0.54	Agree
Total_Mpay SAT	450	4.12	0.64	Agree

4.1.4 Summarized Factors in Mobile Payment Adoption

The users concern about all factors aspects in the "agree" criteria level as seen in Table 4.9. It also reveals that among all, Total M-payment satisfaction is the highest level with the mean average value of 4.12.

4.2 Measurement Model

The factor analysis is conducted for the measurement model in this study. For this section, all the scale are subjected to a confirmatory factor analysis (CFA) by statistics application with maximum likelihood estimation to assess the variable validity and convergent validity.

4.2.1 Confirmatory Factor Analysis (CFA)

The Confirmatory Factor Analysis or CFA is employed into the research procedure to confirm the validity and reliability of the measurement model including trust, security, adoption, and satisfaction. Trust variable consists of 3 constructs namely; confidential trust, integrity trust, and information sharing trust. Security variable has 3 constructs: confidentiality, integrity, and availability. In addition, adoption variable has 6 constructs namely; relative advantage, compatibility, complexity, trialability, observability, and cost. A total of thirteen constructs are measured by forty-three five-point scale items. In this study, the abbreviations for construct are assigned in table as below.

Table 4.10 The abbreviations for research model

Abbreviations		Construct
trust_confi		Confidentiality Trust
trust_intri		Integrity Trust
trust_infor		Information Sharing Trust
sec_confi		Confidentially in Security
sec_intri		Integrity in Security
sec_availi		Availability in Security
RA		Relative Advantage
Compat		Compatibility
Complex		Complexity
Observe		Observability
Trial		Trialability
Cost		Cost
Mpay_SAT		M-payment Adoption Satisfaction

The assessments of measurement model can examine the goodness of fit, the item reliability, and the discriminant validity before to perform the structural equation model (SEM). The assessment of fit for a given model utilizes multiple indices of different types in prior studies. Heir et al. ,(2006) suggested the fit indices including the value of χ^2/df (CMIN/DF), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) in order to obtain adequate information to evaluate the model as shown in Table 4.11. These indices have been selected over other indices because there are the most sensitive to parameter estimation, sample size, and model misspecification.

Table 4.11 Fit indices for the measurement model

Fit Indices	Suggested Value	Actual Value	Sources
χ^2/df (CMIN/DF)	< 4.00	3.35	Marsh and Hocevar, 1985; Shumaker and Lamax, 2004
CFI	≥ 0.90	0.92	Hair et. al., 2006
TLI	≥ 0.90	0.90	Hair et. al., 2006
SRMR	< 0.08	0.06	Hair et. al., 2006
RMSEA	< 0.08	0.07	Hair et. al., 2006

Table 4.11 shows the selected fit indices and provides the suggestion for using fit indices in terms of different number of constructs, different sample sizes, and degree of error in model specification. In this study, it is based on a sample of 450 respondents and a thirteen-construct model with forty-three variables.

Thus, to evaluate the fit, the model examines the recommended fit indices as follow: the value of χ^2/df (CMIN/DF) = 3.35 , Comparative Fit Index (CFI) = 0.92 , Tucker-Lewis Index (TLI) = 0.90, Standardized Root Mean Square Residual (SRMR) = 0.06, and Root Mean Square Error of Approximation (RMSEA) = 0.07. Table 4.11 summarizes the overall model fit measurement of the model. Therefore, the fit indices for the measurement model indicate an adequate fit.

The measurement model is evaluated in terms of convergent validity, and discriminant validity. The convergent validity is examined by three criterions: factor loadings, average variance extracted (AVE), and composite reliabilities (CR). Convergent validity is the extent to which indicators of a specific construct share a high proportion of variance in common. Table 4.12 and Figure 4.1 demonstrate the result of our confirmatory factor analysis (CFA).

Firstly, the factor loading that are the stadarderdize regression weight are showed in Table 4.12. All of factor loading from standardized regression weight are more than the suggested value of 0.5 (Bagozzi and Yi, 1988). The factor loading are varied from 0.545 to 0.897. The result revealed that all factor loading were greater than the recommended threshold of 0.5, ranging from 0.684 to 0.897 for exogenous

construct measurement model, 0.545 to 0.894 for endogenous construct measurement model, and 0.632 to 0.787 for the mediator. Furthermore, the standardized factor loadings of every items in this model are all statistical significant ($p < 0.05$). Thus, it demonstrated the adequate item reliability of factor loadings.

The average variance extracted (AVE) is the indicated convergent validity of each variable which is a summary indicator of convergence. Average variance extracted measure is computed for each latent variable in a measurement model by using standardized factor loadings (Hair et al., 2006). The criterion of an adequate model is which the values of AVE should more than 0.5 (Fornell and Larcker, 1981). From Table 4.12, the values AVE exeed 0.50, suggesting adequate convergent.

In addition, the value of composite reliability (CR) is an indicator of convergent validity. Then, all the value of CR should be more than the minimum criteria of 0.70 (Nunnally and Berstein, 1994). In Table 4.12, the values of composite reliability (CR) are between 0.750 to 0.901 which is greater than 0.70. Thus, the construct are related to the theory.

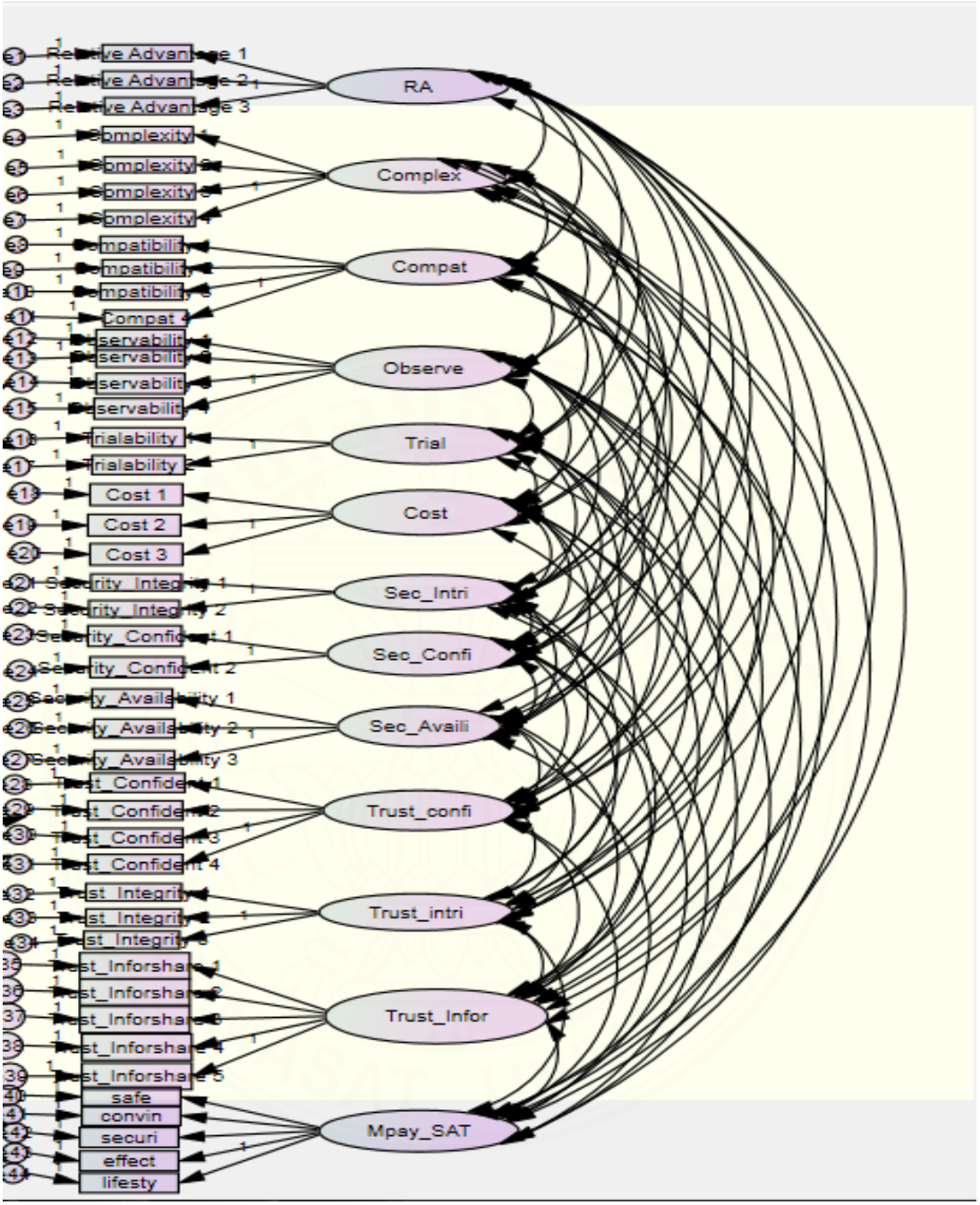


Figure 4.1 The Confirmatory Factor Analysis (CFA) model

Table 4.12 The result of Confirmatory Factor Analysis (CFA) model

Variable	Factor Loading	AVE	CR
RA1	0.729	0.533	0.773
RA2	0.651		
RA3	0.803		
Complex1	0.634	0.608	0.860
Complex2	0.811		
Complex3	0.759		
Complex4	0.893		
Compat1	0.784	0.695	0.901
Compat2	0.823		
Compat3	0.894		
Compat4	0.830		
Trial1	0.727	0.600	0.750
Trial2	0.820		
Observe1	0.782	0.503	0.798
Observe2	0.764		
Observe3	0.593		
Observe4	0.674		
Cost1	0.655	0.501	0.749
Cost2	0.688		
Cost3	0.773		
T_CONFI1	0.756	0.533	0.820
T_CONFI2	0.743		
T_CONFI3	0.727		
T_CONFI4	0.693		
Integri1	0.749	0.521	0.765
Integri2	0.679		
Integri3	0.736		
T_INFOR1	0.694	0.504	0.835
T_INFOR2	0.787		

