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Mobile Banking Adoption in Thailand: An Integration of Technology Acceptance Model and Mobile Service Quality

W. Puriwat[1], S. Tripopsakul[2]

Abstract:

The purpose of this study is to investigate the factors that influence a consumer's intentions to use mobile banking. A web-based survey was employed to collect data from 348 samples of all owners of a mobile device and have experienced with mobile banking applications provide by private banks in Thailand.

The proposed model of mobile banking adoption in this study was based on the Technology Acceptance Model (TAM) and Mobile Service Quality (MSQ). Structural equation modeling (SEM) was used to analyze the data. The results revealed that support for the positive effect of perceived ease of use, perceived usefulness and mobile service quality toward mobile banking adoption intentions.

Therefore, Banks should emphasize on strategies to enhance benefit perceptions of mobile banking by taking these factors into account. This study is also one of the first to examine a combined TAM and MSQ model in the context of m-banking adoption. Theoretical and practical implications of results are discussed in the paper.

Keywords: *Mobile banking adoption, Technology acceptance model, Service quality, Thailand.*

[1]*Wilert Puriwat, Assist. Prof., D Phil(Oxon)., Chulalongkorn Business School, Chulalongkorn University, Wilert@cbs.chula.ac.th*
[2]*Suchart Tripopsakul, Assist. Prof., Ph.D., School of Entrepreneurship and Management, Bangkok University, Thailand, corresponding author: Suchart.t@bu.ac.th*

1. Introduction

Nowadays, Mobile Internet devices and smartphones have at present a significant potential as internet access tools and any online activities in Thailand. According to the National Statistical Office of Thailand in 2017, more than 90% of internet users in Thailand access internet by smartphone devices. The number of smartphone users in Thailand is estimated to reach 30 million by 2020 (Statista, 2017). As these statistics show, financial institutions have not escaped the impact of the digital revolution. The technological advances of internet and smartphone change client's behaviors in banking industry. The increasing use of mobile banking and a consequent decline in visits to physical bank branches and this will continue to drive a transformation of the Thai banking system from "brick and mortar" to "digital".

Mobile banking has become one of main strategies for banks to operate and make transactions with customers. Mobile banking is a focal point of growth strategies for banks. Mobile banking applications provide a combination of payments, banking, real-time two-way data transmission, and ubiquitous access to financial information and services. Although the number of mobile phones is more than personal computer and mobile banking has become more popular than e-banking among bankers, the use of mobile phones or tablets to conduct banking transactions or access financial information is not a widespread as might be expected (Shaikh and Karjaluoto, 2015).

Based on the data of Bank of Thailand in 2017, the total numbers of deposit accounts in Thailand is about 92 millions, but the number of mobile banking registration is about 18 million counting for only 20% of total accounts. Although mobile banking is definitely the future of Thai banking, more understanding of clients about adoption mobile banking is still the necessary and crucial issue to widespread mobile phone penetration especially in upper-middle income economy as Thailand.

Therefore, the purpose of this study is to develop and examine the proposed conceptual model of mobile banking adoption based on two well recognized models; namely Technology Acceptance Model (TAM) and Mobile Service Quality (MSQ). The structure of this paper is as follows. Following the introductory section, Section 2 reviews relevant literatures concerning with mobile banking adoption. Section 3 discusses the research methodology of this study. Section 4 discusses the finding results. And, the discussion, conclusion, limitation, and future research suggestion are discussed in the final section.

2. Literature review

2.1 Technology acceptance model (TAM)

Accrding to Glavee-Geo, Shaikh, and Karjaluoto (2017), one of the most well known applied model of users' acceptance and usage of technology is the technology acceptance model (TAM) of Davis, Bagozzi, and Warshaw (1989). TAM is used to

investigate how users come to accept and use a technology. The objective of TAM is to provide an explanation of the determinants of computer acceptance. The TAM consists of two important independent variables; namely, perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness (PU) was defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". Perceived ease of use (PEOU) refers to "the degree to which the prospective user expects the target system to be free of effort".

