



## Perceived Risks towards Mobile Banking Adoption in Thailand:

### The Moderating Role of the Reference Groups

#### การรับรู้ความเสี่ยงต่อการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือในประเทศไทย : บทบาทตัวแปรกำกับของกลุ่มอ้างอิง

Sasithorn Mahakunajirakul

ศศิธร มหาคุณาจิระกุล

Graduate School of Management and Innovation (GMI), King Mongkut's University of Technology Thonburi (KMUTT),  
Bang Mot, Thung Khru, Bangkok 10140

บัณฑิตวิทยาลัยการจัดการและนวัตกรรม มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี แขวงบางมด เขตทุ่งครุ กรุงเทพฯ 10140

Corresponding author, e-mail: sasithorn.mah@mail.kmutt.ac.th

(Received: Jul 29, 2021; Revised: Sep 16, 2021; Accepted: Sep 20, 2021)

#### Abstract

This research aims (1) to study the relationship between perceived risk and mobile banking adoption, and (2) to examine the moderating effects of the reference groups on the relationship between perceived risk and mobile banking adoption. A total sample was 610 bank customers who were currently using mobile banking applications. The research instrument used in this study was self-administered questionnaires. Data for this study were collected by using survey questionnaire with purposive sampling. MANOVA and structural equation modeling (SEM) were used to analyzed the data. The results demonstrate that (1) perceived risk has a negative influence on the adoption of mobile banking, and (2) reference groups (both private and public groups) moderate the relationship between perceived risk and mobile banking adoption, while private groups reduce the negative effects of risk perception on mobile banking adoption more than public groups. The research results will allow banks and other financial institutions to use reference groups, especially private groups as communication strategies to minimize the negative effects of perceived risk and encourage customers to adopt mobile banking applications.

**Keywords:** Perceived risk, Reference group, Mobile banking adoption, Structure equation model

#### บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อ (1) ศึกษาความสัมพันธ์ระหว่างการรับรู้ความเสี่ยงและการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือ (2) ศึกษาอิทธิพลกำกับของกลุ่มอ้างอิง (กลุ่มส่วนตัวและกลุ่มสาธารณะ) ต่อความสัมพันธ์ระหว่างการรับรู้ความเสี่ยงและการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือ กลุ่มตัวอย่างทั้งหมดคือลูกค้าธนาคาร 610 รายที่ใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือ เครื่องมือวิจัยที่ใช้ในการศึกษาครั้งนี้เป็นแบบสอบถามชนิดให้ผู้ตอบกรอกข้อมูลเอง ข้อมูลสำหรับการศึกษานี้เก็บรวบรวมโดยการสำรวจโดยใช้แบบสอบถามที่มีการสุ่มตัวอย่างแบบเจาะจง การวิเคราะห์ความแปรปรวนพหุคูณและการวิเคราะห์โมเดลสมการโครงสร้างถูกใช้ในการวิเคราะห์ข้อมูล ผลการวิเคราะห์แสดงให้เห็นว่า (1) การรับรู้ความเสี่ยงมีอิทธิพลในทางลบต่อการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือ (2) กลุ่มอ้างอิง (ทั้งกลุ่มส่วนตัวและกลุ่มสาธารณะ) เป็นตัวแปรกำกับระหว่างการรับรู้ความเสี่ยงและการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือโดยกลุ่มส่วนตัวสามารถลดผลกระทบด้านลบของการรับรู้ความเสี่ยงต่อการยอมรับการใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือได้มากกว่ากลุ่มสาธารณะ ผลการวิจัยช่วยให้ธนาคารและสถาบันการเงินต่างๆ ใช้กลุ่มอ้างอิงโดยเฉพาะกลุ่มส่วนตัวเป็นกลยุทธ์ในการสื่อสารเพื่อลดผลกระทบด้านลบจากการรับรู้ความเสี่ยงและแรงจูงใจให้ลูกค้าใช้บริการธุรกรรมของธนาคารผ่านโทรศัพท์มือถือ