Variable	Factor Loading	AVE	CR
T_INFOR3	0.632		
T_INFOR4	0.697		
T_INFOR5	0.731		
Confi1	0.848	0.762	0.865
Confi2	0.897		
Intrigi1	0.778	0.669	0.801
Intrigi2	0.856		
AVAIL1	0.792		
AVAIL2	0.892	0.630	0.835
AVAIL3	0.684		
Mpay_SAT1	0.545		
Mpay_SAT2	0.796		
Mpay_SAT3	0.578	0.534	0.874
Mpay_SAT4	0.822		
Mpay_SAT5	0.854		

The discriminant validity is the extent to which a construct is truly distinct from other constructs. The value of covariance are expressed as correlations after standardization. Then, the values of covariance (r) and approximate standard error (SE) are used to assign the upper bound of the confidence interval. According to Anderson and Gerbing (1988), when adding those two values together, the value of upper bound of the confidence interval should be less than 1.0. In Table 4.13, the result of construct discriminant validity indicated that all constructs have the value less than 1.0. Thus, this model valids with the discriminant validity.

Table 4.13 The construct discriminant validity

Covariance			r	SE	Upper Bound of Confidence Interval
RA	<-->	Complex	0.28	0.03	0.31
RA	<-->	Compat	0.32	0.03	0.35
RA	<-->	Obseve	0.17	0.02	0.19
RA	<-->	Trial	0.21	0.03	0.24
RA	<-->	Cost	0.13	0.03	0.16
RA	<-->	Sec_Intri	0.16	0.02	0.18
RA	<-->	Sec_confi	0.18	0.03	0.21
RA	<-->	Sec_Availi	0.12	0.02	0.14
RA	<-->	Trust_confi	0.04	0.01	0.05
RA	<-->	Trust_intri	0.17	0.02	0.19
RA	<-->	Trust_infor	0.14	0.02	0.16
RA	<-->	Mpay_SAT	0.23	0.03	0.26
Complex	<-->	Compat	0.44	0.04	0.48
Complex	<-->	Obseve	0.25	0.03	0.28
Complex	<-->	Trial	0.30	0.03	0.33
Complex	<-->	Cost	0.17	0.03	0.20
Complex	<-->	Sec_Intri	0.30	0.03	0.33
Complex	<-->	Sec_confi	0.34	0.04	0.38
Complex	<-->	Sec_Availi	0.20	0.02	0.22
Complex	<-->	Trust_confi	0.05	0.02	0.07
Complex	<-->	Trust_intri	0.23	0.03	0.26
Complex	<-->	Trust_infor	0.21	0.03	0.24
Complex	<-->	Mpay_SAT	0.28	0.03	0.31
Compat	<-->	Obseve	0.30	0.03	0.33
Compat	<-->	Trial	0.36	0.04	0.40
Compat	<-->	Cost	0.16	0.03	0.19

Covariance			r	SE	Upper Bound of Confidence Interval
Compat	<-->	Sec_Intri	0.26	0.03	0.29
Compat	<-->	Sec_confi	0.30	0.03	0.33
Compat	<-->	Sec_Availi	0.19	0.03	0.22
Compat	<-->	Trust_confi	0.05	0.02	0.07
Compat	<-->	Trust_intri	0.21	0.03	0.24
Compat	<-->	Trust_infor	0.18	0.03	0.21
Compat	<-->	Mpay_SAT	0.28	0.03	0.31
Obseve	<-->	Trial	0.22	0.03	0.25
Obseve	<-->	Cost	0.13	0.03	0.16
Obseve	<-->	Sec_Intri	0.21	0.03	0.24
Obseve	<-->	Sec_confi	0.24	0.03	0.27
Obseve	<-->	See_Availi	0.15	0.02	0.17
Obseve	<-->	Trust_confi	0.03	0.01	0.04
Obseve	<-->	Trust_intri	0.16	0.03	0.19
Obseve	<-->	Trust_infor	0.15	0.03	0.18
Obseve	<-->	Mpay_SAT	0.14	0.03	0.17
Trial	<-->	Cost	0.20	0.03	0.23
Trial	<-->	Sec_Intri	0.26	0.03	0.29
Trial	<-->	Sec_confi	0.31	0.04	0.35
Trial	<-->	Sec_Availi	0.17	0.02	0.19
Trial	<-->	Trust_confi	0.05	0.02	0.07
Trial	<-->	Trust_intri	0.22	0.03	0.25
Trial	<-->	Trust_infor	0.18	0.03	0.21
Trial	<-->	Mpay_SAT	0.25	0.03	0.28
Cost	<-->	Sec_Intri	0.08	0.03	0.11
Cost	<-->	Sec_confi	0.12	0.03	0.15
Cost	<-->	Sec_Availi	0.07	0.02	0.09

Covariance			r	SE	Upper Bound of Confidence Interval
Cost	<-->	Trust_confi	0.05	0.02	0.07
Cost	<-->	Trust_intri	0.19	0.03	0.22
Cost	<-->	Trust_infor	0.13	0.03	0.16
Cost	<-->	Mpay_SAT	0.20	0.03	0.23
Sec_Intri	<-->	Sec_confi	0.44	0.04	0.48
Sec_Intri	<-->	Sec_Availi	0.23	0.03	0.26
Sec_Intri	<-->	Trust_confi	0.04	0.01	0.05
Sec_Intri	<-->	Trust_intri	0.19	0.03	0.22
Sec_Intri	<-->	Trust_infor	0.18	0.03	0.21
Sec_Intri	<-->	Mpay_SAT	0.14	0.03	0.17
Sec_confi	<-->	Sec_Availi	0.27	0.03	0.30
Sec_confi	<-->	Trust_confi	0.06	0.02	0.08
Sec_confi	<-->	Trust_intri	0.26	0.03	0.29
Sec_confi	<-->	Trust_infor	0.24	0.03	0.27
Sec_confi	<-->	Mpay_SAT	0.19	0.03	0.22
Sec_Availi	<-->	Trust_confi	0.03	0.01	0.04
Sec_Availi	<-->	Trust_intri	0.15	0.02	0.17
Sec_Availi	<-->	Trust_infor	0.14	0.02	0.16
Sec_Availi	<-->	Mpay_SAT	0.12	0.02	0.14
Trust_confi	<-->	Trust_intri	0.10	0.03	0.13
Trust_confi	<-->	Trust_infor	0.06	0.02	0.08
Trust_confi	<-->	Mpay_SAT	0.07	0.02	0.09
Trust_intri	<-->	Trust_infor	0.29	0.04	0.33
Trust_intri	<-->	Mpay_SAT	0.23	0.03	0.26
Trust_infor	<-->	Mpay_SAT	0.17	0.03	0.20

In conclusion, the all measures of the overall model fit fell in the acceptable range which supported the reliability, convergent, and discriminant validity of model for SEM testing and the analysis of hypotheses testing.

4.3 Hypotheses Testing

The symbols and abbreviations that used in data analysis are shown as follows:

n	means	Sample Size
$\overline{X}$	means	Mean
S.D.	means	Standard Deviation
χ^2	means	Chi-square
df	means	Degree of Freedom
GFI	means	Goodness of Fit Index
AGFI	means	Adjust Goodness of Fit Index
NFI	means	Normal Fit Index
IFI	means	Incremental Fit Index
CFI	means	Comparative Fit Index
RMSEA	means	Root Mean Square Error of Approximation
RMR	means	Root Mean Square Residual
b	means	Unstandardized Regression Coefficient
Beta	means	Standardized Regression Coefficient
S.E.	means	Standard Error
R	means	Multiple Correlation
R^2	means	Square Multiple Correlation
t	means	t-distribution
F	means	F-distribution
P	means	Significant Value

4.3.1 SEM Hypothesis Testing

Structural Equation Model Analysis (SEM) is conducted to examine the path analysis among the adoption factors, trust, security and M- payment satisfaction in M-payment adoption. The SEM approach was used in data analysis to demonstrate

the comprehensive analysis for the hypothesized relationship of research model (Fornell and Lacker, 1981).