According to Legris, Ingham, and Collerette (2003), TAM examines the mediating role of perceived ease of use and perceived usefulness on the probability of system use. In the TAM model, PU and PEOU predict attitude and behavioral intention. Previous researches recommend that in order to provide better explanations of an individual's adoption intention and behavior, the extension of TAM with additional antecedents such as self-efficacy, institutional support, anxiety and voluntariness, and perceived mobility is necessary. Therefore, many mobile banking adoption studies extend or supplement the original TAM by including additional constructs, such as relative advantage and personal innovativeness, perceived risk, perceived cost of use, compatibility with life style, and perceived security (Mehrad and Mohammadi, 2016).

2.2 Mobile Service Quality (MSQ)

In accordance to Jun and Palacios (2016), Mobile banking service quality refers to a global consumer judgment of the quality and excellence of mobile content delivery in the context of mobile banking. Previous researches have explored the dimensions of mobile banking service quality and motivations for using and adopting mobile banking. Kim, Park, and Jeong (2004) have revealed three important facets of mobile service quality; namely, call quality, value-added services, and customer support. Lu, Zhang, and Wang (2009) proposed three key dimensions of MSQ; namely, interaction quality, environment quality, and outcome quality.

Malhotra and Malhotra (2013) proposed 5 factors; namely, technical reliability of service, in-store responsiveness, on-phone responsiveness, online self-service facilitation, and flexibility of service. Wong, Tan, Ooi, and Lin (2014) investigate the factors influencing consumers' intention to adopt mobile shopping, and found that three variables; namely, ease of use, usefulness, and compatibility, have significant impact on consumers' mobile shopping intention. Mobile banking is the function that serves as a powerful tool to develop relationships between customers and financial institutions (Jun and Palacios, 2016). Mobile banking is more convenient than online banking since customers can use m-banking service anytime and anywhere. Arvidsson (2014) stated that two service quality dimensions; namely, high trust and low perceived security risks, are associated with a positive view on adopting mobile payment services while Chemingui and Lallouna (2013) identify four motivational factors affecting the intention of using mobile financial services; namely, compatibility, trialability, perceived enjoyment, and system quality. The dimension of mobile service quality still be varied. The table 1 represented

dimensions of mobile service quality explained by Arcand, PromTep, Brun, and Rajaobelina (2017).

Table 1: *Dimensions of MSQ*

Dimension	Definition
Security and Privacy	Security is no longer an afterthought in anyone's software design and development process rather it is a fundamental dimension for driving Internet banking and mobile banking adoption. Prior to adopting mobile banking services, banking clients have to perceive security and safety to utilize. Mobility increases the threat to security and privacy since there is more perceived risk in mobile banking given both remote connectivity and potential loss or theft of the mobile device
Practicity	In human computer interaction filed, the term practicity refers to "the use oriented and supports interactivity to enhance self efficacy with the medium".
Design and Aesthetics	Design is defined as the aesthetics of content and function presented in a mobile device. In the context of mobile commerce, design and aesthetics indirectly impact user loyalty intentions towards mobile services.
Sociality	Sociality is defined as the social benefits derived from interacting with others (such as banking clients and representatives) via a mobile device. In the context of mobile banking, sociality does not occur among friends but rather with customer representatives and other customers. In the mobile banking services environment, connectedness enables users to chat online with a customer service representative whenever they need.
Enjoyment	Enjoyment is defined as perceived intrinsic motivation based on the pleasure or fun experienced when using an electronic device. The emotional and experiential value derived from perception of enjoyment play a positive significant role in motivating the adoption and/or use of innovative technologies including the adoption of mobile banking platforms.

