The Bidirectional Relationship between Objective and Subjective Knowledge: Applying the Heuristic-systematic Model in Vietnamese Mobile Banking

Hai Nguyen Thi Thanh* · Tommi Tapanainen** · Yen Nguyen Thi Hoang***

Abstract

This study investigates the contribution of customer knowledge to customer intention to adopt mobile banking by evaluating the interaction among knowledge, perceived risk and trust, and behavioral intentions. Analysis is conducted through structural equation modelling using SPSS and AMOS and data from 783 customers representing the seven largest banks in Vietnam. Our study is the first one to find the existence of the bidirectional perspective between objective and subjective knowledge. The study further shows that the attenuation effect in the heuristic-systematic model could be used to explain the stronger influence of objective knowledge on intention compered to subjective knowledge. Our findings suggest that customer knowledge, perceived risk and trust impact the intention of mobile banking users in different manners and to different degrees. Particularly, objective customer knowledge is the most influential predictor of mobile banking adoption. Having a greater understanding of these relationships can help firms in deciding the kind of intervention that is most likely to convince customers to adopt a service.

Keywords : Customer Knowledge, Objective Knowledge, Subjective Knowledge, Trust, Perceived Risk, Mobile Banking

1. Introduction

Recently, mobile banking has become a prominent digital access method to use banking services [Alkhowaiter, 2020; Liu et al., 2021; Lyu et al., 2021; Purohit et al., 2021; Shaikh and Karjaluoto, 2015]. Thus, mobile banking acceptance has been investigated in different research fields including information system management and marketing [Alkhowaiter, 2020; Shaikh and Karjaluoto, 2015; Tam and Oliveira, 2017].

Decision-making related to adopting new technologies and purchasing and using products is linked to the knowledge possessed by customers [Cakarnis and Alessandro, 2015; Hadar et al., 2013; Liu et al., 2018; Nejad and Javid, 2017; Song et al., 2021]. This is because when customers acquire new knowledge, they get new insights that can change their attitudes and behaviors. In addition, customer knowledge can contribute to build people's trust [Denton, 2020; Nunkoo et al., 2018; Walczuch and Lundgren, 2004] and reduce risk perceptions [Klerck and Sweeney, 2007; Sharifpour et al., 2014; Wang et al., 2018; van der Cruijsen et al., 2021; Hansen, 2012; Munnukka et al., 2017].

Surprisingly, however, research is scarce on the link between customer knowledge and intention to use mobile banking. This motivated us to build a research framework to explain how customer knowledge can encourage customers to use their Fintech services. We formulated the following research question: "How can customer knowledge influence the adoption of mobile banking services?".

We selected Vietnam as the target country for this research for several reasons: (1) The economy of Vietnam grew between 6 to 7 percent during the last 20 years [tradingeconomics.com, 2024], which resulted in a high need for financial services. (2) There has been great investment into Fintech, which can lead to the huge growth in local Fintech development and an increasing competition in local financial markets. (3) The use of cash transactions nevertheless remains high [Dieu et al., 2023].

(4) Consumers' level of financial literacy is relatively low in Vietnam [Morgan and Tring, 2019; Nathan et al., 2022]. Finally, Lainez and Gardner [2023] note that cyberattacks are increasing in number as digital banking adoption progresses, and it is reported by the Ministry and Information and Communications that a majority of online scams are financial in nature [Vietnamnet Global, 2024], potentially undermining trust in online banking.

2. Literature Review

2.1 Heuristic‑Systematic Model (HSM)

The Heuristic-Systematic Model (HSM) explains how people react to information and form attitudes and it has received great attention in the literature [Chaiken, 1980; Chaiken and Ledgerwood, 2012; Zhang et al., 2014]. There are two information processing styles, the heuristic style and the systematic style. The heuristic style indicates lack of motivation and cognitive effort, and results in limited, superficial information processing utilizing simple rules. In contrast, the systematic style indicates high motivation and cognitive effort, and results in careful and comprehensive information processing. Cues relating to the heuristic style are, for example, the appearance of a person, or the length of a message, whereas argument strength is a cue relating to the systematic style [Chen and Chaiken, 1999].

Moreover, HSM prescribes that people will attempt to obtain sufficient confidence in their information processing first through heuristic processing [Chaiken and Ledgerwood, 2012]. Where the heuristic approach fails to provide a sufficient level of confidence, individuals will increasingly resort to systematic processing [Chaiken, 1980; Martin et al., 2007]. However, for systematic processing to become more important, the individual must possess a higher level of motivation or ability.