**คำสำคัญ :** การรับรู้ความเสี่ยง กลุ่มอ้างอิง การยอมรับบริการธนาคารทางโทรศัพท์มือถือ โมเดลสมการโครงสร้าง

## Introduction

Developments in information technology have an enormous effect on the banking sector, creating continually ever more flexible payment methods and user-friendly banking services. It is now taken for granted that the mobile phone as a channel for service consumption offers enormous potential for banking (Shareef *et al.*, 2018). However, despite its advantages, the use of mobile banking has not spread as was expected. One factor that may inhibit the use of internet banking is the individual risk perception of this tool and of online transactions in general. There are growing concerns about the risk in online banking services across the world (Elhajjar & Ouaida, 2020). Most of the past research found perceived risk negatively related to the bank's consumer adoptions (Roy *et al.*, 2017; Saxena *et al.*, 2020). In Thailand, the number of mobile banking accounts increased by 12 million (19%) from June 2020 to June 2021 (Bank of Thailand, 2021). Despite the continued growth, mobile banking services reach only certain groups of customers. The majority of Thai people who live in rural area are still cash-based (Bank of Thailand, 2019). Fear over mobile banking security and unfamiliar with mobile banking are major factors that impedes Thai customers to use mobile banking (Bank of Thailand, 2019). Few research studies perceived risk in-depth and distinct of perceived risks in mobile banking. This study provides insights into the role of perceived risk on mobile banking adoption.

Moreover, academics have generally agreed that reference groups affect product adoption (Ding *et al.*, 2020; Satyanegara & Widikusyanto, 2018). Most of those studies have focused on the direct effect of reference groups on purchase intention. However, based on a review of the available research, the moderating role of reference groups on perceived risk has not been thoroughly investigated. This paper advances our understanding of how two types of reference groups, whether private or public groups, can mitigate the negative effects of perceived risk on mobile banking adoption.

## Objectives

This research examines (1) the relationship between perceived risk and mobile banking adoption and (2) the moderating role of the reference groups (private and private groups) on the relationship between perceived risk and mobile banking adoption by using MANOVA and structural equation modeling. A conceptual model of the study is shown in Figure 1.

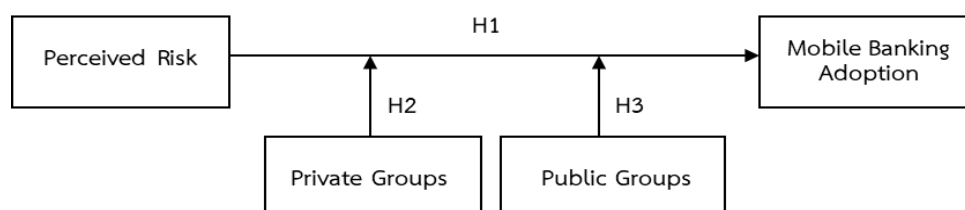


Figure1 Conceptual Model

### Perceived risk

Consumer's perceived risk was originally theorized by Bauer (1960) in consumer behavior studies, refers to the nature and amount of risk perceived by a consumer in contemplating a particular purchase decision. Perceived risk is also one of the critical factors that banks need to consider when designing, launching and promoting mobile banking services for their customers. Perceived risk is usually measured as a multidimensional construct and its essence cannot be captured by a single concept (Chavali & Kumar, 2018; Chen, 2013). Jacoby & Kaplan (1972) supported from Bauer's seminal work on the overall measure of perceived risk, first pointing to its five key dimensions: performance, security, time,

psychological and financial risks. Similarly, Chen (2013) and Masoud (2013) confirmed that perceived risk is composed of five dimensions in the context of retail banking services. The five facets derived from perceived risks for mobile banking as described below:

- **Performance risk** refers to the losses incurred by deficiencies or malfunctions of mobile banking. Consumers feel the insecurity of their bank account when systems are suddenly disconnected.
- **Security risk** is defined as potential loss due to fraud or a hacker which compromises the security of a mobile banking user.
- **Time risk** refers to the loss of time through any inconvenience that is caused by delays in receiving payments or difficulties in navigating the mobile banking application.
- **Psychological risk** refers to when the selection or performance of the product will have negative effect on self-perception.
- **Financial risk** refers to the potential of losing money due to transaction error or bank account misuse.