From our research conceptual framework combined with the thought and theory related to Diffusion Of Innovation (DOI) Model, user trust dimension and security goal which is CIA Model (Confidentially, Integrity, and Availability) and other relevant research concepts. The variances can be constructed in form of Structural Equation Model (SEM) among adoption, trust, security, and user satisfaction. Moreover, statistics program was used to construct the SEM as demonstrated in Figure 4.2.

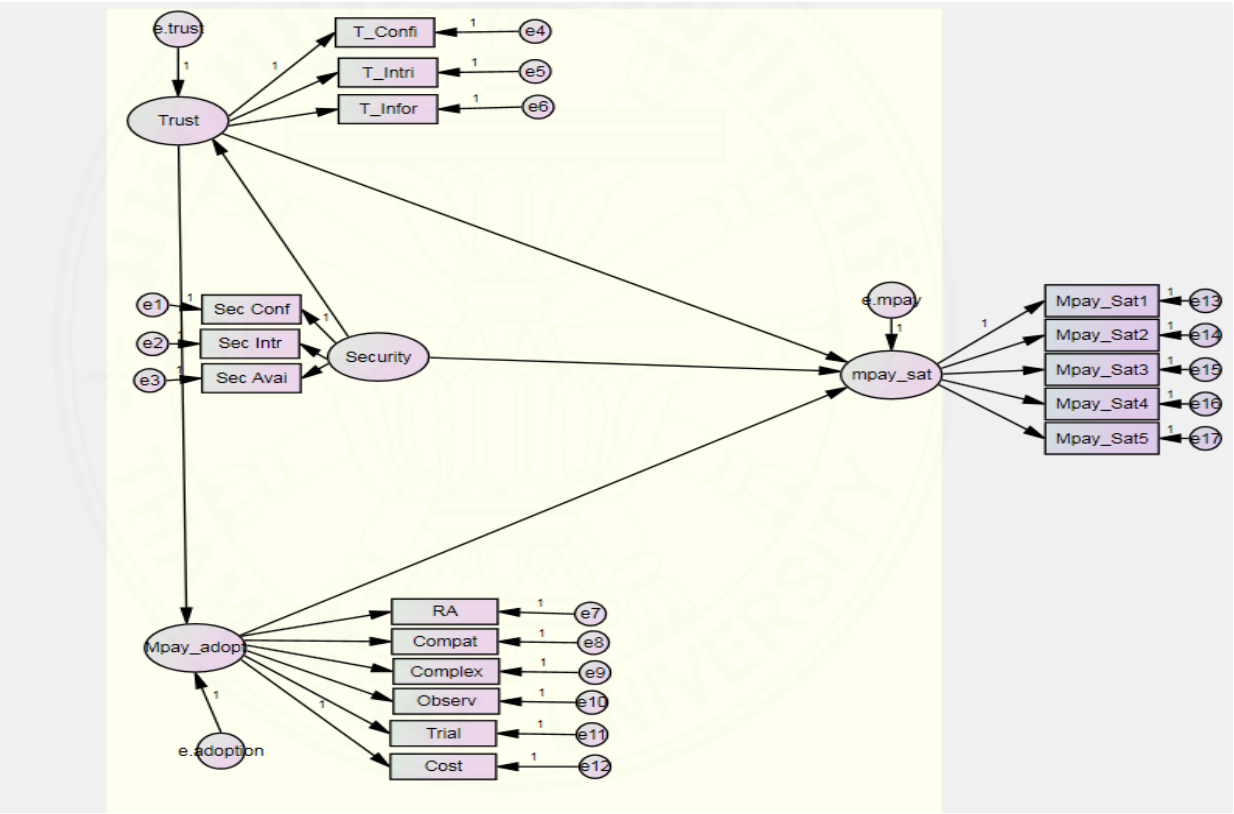
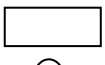
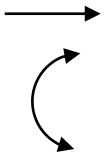


Figure 4.2 SEM model as obtained from the research conceptual framework.

The symbols in the Structural Equation (SEM(Model in this study are depicted as below:

	is used for	Latent Variable
	is used for	Observed variable or manifest variables
	is used for	Error estimation



is used for Direct Relationship

is used for Correlation or Covariance

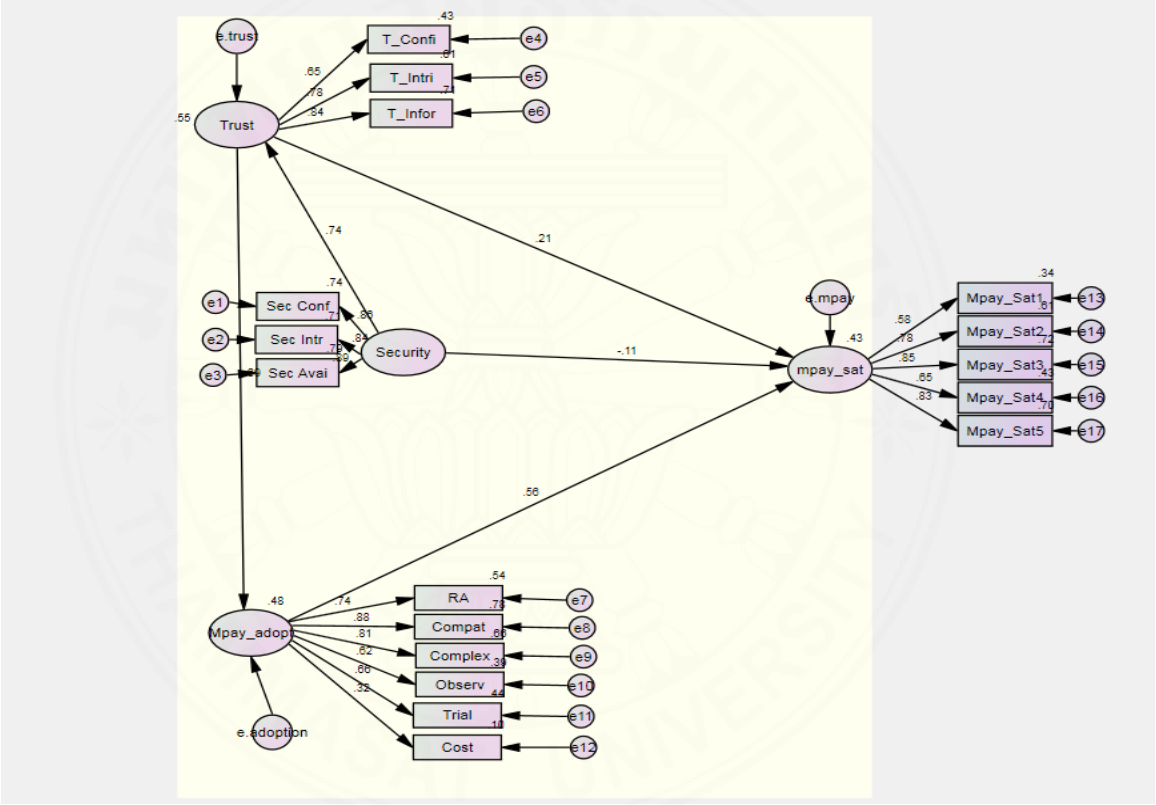
The next section is the abbreviations of the variables that use in Structural Equation Model. The variable type, abbreviations, and the meanings of variables are presented in the table 4.14.