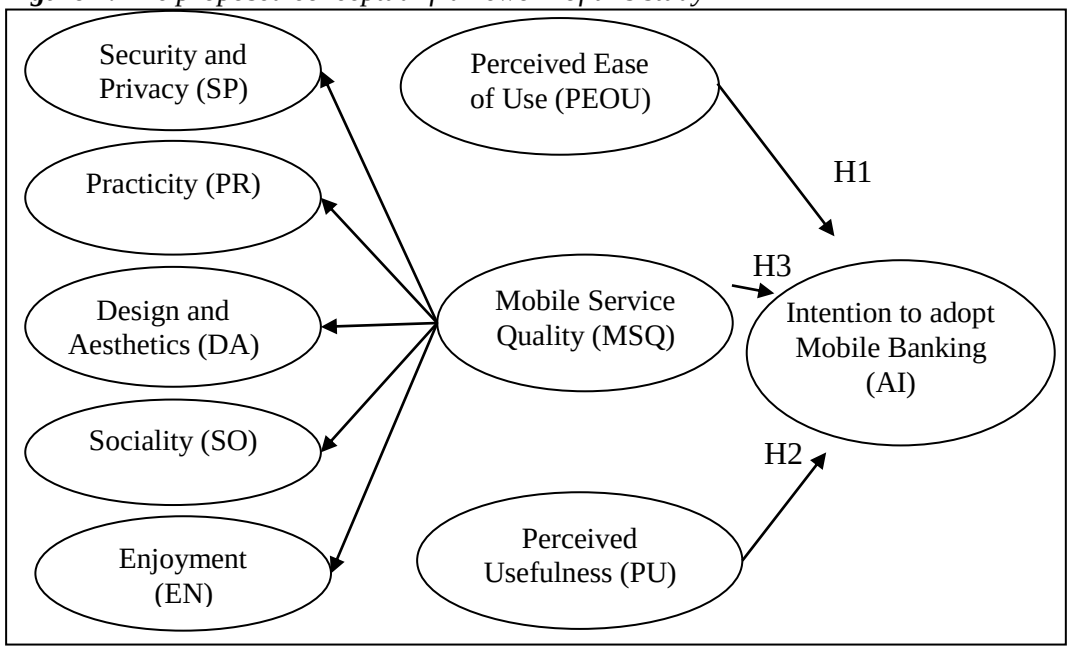
Sources: *Arcand, PromTep, Brun, and Rajaobelina (2017).*

In conclusion, most of mobile banking researches have presented a conceptual framework designed to empirically investigate customers' perceptions of service quality in the context of mobile banking services. And very few researches have attempted to deeply explain mobile banking adoption by combined TAM and MSQ.

3. Conceptual model and the propositions

From the literature review, the authors proposed the conceptual model based on two well known theories in technology adoption and service provision field. the variable from TAM, and MSQ will be tested the effects on the intention in mobile banking adoption in Thailand, and their actual mobile banking adoption Therefore, the research conceptual framework is presented as the Figure 1.

Figure 1: *The proposed conceptual framework of this study*



To test the impact of a range of TAM and MSQ towards intention to adopt mobile banking the following hypotheses have been developed:

H1: Perceived usefulness of mobile banking services has a positive effect on mobile banking services adoption intention.
H2: Perceived ease of use of mobile banking services has a positive effect on mobile banking services adoption intention.
H3: Mobile service quality of mobile banking services has a positive effect on mobile banking services adoption intention.

4. Methodology

4.1 Samples

A web-based survey was employed to collect data from 348 samples of all owners of a mobile device and have experienced with mobile banking applications provide by private banks in Thailand. The survey period was during May to August 2017. A structured questionnaire was circulated to 1,000 respondents. 375 responses were complete and were counted for analysis. Response rate was 37.5 percent. After checking the data completion of questionnaires, 348 samples were eligible for the further analysis.

4.2 Instrument and Measurement

A self-administered online questionnaire was employed to collect data using a convenience sample method. Perceived Usefulness (PU) and Perceived Ease of Use

(PEOU) were measured by items adapted from Davis et al. (1989). Mobile service quality (MSQ) in this study adapted from Arcand, PromTep, Brun, and Rajaobelina (2017). MSQ consists of five dimensions; namely, Security and Privacy (SP), Practicity (PR), Design and Aesthetics (DA), Sociality (SO), and Enjoyment (EN). Adoption intention was measured by items from Cheng, Lama, and Yeung (2006). All of these items were measured using the five-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)". All of constructs and items are represented in Table 2.