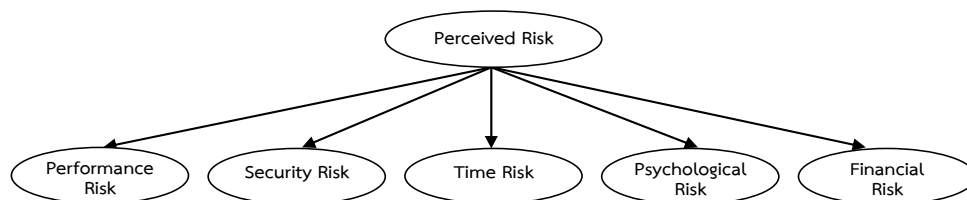


Figure2 Perceived Risk Construct

Based on previous findings from Chen (2013) and Masoud (2013), perceived risk in this study is composed of five dimensions: performance, security, time, psychological and financial risks as shown in Figure 2. We present the following hypotheses:

H1: Perceived risk is a second-order dimension of five risks: performance, security, time, psychological and financial risks.

In general, perceived risk is understood to have a negative influence on the adoption of internet banking (Khasawneh, 2015; Saxena *et al.*, 2020). Roy *et al.* (2017) found that if the perceived risk is low (vs high), customers may consider using online platforms to perform transactions. Therefore, we present the following hypothesis:

H2: Perceived risk has a negative effect on mobile banking adoption.

### Reference group

Researchers have generally agreed that reference groups are able to influence consumers to adopt a product adoption (Ding *et al.*, 2020; Satyanegara & Widikusyanto, 2018). Reference group refers to a group that is considered as the basis of comparison for an individual in forming values and attitudes to behave (Childers & Rao, 1992). Consumers use the reference group as a purchase reference; they habitually ask family, friends, or imitate someone they idolized such as celebrities and influencers.

The reference groups' influence on product adoption can be classified into two groups: private groups and public groups. The private group includes family, other relatives, and friends who regularly communicate with the individual. The public group consists of celebrities, experts, and influencers with whom the individual compares himself or herself (Childers & Rao, 1992). Different types of reference groups have different effects on customers when it comes to adopting a product (Hoonsopon & Puriwat, 2016). For these reasons, the effect of perceived risk on mobile banking adoption may vary if consumers use different sources of information from different types of reference groups. Hoonsopon & Puriwat (2016)



found that consumers who use information from private group sources will have a higher purchase intention than consumers who use information from public group sources. Ding *et al.* (2020, p. 3) stated that when consumers are not familiar with products and perceived risk, they will actively seek a reference group's help and recommendations to reduce the uncertainty or improve their abilities to deal with risks, consequences adopting products. Thilina & Gunawardane (2019) stated that some factors may interact with perceived risk and consequently increase the purchase intention of consumers. In this study, we assume that two types of reference groups (private groups and public groups) will moderate the relationship between perceived risk and mobile banking adoption. We, therefore, hypothesize that:

H3: Private groups moderate the relationship between perceived risk and mobile banking adoption where the impact of perceived risk is less for high private groups than for low public groups.

H4: Public groups moderate the relationship between perceived risk and mobile banking adoption where the impact of perceived risk is less for high public groups than for low private groups.

### Research methodology

**Research design:** This research was a descriptive research study using survey method. Structural equation modeling (SEM) and MANOVA were used to analyze the hypotheses testing in this study.

**Research instrument:** A self-administrated questionnaire was the instrument used in this study. The content validity was examined to check the appropriateness of the measures by asking 4 academicians to review the questionnaire. 25 items to measure the constructs were borrowed from previously published studies. Perceived Risk (PR) scale was adapted from Feathermand & Pavlou (2003). This construct has been conceptualized as a second-order construct consisting of five dimensions: performance risk (PerfR), security risk (SR), time risk (TR), psychological risk (PsyR), and financial risk (FR). Each dimension had three items to reflect its construct. Mobile banking adoption (MBA) was adapted from (Shareef *et al.*, 2018) and measured by using three items. The private groups (PRI) with four items were adapted from Serralvo *et al.* (2010). The public groups (PUB) with three items were adapted from Serralvo *et al.* (2010). For all items, the five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) was employed.

**Sample and data collection:** The population consists of consumers who were currently using a mobile banking application in Thailand. Purposive non-probability sampling approach was used in the present study. Data for this study were collected from branches of the top 4 banks in Thailand by using survey questionnaire. The procedure of this research had been reviewed and approved by the research ethic committee of the King Mongkut University of Technology Thonburi. The permission to approach bank consumers was requested from each of the bank's branch managers and each respondent prior to data collection. Individuals willing to participate would be given an information sheet with details about the project and their right to discontinue participation at any time. Bank customers were approached in person and asked to fill out the self-administered questionnaires. In total, 700 questionnaires were delivered, and 617 were returned. The number of usable respondents was 610. Suggested by Hair *et al.* (2010), the required sample size from using SEM should be between 10 to 20 times the total number of items (indicators). In this study, there were 25 items in this study. Therefore, the sample size should be between 250 to 500 samples. The sample size (n=610) in this study was considered sufficiently large for SEM analysis.