Table 4.14 The variable type, abbreviations in the Structural Equation Model

Variable Type	**Name**	**Meaning**
Latent Variable	Security	Security Factors in M- payment Adoption
Observed variable	sec_conf	Confidentially Security in M- payment Adoption
Observed variable	sec_intr	Integrity Security in M- payment Adoption
Observed variable	sec_avai	Availability Security in M- payment Adoption
Latent Variable	Mpay_Adop	Adoption Factors in M- payment Adoption
Observed variable	RA	Relative Advantage in M- payment Adoption
Observed variable	Compat	Compatibility in M- payment Adoption
Observed variable	Complex	Complexity in M- payment Adoption
Observed variable	Observe	Observability in M- payment Adoption
Observed variable	Trial	Trialability in M- payment Adoption
Observed variable	Cost	Cost in M- payment Adoption
Latent Variable	Trust	Trust Factors in M- payment Adoption
Observed variable	t_confi	Confidentiality Trust in M- payment Adoption
Observed variable	t_intri	Integrity Trust in M- payment Adoption
Observed variable	t_infor	Information Sharing Trust in M- payment Adoption
Latent Variable	ppay_Sat	M-payment Adoption Satisfaction
Observed variable	Mpay_Sat1	M-payment Adoption Satisfaction1
Observed variable	Mpay_Sat2	M-payment Adoption Satisfaction2
Observed variable	Mpay_Sat3	M-payment Adoption Satisfaction3

Variable Type	Name	Meaning
Observed variable	Mpay_Sat4	M-payment Adoption Satisfaction4
Observed variable	Mpay_Sat5	M-payment Adoption Satisfaction5
Error Estimate	e	error (e) estimation in construct

The result form Structural Equation Model (SEM) among adoption, trust, security and customer satisfaction in M-payment Adoption as obtained from the research conceptual framework is shown in figure 4.3.



*p<0.05

Chi-square =598.034, df = 114, GFI = 0.864, RMSEA = 0.097

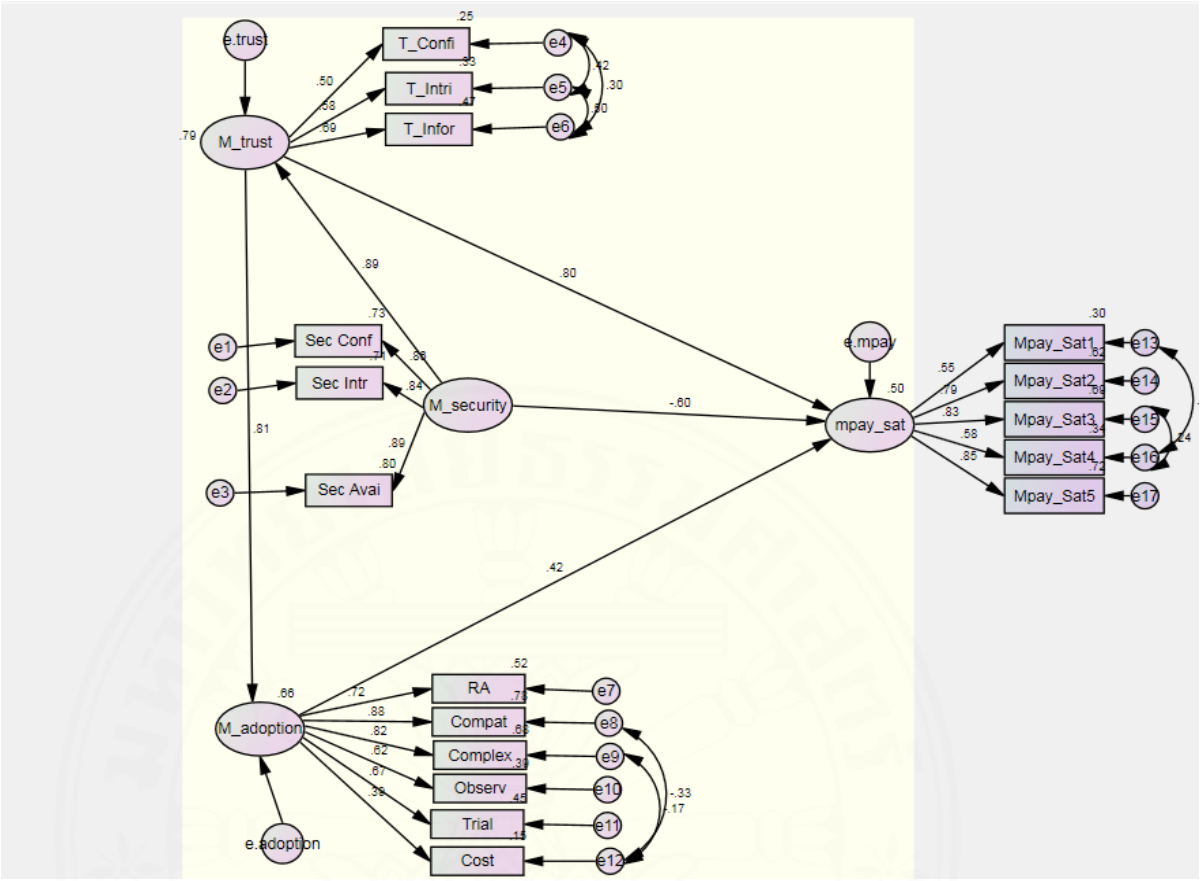
Figure 4.3 The results of SEM model (Before Model Adjusted).

From figure 4.3, by using the Structural Equation Model (SEM) Before model adjusted, we found that the Chi-square test gives the statistical significant level at 0.05 (P <0.05) which does not valid with selected fit indices. To valid with selected fit indices, the relative Chi-square or χ^2/df (CMIN/DF) suggested value should be less than 4. However, the actual relative Chi-square or χ^2/df (CMIN/DF) value from SEM

model before model adjustment is 5.246 which still does not valid the fit indices. On the aspect of Goodness of fit Index (GFI), Normal Fit Index (NFI), Incremental Fit Index (IFI), and Comparative Fit Index (CFI), all the recommended values should be equal or higher than 0.9.

However, it is found that the following actual values such as GFI =0.864, NFI = 0.868, IFI = 0.890, and CFI =0.889, do not fit with the goodness of fit indices. The Root Mean Square Error of Approximation (RMSEA) of 0.097 was found and did not valid the recommended value while the required RMSEA number should be less than 0.08. Thus, it can be concluded that the Structural Equation Model (SEM) (Before model adjusted) have not valid with the goodness of fit indices. Hence, it is necessary to adjust to good fit model with the fit indices. The linkage between error term is used to adjust the good fit model. The linkage is selected from the possible largest value of Modification Indices (MI).

This model adaptation is not suitable to apply the data reduction in the model and the gathering of item parceling variances to form the new factors because the weight value of factors in each elements are at least 0.03 (Kline, 1994). Moreover, with the former literature review on theory of each factor, it does not proper to form the new factor as shown in Figure 4.4.



Chi-square =410.165, df = 107, GFI = 0.906, RMSEA = 0.079

*p<0.05

Figure 4.4 The results of SEM model (After Model Adjusted).

According to Figure 4.4 the adjusted SEM was presented. After model adjustment, we found that the value of χ^2/df (CMIN/DF) less than 4 which fit with goodness of fit indices as shown in Table 4.15. When consider other fit indices with the required value higher or equal to 0.90, it is found that all the indices such as GFI =0.906, NFI =0.909, IFI =0.931, CFI 0.931 have valid with suggested fit indices. Also, two fit indices, RMR and RMSEA that the value must less than0.0 8 (RMR = 0.032 and RMSEA = 0.079) have fitted with the goodness of fit indices as well. Therefore, the results of SEM (before and after adjusted) are shown in Table 4.15.

Table 4.15 The suggested value and actual value of fit indices

Fit Indices	Suggested Value	Actual Value (Before adjustment)	Actual Value (After adjustment)	Sources
χ^2/df (CMIN/DF)	<5	5.246	3.833	(Marsh and Hocevar, 1985; Shumaker and Lamax, 2004)
GFI	≥0.90	0.864	0.906	(Hair et. al., 2006)
AGFI	≥0.80	0.818	0.865	(Shumaker and Lamax, 2004)
NFI	≥0.90	0.868	0.909	(Hair et. al., 2006)
IFI	≥0.90	0.890	0.931	(Hair et. al., 2006)
CFI	≥0.90	0.889	0.931	(Hair et. al., 2006)
RMR	<0.05	0.044	0.032	(Diamantopoulos and Sigguaw, 2000)
RMSEA	< 0.08	0.097	0.079	(Hair et. al., 2006)
Summary		Not fit with Fit indices	Fit with Fit indices	

To validate each variable in the Structural Equation Model Analysis (SEM(among adoption, trust, security factors and satisfaction in M-payment adoption, the analyses of all variables and constructs were performed as following.

Adoption Factors (adoption) in M-payment adoption consist of six observe variables including relative advantage (RA), compatibility (Compat), complexity (Complex), observability (Observe), trialability (Trial), and cost (Cost). They conform the M-payment Adoption Factors (Mpay_adop) which are the latent variables that have the factor loading from 0.30 onward with the significant statistical level of 0.05 ($P < 0.05$). By setting the Factor Loading at 0.722, 0.881, 0.823, 0.624, 0.672 and

0.390 respectively, each element can be explained by the degree of fit as reflected by the squared multiple correlations (SMC). These represent the measured variable's variance that is explained by the latent factor regarded as R^2. The explained variance of relative advantage (ra), compatibility (compat), complexity (complex), observability (observe), trialability (trial), and cost (cost) are 52.1, 77.6, 67.7, 39.0, 45.2, and 15.2 percent respectively.