Table 2: *Constructs and items of this study*

Constructs	Items
Perceived Usefulness (PU)	Using mobile banking would improve my performance in conducting banking transactions
	Using mobile banking would make it easier for me to conduct banking transactions
	I would find mobile banking useful in conducting my banking transactions
Perceived Ease of Use (PEOU)	Learning how to use Mobile banking is easy for me
	My interaction with Mobile banking is clear and understandable
	I find Mobile banking easy to use
	It is easy for me to become skilful at using Mobile banking
Security and Privacy (SP)	I think that the personal information that I provide on mobile is well protected
	I think that online transactions carried out on mobile are secure
	I think that the confidentiality and privacy of my personal information is assured when I do mobile banking
Practicity (PR)	The productivity of my banking activities is improved on mobile
	The effectiveness of my banking activities is enhanced on mobile
	On mobile, it is easy to find what you are looking for
Design and Aesthetics (DA)	The design (such as colors, font size, graphics, animations, etc.) of the mobile application/site is professional
	The design of the mobile application/site is creative
	Overall, the design of the mobile application/site is visually appealing
Sociality (SO)	I can chat online with a customer service representative of the institution when I need it on my mobile
	The institution offers relevant customers' testimonials on mobile
Enjoyment (EN)	Mobile banking is fun
	Mobile banking is pleasant
	Mobile banking is enjoyable
Adoption intention (AI)	I would use m-banking for my banking needs
	Using m-banking for handling my banking transactions is something I would do
	I can see myself using m-banking for handling my banking

	transactions

Note: *MSQ is the 2nd higher order factor of SP, PR, DA, SO, and EN.*

5. Results

5.1 Result of Demographic data

This study targeted 348 respondents based on the convenience sampling technique. Table 3 shows the demographic profiles of respondents. The majority of respondents' characteristic are females (52.45%), aged between 26 to 35 years old (34.72%), with Bachelor's degree (57.82%) and income between 20,001-40,000 THB (59.23).

Table 3: *Demographic Profile*

	Frequency	Percentage
Gender		
Male	165	47.55
Female	183	52.45
Age		
18-25	60	17.25
26-35	121	34.72
36-45	99	28.56
46-55	62	17.81
Over 55	6	1.66
Educational Level		
Lower than Bachelor's degree	77	22.06
Bachelor's degree	201	57.82
Master's degree or above	70	20.12
Current income in THB (1 USD = 33.10 THB)		
Less than 20,000	54	15.45
20,001-40,000	206	59.23
40,001-60,000	35	10.17
60,001-80,000	28	7.93
80,001-100,000	14	4.10
More than 100,000	11	3.12

5.2 Result of measurement model

The authors firstly tested the multicollinearity issue among independent variables and found that the variance inflation factor values for all factors range between 1.825 and 2.984, which are below the threshold value of 5 (O'brien, 2007). Therefore, there exists no multicollinearity issue in this study. After that, in order to test the proposed conceptual framework and hypotheses, the two-step approach recommended by Anderson and Gerbing (1988) was undertaken. The measurement model firstly was examined so as to test the reliability and validity. Initially, Pooled

confirmatory factor analyses (PCFA) method combines all latent constructs in one measurement model and perform the CFA at once are recommended by Awang (2015) to test the validity, which consists of convergent validity and discriminant validity. Convergent validity measures whether constructs can effectively reflect their corresponding factor, whereas discriminant validity measures whether two constructs are statistically different. As shown in the table 4, all loadings are greater than 0.7. All AVEs exceed 0.5 and all CRs exceed 0.7. Consequently, the scale has sufficient convergent validity. Additionally, all Cronbach's alpha values are above 0.7, representing satisfied reliability.

In order to test the discriminant validity, the AVE of each construct was compared to their corresponding inter construct correlation as recommended by Fornel and Larcker (1981) cited in Awang (2015). To satisfy the requirement of the discriminative validity, the square root of a construct's AVE must be greater than the correlations between the construct and other constructs in the model. As listed in Table 5 for each factor the square root of AVE is significantly larger than its correlation coefficients with other factors, showing satisfied discriminant validity.