**Data analysis:** Structural equation modeling (SEM) was used for testing the measurement model and structural model. For the measurement model, second-order factor analysis was performed to confirm reliability and validity. Furthermore, hypotheses were tested in the structural model. MANOVA was used to test the moderating effects of public groups and private groups on the relationship between

perceived risk and mobile banking adoption and to confirm SEM results.

## Results

Data analysis was realized with a two-step procedure of structural equation modeling. First, measurement model was performed to assess construct reliability and validity. Perceived risk of five dimensions was examined in measurement model (H1). Second, the structural model was performed to investigate the influence of perceived risk on mobile banking adoption (H2) and, the moderating effects of the reference groups on the relationship between perceived risk and mobile banking adoption (H3-H4).

**Measurement model:** To test for multivariate normality, the analytical results indicated that the kurtosis value ranged from 0.786 to 0.838, and the skewness value ranged from 0.723 to 0.885, thus satisfying the valuation criteria (ranging from - 2 to +2) suggested by Hair *et al.* (2010). To evaluate the reliability and validity of the measure in a proposed model, we followed the guidelines of Hair *et al.* (2010). Confirmatory factor analysis (CFA) was used to test the construct validity of 8 constructs in the proposed model. Confirmatory factor analysis (CFA) was used to examine how well the indicators were grouped into some specific constructs that a researcher specified or hypothesized. Factor loading, composite reliability (CR), average variance extracted (AVE) were carried out to validate all first-order constructs. Composite reliability (CR) was used to test the reliability of the constructs. Hair *et al.* (2010) suggested that the cut-off CR value should be 0.7 or above when assessing reliability. The findings showed that all constructs had a CR higher than 0.7, which provided a good level of reliability. The results of factor loading, CR, and AVE are summarized in Table 1. For convergence validity, all constructs had an average variance extracted (AVE) greater than 0.5, which met the criteria of convergence validity. Hair *et al.* (2010) suggested that the standardized factor loading of each item should be 0.5 or higher, and preferably 0.7. The findings showed that 25 items had standardized factor loadings higher than 0.7, which revealed a good convergent validity. Next, discriminant validity was examined. Discriminant validity was measured by comparing the squared correlation between a pair of constructs with the average variance extracted (AVE) for each of the two constructs. If the square correlation was smaller than AVEs, then the discriminant validity was established (Hair *et al.*, 2010). All constructs had a significantly higher square root of AVE values compared to their correlations with other constructs. Therefore, the measurement model test results fulfilled the required validity and reliability criteria.

**Table 1** Result for First-order Constructs

Construct	Items	Standardized Factor Loading	CR	AVE
Performance Risk (PerfR)	3	0.83-0.87	0.77	0.61
Security Risk (SR)	3	0.84-0.88	0.74	0.59
Time Risk (TR)	3	0.84-0.87	0.73	0.57
Psychological Risk (PsyR)	3	0.86-0.89	0.71	0.62
Financial Risk (Finr)	3	0.85-0.86	0.75	0.58
Private Groups (PRI)	4	0.71-0.72	0.82	0.61
Public Groups (PUB)	3	0.72-0.73	0.85	0.65
Mobile Banking Adoption (MBA)	3	0.82-0.87	0.78	0.63

To investigate H1, perceived risk was conceptualized as a second-order latent construct. Second order confirmatory factor analysis was performed to estimate the reliability and validity of perceived risk of five sub-constructs. Table 2 shows the results of second-order model. The findings showed that the

estimated model had an acceptable fit with the observed data ( $\chi^2 = 61.21$ ,  $df = 47$ ,  $\chi^2/df = 1.30$ ,  $p$ -value = 0.080, RMSEA = 0.02, CFI = 1, TLI = 1, SRMR = 0.02) Moreover, each first-order construct factor loading strongly and significantly correlate with the second-order construct as shown in Table 2. The results confirmed that perceived risk was a second-order dimension of five risks: performance risk, security risk, time risk, psychological risk and financial risk. Thus, hypothesis H1' was supported.