Trust factors (trust) in M-payment adoption consist of three observe variables; confidential trust (t_confi), integrity trust (t_intri), and information shared trust (t_infor). They conform to trust variable (trust) which are the latent variables with the factor loading from 0.30 onward with the significant statistical level of 0.05 ($P < 0.05$). By setting the factor loading at 0.504, 0.576 and 0.688 respectively and each construct can be explained by the degree of fit is reflected by the squared multiple correlations (SMC) representing the measured variable's variance that is explained by the latent factor regarded as R^2. The explained variance of confidential trust (t_confi), integrity trust (t_intri), and information shared trust (t_infor) are 25.4, 33.1, and 47.4 percent respectively.

Security factors (security) in M-payment adoption consist of three observe variables as follows: confidentially (sec_conf), integrity (sec_intr), and availability (sec_avai). They conform to the security variable (security) which are the Latent variables with the factor loading from 0.30 onward with the significant statistical level of 0.05 ($P < 0.05$). By setting factor loading at 0.855, 0.844 and 0.893 respectively, each element can be explained by the degree of fit as reflected by the squared multiple correlations (SMC). These represents for the measured variable's variance that is explained by the latent factor regarded as R^2. The explained variance of confidentially (sec_conf), integrity (sec_intr), and availability (sec_avai) are 73.2, 71.3, and 79.8 percent respectively.

Factors of M-payment satisfaction (Mpay_Sat) consist of five Observe variables as follows: M-payment Satisfaction1 (Mpay_Sat1), Mobile Payment Satisfaction2 (Mpay_Sat2), M-payment Satisfaction3 (Mpay_Sat3), M-payment Satisfaction4 (Mpay_Sat4), and M-payment Satisfaction5 (Mpay_Sat5). They conform to M-payment satisfaction (Mpay_Sat) that is the latent variables with the factor loading from 0.30 onward and the significant statistical level of 0.05 ($P <$

0.05). By setting the factor loading at 0.551, 0.789, 0.830, 0.579 and 0.851 respectively, each element can be explained by the degree of fit as reflected by the squared multiple correlations (SMC). These represent for the measured variable's variance that is explained by the latent factor regarded as R^2. The explained variances of satisfaction Factors are 30.3, 62.3, 68.9, 33.6, and 72.5 percent respectively.

It can be summed that each variable in the Structural Equation Model has been valid because all factor loading values are more than 0.03 (Kline, 1994) and shown in Table 4.16.

Table 4.16 The validity analysis results in each element of Structural Equation Model Analysis (SEM)

Latent Variables	**Observe Variables**	**Factor Loading**				
		b	**S.E.**	**B**	**t**	**R^2**
Security	Sec_conf	1.000		0.855		0.732
	Sec_intr	0.918	0.041	0.844	22.157*	0.713
	Sec_avai	0.894	0.037	0.893	23.978*	0.798
Trust	T_confi	1.000		0.504		0.254
	T_intri	1.159	0.103	0.576	11.292*	0.331
	T_infor	1.505	0.135	0.688	11.185*	0.474
Mpay_Adop	RA	1.578	0.211	0.722	7.466*	0.521
	Compat	2.425	0.327	0.881	7.411*	0.776
	Complex	1.992	0.266	0.823	7.475*	0.677
	Observe	1.588	0.222	0.624	7.166*	0.390
	Trial	1.710	0.233	0.672	7.325*	0.452
	Cost	1.000		0.390		0.152
Mpay_Sat	Mpay_Sat1	1.000		0.551		0.303
	Mpay_Sat2	1.214	0.105	0.789	11.512*	0.623
	Mpay_Sat3	1.306	0.111	0.830	11.789*	0.689
	Mpay_Sat4	1.100	0.097	0.579	11.399*	0.336
	Mpay_Sat5	1.214	0.117	0.851	11.913*	0.725

*p <0.05

The result of Structural Equation Model testing was considered on the aspect of path analysis. The detail of the study is described below.

In terms of path analysis, it is found that: 1) adoption factors (Mpay_adop) affect the satisfaction in M-payment adoption (Mpay_Sat) at the statistically significant level of 0.05 ($P < 0.05$). It implies that the adoption factors (Mpay_adop) influence the factor of satisfaction in M-payment adoption (Mpay_Sat) in the same direction. 2) trust factors (trust) influence on satisfaction on M-payment Adoption (Mpay_Sat) at the statistically significant level of 0.05 ($P < 0.05$). That means whether the M-payment can be trust and reliable, it will give an impact more on satisfaction toward M-payment Adoption (Mpay_Sat) in a high level. 3) security factors (security) influence the trust factors (trust) at the statistically significant level of 0.05 ($P < 0.05$). When the M-payment adopters perceived in security of M-payment, it will positively influence the trust factors of M -payment adopters This will give an impact on the higher trust perception (trust) in M-payment adoption in a high level. 4) security factors (security) affect the satisfaction in M-payment Adoption (Mpay_Sat) at the statistically significant level of 0.05 ($P < 0.05$). This means that the security factors (security) influence the factor of satisfaction in M-payment Adoption (Mpay_Sat) in the opposite direction. 5) From the SEM hypothesis testing, we have also found that both trust factors (trust) and security factors (security) have provided an indirect effect on the satisfaction in M-payment Adoption (Mpay_Sat) at the statistical significant level of 0.05 ($P < 0.05$).That is the M-payment with the higher reliability on the security factor of M-payment system and having user perceived on trust will influence on satisfaction toward M-payment Adoption (Mpay_Sat) of the adopters to increase in the same direction**.**

In conclusion, the effectiveness of prediction found that SEM model has validity (Joreskog & Sorbom, 1993) since it has the R^2 value of 0.503 or 50.30 percent which is more than 40 percent. This can be considered that the developed model can explain the variation of the adoption, trust, security factors, and satisfaction in M-payment adoption (Saris & Strenkhorst, 1984) as shown in table 4.17.

Table 4.17 The result of the path analysis in the Structural Equation Model Analysis (SEM)

Effect variance	Influence	Cause variance		
		Security	**Trust**	**Adoption**
Trust	Direct Effect	0.888*		
	Indirect Effect	-		
	Total Effect	0.888*		
	R^2	0.788		
Mpay_Adop	Direct Effect	-	0.815*	
	Indirect Effect	0.723*	-	
	Total Effect	0.723*	0.815*	
	R^2	0.664		
Mpay_Sat	Direct Effect	- 0.597*	0.799*	0.415*
	Indirect Effect	1.010*	0.338*	-
	Total Effect	0.413*	1.138*	0.415*
	R^2	0.503		

*p <0.05

According to the result of path analysis of Structural Equation Model Analysis (SEM) in this study can also be written into the regression equation as follows:

trust = 0.888* security; R^2 = 0.788

adoption = 0.815* trust; R^2 = 0.664

Mpay_Sat = -0.597* security + 0.799* trust + 0.415* adoption; R^2 = 0.503

The five hypotheses and results in this research are explained and they are presented as follows:

Hypothesis 1 : *The adoption factors have impact on satisfaction in M-payment adoption.*

Hypothesis testing result at the statistically significant level of 0. 05 found that the adoption factors have positively impact on satisfaction in M-payment

adoption 0.05 ($P < 0.05$). That means the more importance of adoption factors will affect the better result on satisfaction in M-payment adoption.

It can be summed the adoption factors have positively impact on satisfaction in M-payment adoption so; Hypothesis 1 is supported.

Hypothesis 2: *Trust factors have impact on satisfaction in M-payment adoption.*

The result of hypothesis testing at the statistical significant level of 0.05 found that Trust factors have positively impact on satisfaction in M-payment adoption 0.05 ($P < 0.05$). That means if M-payment has the factor of trust that can be reliable by the adopters, it would result on the better satisfaction in M-payment adoption.

It can be concluded that Trust factors have positively impact no satisfaction in M-payment adoption, so Hypothesis 2 is supported.

Hypothesis 3: *Security factors have impact on trust factors in M-payment adoption.*

The result of hypothesis testing at the statistical significant level of 0.05 found that Security factors have positively impact on trust factors in M-payment adoption0.05 ($P < 0.05$). That means if M-payment has the factor of security that allows the adopters to confident on safety use, it would result on perceived higher trust level in M-payment adoption.

It can be concluded that Trust factors have positively impact on security factors in M-payment adoption, so Hypothesis 3 is supported.