When systematic processing starts increasing in importance, this may mean that systematic and heuristic processing will occur in parallel in three ways [Chen and Chaiken, 1999]. First, these two processing modes can exert independent effects, which is called additivity [Chaiken et al., 1989]. Second, systematic processing can attenuate the influence of heuristic processing, which weakens its effect [Chaiken et al., 1989]. And third, heuristic processing can bias the perception of argument validity and therefore weaken the influence of systematic processing [Chaiken et al., 1989; Chaiken and Ledgerwood, 2012].

2.2 Objective Knowledge (OK) and Subjective Knowledge (SK)

Customer knowledge consists of objective knowledge (OK) and subjective knowledge (SK) [Alba and Hutchinson, 2000; Brucks, 1985; Lee and Lee, 2009]. In financial services, SK and OK have varying influences on financial behavior [Chung and Park, 2019; Hwang and Park, 2022; Tang and Baker, 2016; Xiao et al., 2014].

2.2.1 Objective Knowledge (OK) and Systematic Processing

Objective knowledge (OK) is "actual" knowledge and information that can be communi-

cated with others and thus verified by a third party [Park and Lessig, 1981]. In the context of financial investments, OK could thus be defined as the accurate recall of the specific features of investment instruments (such as interest rates and credit limits) or financial services (such as service fees and transaction limits) [Munnukka et al., 2017; Nejad and Javid, 2018; Riitsalu and Murakas, 2019; Tang and Baker, 2016; Xiao et al., 2011]. OK about mobile services could, for example, be built based on basic information about what it is and what are its features (what it can do). The more a person possesses OK about something and has interest toward that thing, the more they are likely to be cued for systematic processing of information regarding it [Chaiken, 1980].

2.2.2 Subjective Knowledge (SK) and Heuristic Cues

Subjective knowledge (SK) is the feeling that one knows something, relating to one's confidence regarding that area [Alba and Hutchinson, 2000; Brucks, 1985; Carlson et al., 2009; Moorman et al., 2004; Park and Lessig, 1981]. SK about a product consists of opinions and perceptions and not hard facts about the product [Alba and Hutchinson, 2000; Brucks, 1985]. Therefore, someone having SK possesses holistic, bottom-line conclusions about the area of concern, but lacks the detailed information base (ability) to assess new information in a rational and logical way, making them susceptible to heuristic assessment of information emanating from the area of concern. In mobile banking, SK could be created through easily noticed and processed information, such as the endorsement of financial service experts, the number of comments or reviews regarding quality of

services (many or few), or reviewer reactions (positive or negative).

3. Hypotheses Development

3.1 Objective Knowledge (OK) and Subjective Knowledge (SK)

3.1.1 OK and SK-Perceived risk (PRI)

One source of fear for individuals is the fear of the unknown; in other words, risk perceptions are linked to the amount of information possessed about a given situation [Klerck and Sweeney, 2007; Wang et al., 2018]. When consumers know more about a given situation, they tend to perceive the risks to be lower. Conversely, when such information is not available, consumers are likely to feel the risks to be greater. Previous studies have found consumer knowledge as one antecedent of risk perception [Liu et al., 2021; Sharifpour et al., 2014; Wang et al., 2018]. Particularly, it can decrease perceived risk in purchasing situations [Klerck and Sweeney, 2007]. Knowledge also appears to be important for individuals to mitigate risks when they purchase financial services [Cho and Lee, 2006]. Particurlarly, in the studies of Munnukka et al. [2017] and Wang [2009], OK is conceptualized as an antecedent of perceived investment risk. Therefore, we propose that:

H1a: OK is negatively associated with the perceived risk.

H2b: SK is negatively associated with the perceived risk.

3.1.2 OK and SK-Trust (TRU)

Knowledge possessed about something is also related to the level of trust that an in-dividual holds regarding that thing [Walczuch and Lundgren, 2004; Nunkoo et al., 2018]. In the realm of business, the information possessed by a consumer about a given product or service predicts trust toward that service [Denton et al., 2020; Pagliara et al., 2021]. This relationship also holds for financial service providers and their services [Hansen, 2012; van der Cruijsen et al., 2021]. Trust toward financial companies is fostered by knowledge regarding the companies [Walczuch and Lundgren, 2004]. Knowledge possessed about finance in general (not just about finance industry companies) can also foster trust toward the financial service providers, because it allows consumers to understand the financial services marketplace, and therefore predict companies' behaviors [Puccetaitte and Lamsa, 2008; Shim et al., 2013]. Hence, we can set the below hypotheses:

H2a: OK has a positive influence on trust.