**Table 2** Second-order Construct

Second-order Factor	First-order Factor	Loadings	CR	AVE
Perceived Risk (PR)	Performance Risk (PerfR)	0.89**	0.91	0.65
	Security Risk (SR)	0.90**		
	Time Risk (TR)	0.92**		
	Psychological Risk (PsyR)	0.95**		
	Financial Risk (FinR)	0.97**		

\* $p < 0.05$ , \*\* $p < 0.01$

**Structural model testing:** To investigate the influence of perceived risk on mobile banking adoption and the moderate effects of reference groups, the researchers empirically examined to structural model (H2 to H4). The estimated model showed a reasonable fit with the observed data ( $\chi^2 = 65.16$ ,  $df = 50$ ,  $\chi^2/df = 1.30$ ,  $p$ -value = 0.07, CFI = 1.00, TLI = 1.00, RMSEA = 0.02, SRMR=0.01). Structural equation modeling was used to test hypotheses 2 to 4. The detailed result of the hypotheses testing was explained in Table 3. For hypothesis 2, the direct effect of perceived risk on mobile banking adoption was examined. A negative effect ( $\beta_{PR} = -0.31$ ;  $t = -2.87$ ;  $p < 0.05$ ) of perceived risk on mobile banking adoption was found, which supported hypothesis 2. The result showed that perceive risk influences mobile banking adoption. In addition, hypothesis 3 posited the moderating effect of perceived risk and private groups on mobile banking adoption. The results showed that there was an interaction effect between perceived risk and private groups on mobile banking adoption ( $\beta_{PR*PRI} = -0.16$ ;  $t = -2.14$ ;  $p < 0.05$ ) which supported hypothesis 3. For hypothesis 4, the moderating effect of perceived risk and public groups on mobile banking adoption was tested in hypothesis 4. The results showed that there was an interaction effect between perceived risk and public groups on mobile banking adoption ( $\beta_{PR*PUB} = -0.23$ ;  $t = -2.71$ ;  $p < 0.05$ ). The result showed a congruence with the proposed hypothesis. Thus, reference groups (private and public groups) moderated the relationship between perceived risk and mobile banking adoption. Moreover, the results revealed that private groups reduced the negative effects of perceived risk on mobile banking adoption than public groups ( $\beta_{PR*PRI} = -0.16 > \beta_{PR*PUB} = -0.23$ ). Thus, reference groups moderated the relationship between perceived risk and mobile banking adoption. Figure 3 shows the final of estimated model.

**Table 3** Path Coefficient and Hypothesis Testing

Relationship	Beta	p-value	Result
H2 Perceived Risk-> Mobile Banking Adoption	-0.31	0.00**	Supported
H3 Perceived Risk * Private Groups -> Mobile Banking Adoption	-0.16	0.03*	Supported
H4 Perceived Risk * Public Groups -> Mobile Banking Adoption	-0.23	0.02*	Supported

\* $p < 0.05$ , \*\* $p < 0.01$

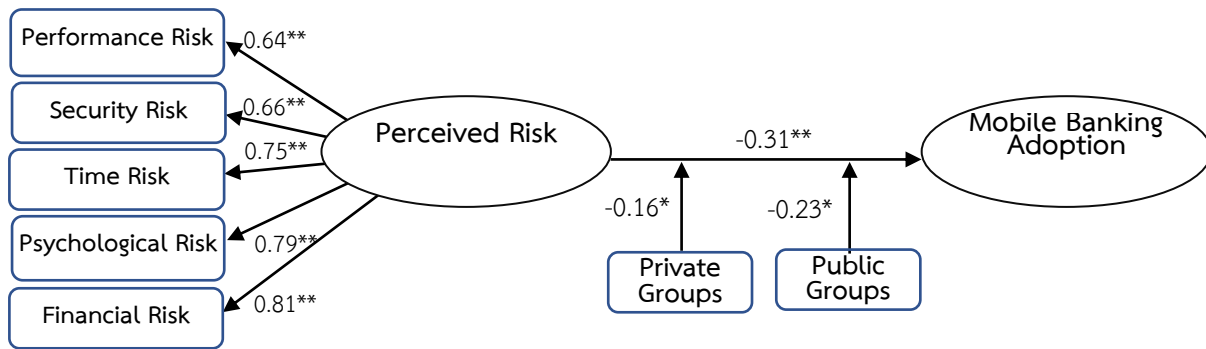


Figure 3 Structural Model Results

**MANOVA:** MANOVA was used to confirm the findings from the structural model to determine whether private and public groups moderate the relationship between perceived risk and mobile banking adoption (H3 and H4). First, a within-subject design of 2 (high vs. low perceived risk) x 2 (high vs. low private groups concept) conditions was used to test and confirm hypothesis 3. Next, a within-subject design of 2 (high vs. low perceived risk) x 2 (high vs. low public groups) conditions were used to test and confirm hypothesis 4. Lastly, samples were divided for each condition by using the median split technique.