Hypothesis 4 :*Security factors have impact on satisfaction in M-payment adoption.*

The result of hypothesis testing at the statistical significant level of 0.05 found that Security factors have negative impact on satisfaction in M-payment adoption 0.05 ($P < 0.05$). That means if M-payment has more security that allows the adopters to confident on safety use, it would not result on the same direction on satisfaction in M-payment adoption.

It can be concluded that Trust factors have negative impact on satisfaction in M-payment adoption, so Hypothesis 4 is supported.

Hypothesis 5: *Security factors have indirect impact on M-payment adoption.*

The result of hypothesis testing at the statistical significant level of 0.05 found

that Security factors have indirect effect on M-payment adoption 0.05 ($P < 0.05$). That means if M-Payment has the security factor that can be trusted by the adopters, it would result on an indirect effect on the adoption factor toward better satisfaction in M-payment adoption.

It can be concluded that security factors have indirect impact on M-payment adoption, thus Hypothesis 5 is supported.

4.3.2 One-Way Analysis of Variance Hypothesis Testing

According to Rogers (1995) study, M-payment adopter can be divided into five main stages such as innovators, early adopters, early majority, late majority, and laggards. Hypotheses testing results can be conducted as follows:

Hypothesis 6: *The different stages of M-payment adopters can be differently resulted on Adoption factors in Mobile payment adoption.*

Hypothesis 7: *The different stages of M-payment adopters can be differently resulted on Trust factors in M-payment adoption.*

Hypothesis 8: *The different stages of M-payment adopters can be differently resulted on Security factors in M-payment adoption.*

Hypothesis 9: *The different stages of M-payment adopters can be differently resulted on Satisfaction in M-payment adoption.*

Table 4.18 The result of differences between M-payment Adopter stages and factors M-payment adoption

Item	Adopter Stage	n	$\overline{X}$	SD	Df	F	Sig(2-tailed)
Adoption Factors	Innovators	186	3.766	0.51	449	3.092*	0.021
	Early Adopters	108	3.762	0.43			
	Early Majority	103	3.680	0.54			
	Late Majority	38	3.748	0.58			
	Laggards	15	3.544	0.51			
Trust Factors	Innovators	186	3.822	0.53	449	0.335	0.855
	Early Adopters	108	3.752	0.49			
	Early Majority	103	3.775	0.59			

	Late Majority	38	3.850	0.61			
	Laggards	15	3.706	0.46			
Security Factors	Innovators	186	3.468	0.70	449	0.522	0.720
	Early Adopters	108	3.548	0.59			
	Early Majority	103	3.478	0.69			
	Late Majority	38	3.430	0.73			
	Laggards	15	3.478	0.61			
Satisfaction in Mobile Payment Adoption	Innovators	186	4.166	0.66	449	3.619*	0.000
	Early Adopters	108	4.115	0.60			
	Early Majority	103	4.060	0.62			
	Late Majority	38	4.121	0.75			
	Laggards	15	3.987	0.63			

* $P < 0.05$ (n = 450)

From table 4.18, the result of hypotheses testing by F-test (One way ANOVA) at the statistical significant level of 0.05 ($P < 0.05$) found that the different stages of M-payment adopters give significance to the adoption factors and satisfaction in M-payment adoption. It is found that the different stages of M-payment adopters will result differently on the part of adoption factors and satisfaction in M-payment adoption. But for the trust factors and security factors, it is found that the different stages of M-payment adopters do not differently effect on this issue. By when comparing the difference by LSD, it is found that 1) innovators stage and Laggards stage have a significantly difference on adoption factors in M-payment adoption. 2) early adopters stage pays attention on the adoption factors in M-payment adoption more than the Laggards stage with significantly. And, 3) innovators stage have a significantly difference on satisfaction in M-payment adoption rather than laggards stage. Then results are presented in Table 4.19.

Table 4.19 The comparison results of LSD among adopter stage in M-payment Adoption

Item	Adopter Stage	n	$\overline{X}$	SD	Adopter Stage				
					1	2	3	4	5
Adoption Factors	Innovators	186	3.766	0.51	-				
	Early Adopters	108	3.762	0.43		-			
	Early Majority	103	3.680	0.54			-		
	Late Majority	38	3.748	0.58				-	
	Laggards	15	3.544	0.51	*	*			-
Satisfaction in Mobile Payment Adoption	Innovators	186	4.166	0.66	-				
	Early Adopters	108	4.115	0.60		-			
	Early Majority	103	4.060	0.62	*		-		
	Late Majority	38	4.121	0.75				-	
	Laggards	15	3.987	0.63					-

* significantly difference by LSD (n=450)

According to Table 4.20, it can be concluded that the different stages of M-payment adopters do not differently result on trust factors and security factors. Therefore, hypothesis 6 (H6) and hypothesis 7 (H7) are rejected. But on the aspect of adoption factors and satisfaction in M-payment adoption, it is found that the different stages of M-payment adopters can result on the different of factors in both aspects. Thus hypothesis 5 (H5) and hypothesis 8 (H8) are supported.

Table 4.20 The Summary of research hypotheses testing

Hypothesis	Effect	Result
Hypothesis: 1 The adoption factors have impact on satisfaction in M-payment adoption.	DE = 0.42	Supported
Hypothesis: 2 Trust factors have impact on satisfaction in M-payment adoption.	DE = 0.80	Supported
Hypothesis: 3 Security factors have impact on trust factors in M-payment adoption.	DE = 0.89	Supported

Hypothesis	Effect	Result
Hypothesis : 4 Security factors have impact on satisfaction in M-payment adoption.	DE = (-0.60)	Supported
Hypothesis : 5 Security factors have indirect impact on M-payment adoption.	IE = 1.01	Supported
Hypothesis	F-test	Result
Hypothesis:6 The different stages of M-payment adopters can be differently resultted on the adoption factors in M-payment adoption.	3.092*	Supported
Hypothesis:7 The different stages of M- payment adopters can be differently resultted on trust in M-payment adoption.	0.335	Rejected
Hypothesis:8 The different stages of M-payment adopters can be differently resultted on security inM-payment adoption.	0.522	Rejected
Hypothesis:9 The different stages of M-payment adopters can be differently resultted on satisfaction in M-payment adoption.	3.619*	Supported

CHAPTER 5
DISCUSSION AND CONCLUSION

For this final chapter, the main purposes are to present the summary of this dissertation together with the implications of the research results, discussion on important issues, limitations of the research, and suggestions for future research. There are five sections in this chapter: discussion about research issues and hypotheses, conclusions about the research findings, implications, limitations, and future research.

5.1 Discussion

The result of this study shows that M-payment adoption, trust, and security have a significant impact on M-payment satisfaction. The factors in M-payment adoption in this study are relative advantage, compatibility, complexity, observability, trialabilty, and cost. The highest important of M-payment adoption to M-payment satisfaction is compatibility which consists of various adoption researches (Schierz et al., 2010; Yang et al., 2012). Complexity and relative advantage are in the second and the third rank that also have high impacts on M-payment satisfaction respectively. In previous research, the impact of relative advantage and complexity in innovation adoption have more important than the other factors because these two factors make customers feel familiar and more beneficially with their M-payment usage (Chen, 2008; Mallat et al.,2006; Mallat et al.,2009; Zhou et al., 2010). The lowest impacted factor in M-payment adoption to M-payment satisfaction is cost in M-payment adoption. Any cost in M-payment operation, for example, equipment cost, Internet cost, service cost do not affect with decision in the adoption process (Lu et al., 2011). For security factors, availability has the highest loading because most of customers concern about the quality of authentication and authorization process in M-payment (Chandra et al., 2010; Dahlberg et al., 2008; Kim et al.,2010). Thus, it is necessary for M-payment operators which have to guarantee their customers regarding the security in their M-payment usage. In trust aspect, Information shared trust is the most important factor that will highly affect customer trust in M-payment adoption. Because the confidence of any information from M-payment service providers are

very sensitive to the perceive of customer trust (Deibert et al., 2008; Linck et al., 2006; Hassinen et al., 2006).

The results of this study also demonstrate the mediating effect of trust on the relationship between security and M-payment satisfaction, which is the primal interest of the study. It is interesting to note that the direct effect of security on the M-payment satisfaction, indicating negative relationship (-0.6), which contradicts to previous literatures (Choi et al., 2008; Laukkanen and Kiviniemi, 2010; Wessels and Drennan, 2010). It is more common that the higher level of security, the higher level of customer satisfaction. However, there might be other confounding factors that contribute to decrease in satisfaction while the level of security is highly maintained.

Complicated process to ensure customer's security may impose too much burden and prolong the entire payment processes (Burkle et al., 2009; Kanniainen, 2010; McTaggart et al., 2010). User registration, identification, and verification as well as approval from payment service provider are good examples that create over requisite, thus reducing customer satisfaction and discouraging usage of such a service. Moreover, different level of digital device literacy of users also plays important roles in different level of M-payment usage (Shin and Kim, 2008; Zhou, 2013; Zhou and Wang, 2010). Users with low level of digital device literacy are less tolerate to complicated M-payment process.