H2b: SK has a positive influence on trust.

3.1.3 OK and SK-Intention (INT)

Previous studies have primarily explored customer knowledge and its effects on financial behavior and well-being [Fan, 2021; Munnukka et al., 2017; Riitsalu and Murakas, 2019; Tang and Baker, 2016]. For example, customer knowledge has been found to influence behaviors such as saving money and the seeking of financial advice [Babiarz and Robb, 2014; Robb et al., 2012]. Similarly, it has been found to predict investment attitude and intention [Munnukka et al., 2017]. Therefore, we can set the following hypotheses:

H3a: OK will have a positive influence on intention.

H3b: SK will have a positive influence on intention.

3.1.4 OK-SK Bidirectional Relationship

There is a divergence of views regarding the relationship between SK and OK, with topic complexity and systematic biases held by an individual affecting whether a relationship can be detected among these two types of knowledge [Carlson et al., 2009; Gignac, 2022; Hwang and Park, 2022; Nejad and Javid, 2018]. For example, some prior studies found moderately high correlations between subjective and objective knowledge [Carlson et al., 2009; Brucks, 1985], while other empirical studies found that "OK and SK are distinct constructs that do not always coincide" or have insignificant or weak correlations [Gignac, 2022; Moorman et al., 2004; Nejad and Javid, 2018; Tang and Baker, 2016].

In addition, the relationship among these variables may be more complicated. One consideration is the causality of the relationships among SK and OK. For example, OK can cause SK because a person may develop more confidence if they already possess detailed knowledge about a subject. On the other hand, SK can cause OK if having confidence and opinions encourages and motivates a person to acquire more detailed knowledge about a subject. As a result, we can formulate the hypotheses as follows:

> H4a: OK will have a positive influence on SK.
> H4b: SK will have a positive influence on OK.

3.2 Trust (TRU) and Risk (RIS)

3.2.1 Trust (TRU) to INT

There is no personal connection in online services unlike in offline services. This forces consumers of online services to rely more on trust in their service selection [Kim and Peterson, 2017; Liu et al., 2018]. The meta-analysis of Kim and Peterson [2017] shows that intention to use a website and purchase intention could result from online trust. In the area of financial services, as money is involved, trust is even more important. Previous research confirms that trust is a predictor for mobile banking use intention [Alkhowaiter, 2020; Giovanis et al., 2019; Sharma and Sharma, 2019; Karjaluoto et al., 2020; Shaw, 2014; Thusi and Maduku, 2020]. Therefore, we propose that:

> H5: Trust (TRU) has a positive effect on Intention to Use (INT).

3.2.2 Risk (PRI) to INT

Customers using online banking perceive risk in interference by outsiders to one's financial transactions that can result in those outsiders gaining access to one's financial information [Giovanis et al., 2019; Hanif and Lallie, 2021; Thusi and Maduku, 2020]. Indeed, prior research has found that this perceived risk is negatively associated with mobile banking adoption [Giovanis et al., 2019; Hanif and Lallie, 2021; Thusi and Maduku, 2020]. Based on these empirical results and arguments, hypothesis H6 is proposed:

> H6: Risk (RIS) has a negative effect on Intention to Use (INT)

3.2.3 The Bidirectional Perpective of Trust (TRU) and Risk (RIS)

Trust and risk are interlinked, so they should be investigated together [Chin et al., 2018; Kim and Koo, 2016]. In the presence

of trust among two parties, the parties perceive less risk, since they believe that neither is going to take advantage of the other [Kim and Koo, 2016]. Similarly, Thusi and Maduku [2020] found that if the perceived risk level is reduced, trust would increase in mobile banking services. Thus, we hypothesize as follows:

H7a: Trust (TRU) will have a negative influence on risk (RIS).

On the other hand, risk perceptions rise as a result of information available in social media, which in turn reduces trust [Liu et al., 2021]. Malaquias and Hwang [2016] investigated the effect of risk in mobile banking services on trust. Risk perceptions reduce the chance of adoption in mobile banking [Sohail and Al-Jabri, 2014], which indirectly suggests that consumers perceiving risk lose their confidence in the mobile banking systems. Hence,

we formulate the hypothesis that higher risk contributes to lower trust toward mobile banking:

H7b: Risk (RIS) will have a negative influence on trust (TRU).