In this test, we identified that the higher the private groups, the lower the effect of perceived risk on mobile banking adoption. The four conditions with mean distribution are shown in Table 4 and the mean plot is shown in Figure 4. In high private groups, mobile banking adoption of consumers who have a low perceived risk ( $\bar{X} = 4.71$ ) was higher than that of consumers who have a high perceived risk ( $\bar{X} = 2.67$ ). In low private groups, mobile banking adoption of consumers who have a low perceived risk ( $\bar{X} = 3.92$ ) was higher than that of consumers who have a high perceived risk ( $\bar{X} = 2.33$ ). Additionally, the mean of mobile banking adoption dramatically decreases from low to high perceived risk in high private groups ( $\Delta \bar{X} = 2.04$ ) compared to low private groups ( $\Delta \bar{X} = 1.59$ ). Thus, hypothesis 3 was supported ( $F_{\text{test}}=16.79$ ,  $p < .05$ ) and confirmed the former analysis from the structural model that private groups moderate the relationship between perceived risk and mobile banking adoption.

**Table 4** Mean Level of Mobile Banking Adoption for Perceived Risk and Private Groups

Private Groups (PRI)			
		High	Low
<b>Perceived Risk (PR)</b>	High	2.67(0.87)	2.33(0.70)
		n=97	n=143
	Low	4.71(0.41)	3.92(0.26)
		n=187	n=183

Note. SD shown in parentheses

**Table 5** Mean Level of Mobile Banking Adoption for Perceived Risk and Public Groups

Public Groups (PUB)			
		High	Low
<b>Perceived Risk (PR)</b>	High	2.61(0.70)	2.37(0.87)
		n=108	n=82
	Low	4.57(0.50)	3.89(0.16)
		n=212	n=208

Note. SD shown in parentheses

The moderating effect of perceived risk and public groups on mobile banking adoption was tested in hypothesis 4. We identified that the higher the public groups, the lower the effect of perceived risk on mobile banking adoption. The mean plot is revealed in Figure 5 and the means of four conditions are shown in Table 5. In high public groups, mobile banking adoption of consumers who have a low perceived risk ( $\bar{X} = 4.57$ ) was higher than that of consumers who have a high perceived risk ( $\bar{X} = 2.61$ ). In low public groups, mobile banking adoption of consumers who have a low perceived risk ( $\bar{X} = 3.89$ ) was

higher than that of consumers who have a high perceived risk ( $\bar{X} = 2.37$ ). Additionally, the mean of mobile banking adoption significantly decreases from low to high perceived risk in high public groups ( $\Delta \bar{X} = 1.96$ ) compared to low public groups ( $\Delta \bar{X} = 1.52$ ). Thus, the result supported hypothesis 4 ( $F_{\text{test}}=11.516, p < 0.1$ ) and confirmed the previous analysis from the structural model that public groups moderate the relationship between perceived risk and mobile banking adoption.