Nevertheless, the mediating role of trust in the full model shows positive indirect relationship between security and M-payment satisfaction. Furthermore, indirect effect, through trust, from security to M-payment satisfaction has a higher total effect than the direct effect between security and M-payment satisfaction. This indicates that, with user's trust, higher level of security increases level user's satisfaction.

Trust is a matter of interplaying between reality and perception (Chandra et al., 2010; Linck et al., 2006; Lu et al., 2011). Although service providers make every efforts to guarantee maximum payment security, it will not contribute to satisfaction if it fails to make users perceive about it. However, if there is no security at all, it is impossible or extremely difficult to gain customers' trust. Therefore, establishing trust of users in service providers is the key factor to make security positively contribute to M-payment satisfaction.

Reputation of service providers through a broad customer base can importantly make trust among potential users. When making a payment, especially in a large sum, users either fear for fraud transactions or instability of the system that may incur costly mistakes. Trusted and familiar brand of service provider can reduce user's uneasiness. In addition, investment in the stability of the system to minimize the chance of interruptions is crucial to create trust.

The other indirect path of effect from security to M-payment satisfaction is through two variables, trust and adoption. This path incorporates the effects of security on trust and of trust on adoption, before affecting M-payment satisfaction. The effect of this indirect path adds to the total of indirect effect and makes it higher than that of direct effect. This makes it clear that when trust is in place users are more likely to adopt M-payment and more satisfied.

This study also uses the one-way ANOVA to test the hypotheses whether there are some differences between types of M-payment users and the investigated variables, i.e., M-payment adoption, trust, security, and customer satisfaction. The results show significant differences in M-payment adoption and customer satisfaction among the M-payment adopter of different stages which consists of innovators, early adopters, early majority, late majority, and laggards. It appears that innovators and early adopters are faster in adopting M-payment than laggard user. The result is consistent with the diffusion of innovation theory (DOI) suggesting that laggards tend to be the last group adopting innovation and new technology (Roger, 1995).

Regarding the customer satisfaction in M-payment, this study found that the innovator has greater level of satisfaction than the early majority. This has an interesting implication for marketing consideration. According to the distribution of users, the early majority comprises the largest group in the diffusion innovation adoption theory by Roger (1995). Hence, if a service provider fails to improve the satisfaction of this large share of users, it will adversely affect the later adopters, i.e., late majority and laggards, as a result of a negative word of mouth (WOM) which can affect the adoption of new innovation and the choice of technology and brands in mature categories (Chen et al., 2011; Duan et al., 2008; Li et al., 2011). Word of mouth (WOM) is an informal message about an organization's products or services or even about the organization itself among consumers (Awad and Ragowsky, 2008;

Chintagunta et al., 2010; Huang et al.,2011; Ye et al., 2009). Usually WOM involves comments about product performance, service quality, and trustworthiness passed on from one person to another. From previous researches, negative WOM is more powerful influence on consumer behavior than positive WOM (Chen et al., 2011; Samutachak and Li, 2012).

5.2 Conclusion

This study aims to explore the relationship among trust, security and customer satisfaction in M-payment adoption. The next objective is to examine the mediation of trust in M-payment adoption. The last objective is to explain significant differences in adopter of different stages and M-payment adoption process, i.e. security, trust, M-payment adoption and satisfaction. Four-hundred-fifty respondents is randomly selected. The questionnaire survey is our data collection method. The samples are collected from five geographical regions in Thailand i.e., Bangkok and central, northern, north eastern, eastern, and southern part of Thailand. Moreover, the screening question is used to select only the existing M-payment adopters. The result shows that security, trust and M-payment adoption have a significant direct impact on M-payment satisfaction. The direct impact level on satisfaction ranks from trust, security, and M-payment adoption respectively. However, we found that security has a negative impact on satisfaction. It demonstrates that there are other confounding factors contributing to the relationship between security and customer satisfaction in M-payment adoption. The complicated process in authentication and the low level in computer literacy are main reasons that contribute to the low level of M-payment satisfaction. After introducing trust as the mediator of the relationship between security and satisfaction, the result changes in an opposite direction from negative to positive impact. Thus, security issue is not the only important factor in M-payment adoption especially to the level of customer satisfaction. The result illustrates that the customer's perception of trust can increase the level of satisfaction in M-payment adoption. This research also shows significant differences in adoption process among the M-payment adopter of different stages. Our result from F-test show that there are only significant differences in M-payment adoption factors and customer satisfaction factors among the M-payment adopter of different stages.

In conclusion, M-payment adoption in Thailand is just in early stage. There are many issues to be learned such as the system and user interface designing, the service and technology on M-payment. Then, more investigation is need for the future study.

5.3 Implication

The results of this study show the role of trust in mediating the relationship between security and user satisfaction on M-payment. Without trust, security can reduce user satisfaction as the complexity of the security assuring process increases. Although this seems to contradict to previous literature on mobile service (Balasubramanian et al., 2003; Liu et al., 2008; Shanker et al., 2003; Szymanski and Hise, 2000; Yoon, 2010), it reveals additional explanations. The relationship between security and M-payment satisfaction may not appear in a linear fashion but rather non-curvilinear. The relationship proceeds positively until it reaches the vertex and declines afterwards. Over-engineered process to guarantee security may result in too much burden for users and create dissatisfaction. However, the significance of system and client security is undeniable and the assurance of security inevitably requires technical complexity. Therefore, it is a challenge for system provider to develop the security system that is able to maintain the balance between efficiency and simplicity.

On the other hand, establishing user trust in the security system is vital to M-payment adoption and satisfaction. In addition, image and reputation of the service provider play important roles in creating trust among users (Chang et al.,2006; Josang et al., 2007; Wang and Vassileva, 2007). Service providers that are financial institutions, for example, are likely to be more trusted than unfamiliar service providers. Therefore, partnering with financial institution is advisable in order to create clients' trust. In general, assuring by service provider that the clients' security is strictly monitored by showing a guarantee statement can increase perceived trust. Relatively lower satisfaction in M-payment among majority adopters than innovators and early adopters raises concerns about group of users on whom service providers should place such a special care. It is most likely that this group of users has less knowledge in digital literacy than that of innovators and early adopters. As a result, they tend to be more cautious and easily panic. Their reluctances to subscribe the

service will affect the adoption of later adopters, i.e., late majority and laggards.

Although the company image of service provider and its partner is important to client's trust, the actual stability and integrity of the system is essential. Service provider must exert every efforts to minimize the chance of M-payment system failure.

This study also uses one-way ANOVA analysis to test the hypotheses that there are some differences between type of M-payment users and the factors in adoption process such as M-payment adoption, trust, security, and satisfaction. The result demonstrates that M-payment adoption and satisfaction have significantly differences among the adopters group.

Firstly, innovators and early adopters have more rapid in M-payment adoption than laggards user. The results are confirmed with the user stages in DOI adoption theory whereas laggards have chance to be the last group in innovation or technology adoption. Secondly, for the satisfaction in M-payment, we found that innovators have more satisfaction level in M-payment adoption than early majority. This has implication for marketing consideration. According to the distribution of users, early majority comprise the largest group in diffusion innovation adoption by Roger(1995). Hence, If service provider fail to improve satisfaction of this large share of user it would be at worthy affect to the late adopters, i.e. late majority and laggards.

5.4 Limitation

This study found with some limitations that the researcher considered being useful to share. Firstly, the limitation in data collection by random sampling method, where this study applied a technique of non-probability convenience sampling. Ndubisi and Iftikhar, (2012); Wu et al., (2003) argued that a convenience sample does not represent the inherent characteristics of the general population.Since this study was conducted with the relatively large sample size with the statistically found that the criteria for the target population can be satisfied by the sample characteristics, it needed to be treated with caution on the generalizability of results.

Secondly, factors affecting the adoption of M- payment adoption were explored in a relatively new area for this IS research in which conducted on the particular set of only prospect consumers in Thailand. The concern is on results

generalization. But despite this concern, the significant role from trust in M-payment usage has been tinted, though among the samples with familiarity to M-payment service. Essentially, more studies in wider contexts are needed in the field of M-payment systems.

5.5 Future Research

This study has certain limitations that can be addressed for the future research. Firstly, comparison of the effect of trust as a mediator in other adoption models, for example, technology acceptance model (TAM) (Chen et al., 2008; Kim et al., 2010; Schierz et al., 2010), theory of planed behavior (TPB) (Chandra et al., 2010; Dahlberg and Oorni, 2007; Yang et al.,2012), etc. The impact of the mediator in other adoption models can also evaluated.