Table 4: *Standardized loadings, AVE, CR and Cronbach's alpha values*

Construct	Item	Standardized loadings	AVE	composite reliability (CR)	Cronbach's Alpha
PU	PU1	0.849	0.739	0.749	0.818
	PU2	0.811			
	PU3	0.857			
PE	PE1	0.877	0.797	0.789	0.808
	PE2	0.802			
	PE3	0.811			
	PE4	0.793			
MSQ*	SP	0.806	0.780	0.780	0.788
	PR	0.834			
	DA	0.817			
	SO	0.775			
	EN	0.766			
AI	AI1	0.852	0.817	0.815	0.814
	AI2	0.788			
	AI3	0.824			

Note: **MSQ was treated and analyzed as the higher order factor of SP, PR, DA, SO, and EN. Fit indices: CMIN/DF=2.114; GFI=0.86; AGFI=0.79; NFI=0.87; CFI=0.91; RMSEA=0.056.*

Table 5: *The square root of AVE and factor correlation coefficients*

	PU	PE	SQ	AI
PU	**0.860**			
PE	0.711	**0.893**		

MSQ	0.670	0.707	**0.883**	
AI	0.613	0.592	0.604	**0.903**

Notes: *The square root of the Average variance extracted (AVE) of each construct is shown on the diagonal in bold format and the off-diagonal represent the correlations.*

5.3 Result of structural model

The structural model was examined. The fit indices of the structural model were tested and found to be within their acceptable level (CMIN/DF = 2.020; GFI = 0.85; AGFI = 0.78; NFI = 0.88; CFI = 0.90; RMSEA = 0.054). Therefore, the overall fit statistics suggest that the model has sufficient model fit. The assessment of path coefficients showed that PU (H1: b = 0.85, t-value = 11.33, sig < 0.001); PEOU (H2: b = 0.79, t-value = 12.93, sig < 0.001); and MSQ (H3: b = 0.82, t-value = 10.28, sig < 0.001) were all found to be significant predictors of AI. All hypotheses are supported. Hypothesis testing results were represented in Table 6.

Table 6: *Results of path analysis*

Hypothesized path		Standardized estimate	t-value	Result
PU	AI	0.85	11.33***	Supported
PEOU	AI	0.79	12.93***	Supported
MSQ	AI	0.82	10.28***	Supported

Notes: **p < 0.05; **p < 0.01; ***p < 0.001.*

6. Discussion and implications

The purpose of this study is to investigate the factors that influence a consumer's intentions to use mobile banking. The purposed model has developed based on two well known theories; namely TAM and service quality. Previous researches showed that the better explanation of an individual's adoption intention and behavior can be achieved with additional antecedents. From a theoretical point of view, this study has served to broaden the understanding of the factors influencing mobile banking adoption. One of the theoretical contributions of this study is the extension of TAM by including MSQ. The findings of the research are consistent with the literature of mobile banking adoption. Mobile banking adoption concerned with not only efficiency of an application but also with human reaction to a service provision via mobile banking.

Therefore, Service quality provided by banks also an important issue for client adoption to mobile banking. This study included additional antecedents from the service quality theory. The result show that perceived usefulness, perceived ease of use, and mobile service quality significantly influence an intention to adopt mobile banking. Client perceived mobile service quality is one of the vital factors determining the success of mobile banking service providers. This findings offer several managerial implications. Firstly, banks should pay attention to the five attributes of mobile service quality to effectively enhance the rate of mobile banking adoption such user friendly design, security approach, easy-to-understand

information on mobiles devices. Secondly, banks should provide a well-designed mobile application, in terms of the application's appearance, layout, structure, and available functions. Perceived ease of use and perceived usefulness both had significant positive influence on intention to adoption mobile banking. Therefore, banks need to focus on aspects to improve perceived ease of use and perceived usefulness as well. Banks should present a well-designed interface to users to improve the perceived ease of use and deliver timely, accurate and up to date information to clients.

7. Limitations and future research directions

This study has few limitations, which in turn provide potential directions for future research. Firstly, data collection was limited to the customers of those banks who live in Thailand. Therefore, the findings should be circumspectly generalized for other countries. Secondly, this research mainly conducted a cross-sectional study. Therefore, a longitudinal study is recommended for providing more insights of mobile banking adoption over time. Thirdly, other factors apart from TAM and MSQ such as demographic factors are not considered in this study. Studying adoption of mobile banking by including demographic factors such as age, gender, income and education is recommend for future researches.

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