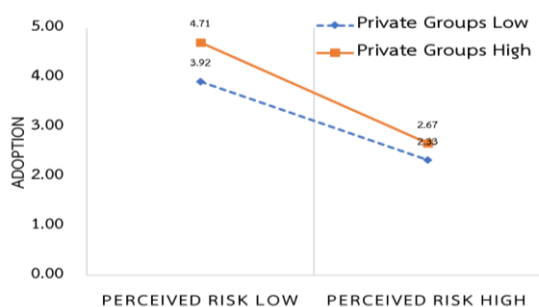


Figure 4 Mean Plot of Private Groups

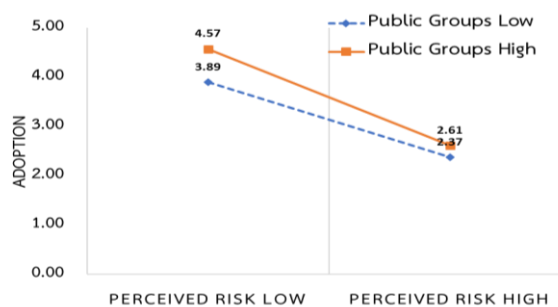


Figure 5 Mean Plot of Public Groups

## Discussion

Perceived risk has been identified as a major concern for mobile banking adoption. Our results demonstrate that perceived risk has a significant negative effect on mobile banking adoption. This relationship is aligned with perceived risk theory that perceived risk is directed by a sense of loss and uncertain, personal and negative consequences. Given that intention is a strong predictor of behavior, we found that the presence of perceived risk limits intention to use technology products (Bauer, 1960). Also, this finding is in accordance with previous studies of Khasawneh (2015) and Saxena *et al.* (2020) that bank customers perceive risk as a major impediment to the adoption of mobile banking. In other words, the higher the perception of risk in the mobile banking context, the lower the mobile banking adoption by customers. Banks should address the risk concern to ensure that their commercial transactions are safe and that the whole mobile banking system is operable. They need to lower the risk and make the mobile bank system more secure to increase the usage of mobile banking services.

Another finding from this study is that perceived risk is a five first-order factors reflective second-order of risks, call performance, security, time, psychological and financial risks. The SEM results demonstrated that financial risk had the strongest relation with the perceived risk, followed by the psychological risk, time risk, security risk, and performance risk respectively. This is consistent with the findings of Chen (2013) and Masoud (2013) that perceived risk is composed of five risk dimensions.

Furthermore, the findings of the study fill the gap in the existing literature by verifying that reference groups (both private and public groups) can moderate the effects of perceived risk on mobile banking adoption, while the impact of perceived risk is less negative for high reference groups (public and private groups) than for low reference groups (public and private groups). Supported by Thilina & Gunawardane (2019), they suggested that some social factors may interact with perceived risk and this interaction affects the purchase intention of consumers. Consequently, the higher the reference groups, the lower the negative effect of perceived risk on the purchase intention of consumers. Thus, for customers who consult or follow either public groups or private groups to adopt mobile banking services, the negative effects of perceived risk on mobile banking adoption were alleviated.

Moreover, this study provides new avenues for research which shows that private groups as a moderating role reduce the negative effects of risk perception on mobile banking adoption more than

public groups. The results in line with social influence theory explaining a psychological phenomenon that reference groups can influence an individual's attitudes and perception such as perceived risk, and can alter individual to take on a specific behavior which can be reflected in that individual's purchase or adopt behavior (Childers & Rao, 1992). This finding is in accordance with the research of Hoonsopon & Puriwat (2016) that there is a significant moderating effect of reference groups on purchase intention, and consumers will be more likely to follow their private groups than public groups. For those consumers who are cautious in utilizing mobile banking, information from private sources tends to yield a positive result rather than those who are influenced by public sources. Therefore, family and friends can convince and educate customers on how to use mobile banking technology which helps customers gain confidence and be less concerned about adopting mobile banking services than from celebrities and influencers.

## Conclusion

The widespread use of mobile banking services can be useful for both customers and banks. However, users' perceived risk reduces the use of mobile banking services. The results of the study found that perceived risk has a negative effect on mobile banking adoption. Moreover, reference groups (both private and private groups) moderate the relationship between perceived risk and mobile banking adoption, while private groups decrease the negative effects of risk perception on mobile banking adoption more than public groups. This study also confirms that perceived risk is based on five dimensions: performance, security, time, psychological and financial risks, and the most important dimension is financial risk.

**Implications:** For theoretical contribution, to the best of our knowledge, this study furthers the explanation of social influence theory that reference groups (both public and private groups), at higher levels, lessen the negative effects of perceived risk on mobile banking adoption. Especially, private groups reduce the negative effects of perceived risk on mobile banking adoption more than public groups. For managerial implications, managers who work with financial services can use the results to help them better understand their customers and support the banks in building their strategies. Although consumers believe that messages from private groups are more relevant than messages from public groups. However, firms can use either private or public groups, especially private groups to promote how banks manage the risk of mobile banking and to persuade consumers to adopt mobile banking services.

**Suggestions for future studies:** This study examines mobile banking adoption only in Thailand. Future research should be conducted in other countries in order to improve generalization. Moreover, other factors apart from perceived risk and reference groups are not considered in this study. Studying mobile banking adoption by including demographic factors such as customer generation (gen X, Y, and Z), age, gender, and income in the model is suggested for future research.