Next, the comparison of trust in mobile payment adoption between developed country and developing country can be explored. The different impact in variables should be demonstrated. Furthermore, other forms of mobile service systems such as mobile banking and mobile commerce can be examined. Then, the results in a different platform can be tested to identify different factors that can affect trust and other factors such as security and adoption. Lastly, type of service providers may influence trust and adoption of M-payment as financial institute affiliated provider may be viewed superior regarding their experiences and systematically monitored. Therefore, a separation trust between these two categories of service provider can generate a better understanding on the future research.

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APPENDIX

APPENDIX A: QUESTIONNAIRE

MOBILE PAYMENT (M-PAYMENT): AN EXAMINATION OF FACTOR INFLUENCING ADOPTION IN THAILAND

This questionnaire is used in the study of Mobile Payment (M-payment): An Examination of Factor Influencing Adoption in Thailand. It is developed by Chat Chuchuen who is currently doctoral student at school of management technology, SIIT Thammasat university, Thailand. The objective of this study can be used to study the relationship and effect of security and trust in M-payment. Your information will be used to analyze status and expected perceived benefit. Your response will be kept strictly confidential.

Part 1 General Information

1. Gender ( ) Male ( ) Female
2. Age
   - ( ) 18 – 25 years ( ) 26 – 33 years
   - ( ) 34 – 41 years ( ) 42 – 49 years
   - ( ) more than 50 years
3. Educational Level
   - ( ) High School Level ( ) Bachelor Degree
   - ( ) Graduate Degree ( ) Others……
4. Occupation
   - ( ) Government officer ( ) State Enterprise officer
   - ( ) Private Company ( ) Business Owner
   - ( ) Student ( ) Unemployed
   - ( ) Other ……..
5. Position Level
   - ( ) Top Management Level ( ) Middle Management Level
   - ( ) Operational Level ( ) Knowledge worker or specialist
   - ( ) Other ……..

6. Living Region

( ) Bangkok and surrounding ( ) Northern Region

( ) North Eastern Region ( ) Southern Region

( ) Eastern Region

7. Characteristics of adopter in Mobile-payment service (Please select only 1 for your suitable characteristics)

( )	I always interesting in any new idea and be the pioneer to learn any new idea. Otherwise, I willing to take risk from it. I use any reasonable sources for make my decision and have high educated colleagues or friends to contact. I have plan to manage my financial.
( )	I would like to be leader in any situation. I carefully for any innovation decisions. In uncertainty situation, I decrease uncertainty about new idea by adopting it, and then conveying a subjective evaluation of the innovation to my friends.
( )	I seldom to be leader in any situation. I quite slow to learn or adopt the new ideas and innovations. However I love to have to contact with professional groups.
( )	I am typically skeptical in any new idea and innovation. Sometime I have some personal financial problems and rarely to be a leader for my team.
( )	I am out-of-date in any new idea and be the last group to lean and adopt any new idea. I prefer to be supporter than leader. I have contact only my close friends and member of my family and always have personal financial problems.

Part 2 Mobile Usage and M-payment Usage Information

8. How long have you used your mobile phone? ……. Years

9. Activities used in mobile phone (you may choose more than 1 option.)

( ) Voice communication ( ) SMS or MMS services

( ) Entertainment (such as song and game download)( ) Internet and e-mail Service

( ) Payment Service ( ) Other……

10. Mobile Service Provider using

( ) AIS ( ) DTAC

( ) TRUE and TRUE move H ( ) Other……..

11. Have you had experience in Mobile-payment?

( ) Yes (go to question 13) ( ) No

12. Level of obstruct in M-payment adoption factors (for non-adopters only)					
	Highest	High	Medium	Low	Lowest
Financial readiness					
M-payment service support readiness					
Personal knowledge readiness					
Cost of device					
Cost of services					
Security and Trust in system					
Other Environment factors (such as Environment factor)					

13. What is the payment transaction type that you always use?

( ) Credit Card ( ) Debit Card

( ) ATM ( ) Payment Provider such as Paypal, Thai Sabuy etc.

( ) E-Wallet or NFC ( ) Other……

14. The Mobile payment technology that you always use

( ) M pay by AIS ( ) M cash by AIS

( ) True money by True ( ) Touch SIM by True

( ) ATM SIM by DTAC ( ) GSM mobile paywave by AIS

( ) KTB online mobile ( ) SCB easy net

( ) K mobile banking ( ) TMB M-banking

( ) Krungsri mobile banking ( ) Bualuang i-banking

( ) UOB cyber banking ( ) Other (please specific)…….

15. Which is famous device in your m-payment using?

( ) Feature phone and Smartphone ( ) Tablet PC

16. The monthly average amount you spend using mobile payment …… baht

17. Your frequently of M -payment use

( ) Everyday ( ) 5 – 6 days a week

( ) 3 – 4 days a week ( ) 1 – 2 days a week

( ) Less than 1- 2 day a week

18. Reason for using mobile payment (Can choose more than 1 answer)

( ) No bank note or coin available
( ) Convenience of buying good and services
( ) Easier than cash
( ) Trying new technologies
( ) easy to learn and simple to use
( ) Better quality obtained
( ) Other (please specific)……..

19. Reason for not using mobile payment (Can choose more than 1 answer)

( ) Dislike paying for service fee
( ) Lack of Proper security
( ) Easier to pay with cash
( ) Easy to use but registration is too troublesome
( ) Try new technology later
( ) Don't want to change how things are usually done.
( ) Don't like sending text message
( ) Don't know how to send text message or using new technology
( ) Other (please specific)……..

Part 3 M-payment Adoption, Trust, and Security Factors

	Very Agree	Somewhat Agree	Neutral	Somewhat Disagree	Very Disagree
20. Technology adoption factors in M-payment adoption					
20.1Relative Advantage					
Using M-payment will help me to achieve my personal goals.					
Using M-payment services will enhance my effectiveness in my financial management.					
Using M-payment services					

	Very Agree	Somewhat Agree	Neutral	Somewhat Disagree	Very Disagree
will be useful to me.					
20.2 Complexity					
My transaction with M-payment services will be clear and understandable.					
Learning to use M-payment services will be easy for me.					
Interacting with M-payment services will not require a lot of mental effort.					
Using process M-payment services will be easy.					
20.3 Compatibility					
M-payment services will be compatible with all aspects of my life.					
I think M-payment services would fit well with the way I like to work.					
M-payment services would fit into my life style.					
Using M-payment services seem to be relevant to me.					
20.4 Observability					
I became interested in M-payment services when I saw other people using them.					
Some of my colleagues have benefited from using M-payment services.					
Other people using M-payment services liked using them.					
M-payment services are very visible in my school or my workplace.					
20.5 Trialability					
I want to be able to appeal M-payment services on a trial basis to see what it can do.					
20.6 Cost					
The device cost (smart phone or tablet) are influence with my decision to use M-payment services.					
The promotions which offer					

	Very Agree	Somewhat Agree	Neutral	Somewhat Disagree	Very Disagree
in M-payment (such as discount) are influence with my decision to use M-payment services.					
The service fee in M-payment (such as SMS, internet connection, etc.) are influence with my decision to use M-payment services.					
21. Security Factors					
I am confident that my data and transactions in M-payment services will be kept secured.					
I trust in security policy of M-payment services.					
During the M-payment transaction, it has not been altered or corrupted by other or unauthorized person.					
The information in M-payment transaction will be integrity.					
M-payment services offer good enough security process to verify authorization.					
I have satisfy with the level of security to access M-payment services.					
M-payment services not allow users to deny the performed during any transaction.					
22. Trust Factors (integrity, Confidential and information shared trust)					
My service provider doesn't disclose my personal information to others without my permission.					
I would not deal with service provider who doesn't keep my personal information confidential.					

	Very Agree	Somewhat Agree	Neutral	Somewhat Disagree	Very Disagree
I prefer to provide my personal information on a confidential basis.					
Some personal information that I gave to my service provider is incorrect.					
My service provider brings high standards to his/her work.					
My service provider is honest.					
I prefer to deal with the service provider who has high integrity.					
My service provider shares common information to help me.					
Information sharing on important issues has become a critical element to my relationship with a service provider.					
I make decisions based on the information that I have received from my service provider.					
My service provider shares confidential information with me.					
The service provider promptly provides any kind of information that I want.					
23.Satisfaction when use M-payment services					
I am satisfied with the way that M-payment has carried out transactions.					
I think that I made the correct decision to use M-payment.					
I am satisfied with the service I have received from M-payment.					
I strongly recommend M-payment to others.					
Overall, I was satisfied with M-payment					

Part 4 Suggestion in Trust in M-payment adoption

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Thank you very much for your time and cooperation.

BIOGRAPHY

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