## Acknowledgment

This work was partially funded by Graduate School of Management and Innovation (GMI), King Mongkut's University of Technology Thonburi (KMUTT).

## References

Bank of Thailand (2020). The payment systems roadmap No.4 (2019 - 2021) [online]. Retrieved September 1, 2021, from: [https://www.bot.or.th/English/PaymentSystems/PolicyPS/Documents/PaymentRoadmap\\_2021.pdf](https://www.bot.or.th/English/PaymentSystems/PolicyPS/Documents/PaymentRoadmap_2021.pdf).

- Bank of Thailand (2021). Use of mobile banking and internet banking statistic 2021 [online]. Retrieved September 2, 2021, from:  
[https://www.bot.or.th/App/BTWS\\_STAT/statistics/ReportPage.aspx?reportID=949&language=eng](https://www.bot.or.th/App/BTWS_STAT/statistics/ReportPage.aspx?reportID=949&language=eng).
- Bauer, R. A. (1960). Consumer behavior as risk taking. In Cox. D. (Ed.), *Risk taking and information handling in consumer behavior*. 389-398. Cambridge. MA: Harvard University Press.
- Chavali, K. & Kumar, A. (2018). Adoption of mobile banking and perceived risk in GCC. *Banks and Bank Systems*, 13(1), 72-79.
- Chen, C. (2013). Perceived risk, usage frequency of mobile banking services. *Managing Service Quality: An International Journal*, 23(5), 410-436.
- Childers, T. L. & Rao, A. R. (1992). The influence of familial and peer-based reference groups on consumer decisions. *Journal of Consumer Research*, 19(2), 198-211.
- Ding, S., Lin, J. & Zhang, Z. (2020). Influences of reference group on users' purchase intentions in network communities: from the perspective of trial purchase and upgrade purchase. *Sustainability*, 12(24), 1-19.
- Elhajjar, S. & Ouaida, F. (2020). An analysis of factors affecting mobile banking adoption. *International Journal of Bank Marketing*, 38(2), 352-367.
- Featherman, M.S. & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59, 451-474.
- Hair, J. F., Anderson, R. E., Babin, B.J. & Black W.C. (2010). *Multivariate data analysis: a global perspective*. Upper Saddle River. NJ: Pearson.
- Hoonsopon, D. & Puriwat, W. (2016). The effect of reference groups on purchase intention: evidence in distinct types of shoppers and product involvement. *Australian Marketing Journal*, 24, 157-164.
- Jacoby, J. & Kaplan, L.B. (1972). The components of perceived risk. *Proceedings of the Annual Conference of the Association for Consumer Research*, 10, 382-393.
- Khasawneh, M.H.A. (2015). A mobile banking adoption model in the Jordanian market: an integration of TAM with perceived risks and perceived benefits. *Journal of Internet Bank Commerce*, 20(3), 1-13.
- Masoud, Y. E. (2013). The effect of perceived risk on online shopping in Jordan. *European Journal of Business and Management*, 5(6), 76-87.
- Roy, S. K., Balaji, M. S., Kesharwani, A. & Sekhon, H. (2017). Predicting internet banking adoption in India: a perceived risk perspective. *Journal of Strategic Marketing*, 25(5), 418-438.
- Satyanegara, D. & Widikusyanto, M.J. (2018). Role of reference group in winning banten higher education service market. *Integrated Journal of Business and Economics*, 2(2), 80-89.
- Saxena, N., Gera, N. & Singh, R.P. (2020). Exploring the effect of perceived risk on adoption of mobile banking in India. *International Journal of Public Sector Performance Management*, 6(5), 722-736.
- Serralvo, F., Sastre, P. & Joao, B. (2010). Reference group influence on consumer decision making process: A study in the Brazilian sports utilitarian vehicles segment. *Journal of Academy of Business and Economics*, 10(2), 157-161.
- Shareef, M. A. , Baabdullah, A. , Duttac, S. , Kumard, V. & Dwivedie, Y.K. (2018). Consumer adoption of mobile banking services: an empirical examination of factors according to adoption stages. *Journal of Retailing and Consumer Services*, 43, 54-67.
- Thilina, D. K. & Gunawardane, N. (2019). The effect of perceived risk on the purchase intention of electric vehicles: an extension to the technology acceptance model. *International Journal of Electric and Hybrid Vehicles*, 11(1), 2019, 73-83.