3.3 Research Model

We map the hypotheses into the research model as shown below in ⟨Figure 1⟩.

4. Research Methodology

4.1 Development of Measurement Instruments

We collected data on Vietnamese mobile banking services using a questionnaire instrument where item scales, except for "objective knowledge", had been adapted from prior research. Particularly, "intention to use" was adapted from Akturan and Tezcan [2012] to include 3 items (INT1: I think I will use
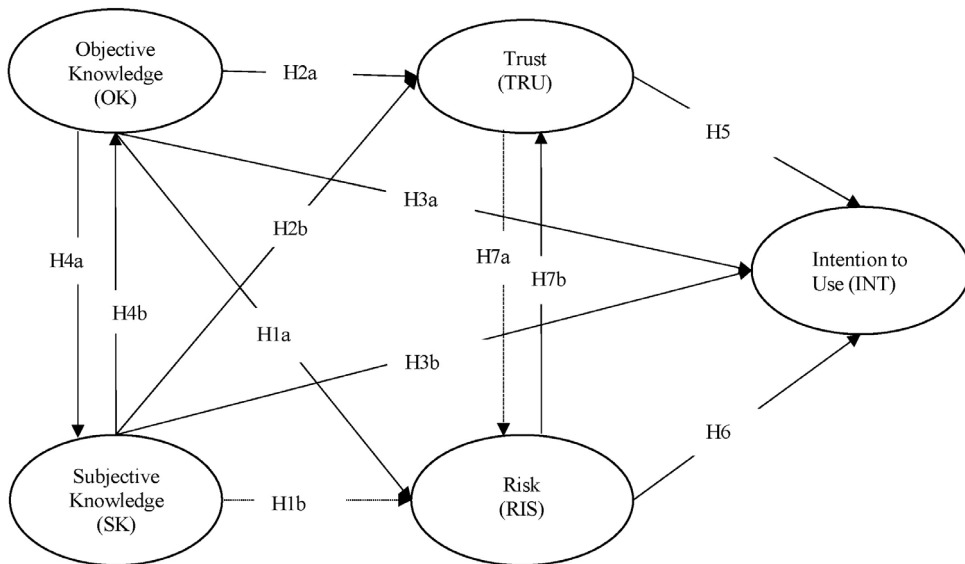
Note: ***p<0.001, **p<0.05, → non-significant path

⟨Figure 1⟩ Research Model

[or continue to use] mobile banking in the future: INT2: I predict I would use [or continue to use] mobile banking in the future; and INT3: I plan to use [or continue to use] mobile banking in the future. "Subjective knowledge" had three items which were based on the study of Flynn and Goldsmith [1999]; and Nejad and Javid [2018] (SK1: I know pretty much about MB; SK2: I feel very knowledgeable about MB; and SK3: Among my circle of friends, I'm one of the "experts" on mobile banking).

For Trust and Risk constructs, we modified from the studies of Zhou et al. [2011] and Malaquias and Hwang [2016] (TRU1: The bank has enough safeguards to make me feel comfortable in using mobile banking; TRU2: I feel assured that legal and technological structures adequately protect me from problems on the mobile banking; TRU3: In general, the mobile platform is robust and safe for using mobile banking; TRU4: I feel confident that encryption and other technological advances on mobile phone technology and the Internet make it safe for me to use mobile banking; and TRU5: In general , the mobile banking is trustworthy) and from the study of Malaquias and Hwang [2016] (RIS1: I am suspicious that someone else may access my bank account in case my banking account information is stolen; RIS2: I am worried that somebody can access my account if I lost or forgot my mobile devices; and RIS3: I am worried that I may not be able to cancel incorrectly entered transactions).

Objective knowledge refers to facts that can be verified by a third party [Cakarnis and Alessandro, 2015; Johnson and Russo, 1984]. Therefore, to measure objective knowledge of mobile banking, we collected information regarding mobile banking features such as functionalities, convenience, and terms/conditions of usage provided by financial organizations in Vietnam on their websites. As a result, we had 5 items to measure objective knowledge in mobile banking, consisting of OK1: Mobile banking is a type of e-banking service on mobile devices; OK2: User can use account infomation inquiry service with mobile banking; OK3: Mobile banking allows the transfer of money between two bank accounts within the same bank or in two separate banks; OK4: Mobile banking user can pay bills for electricity, water, Internet services and other services; and OK5: Mobile banking allows customer to recharge phone or game cards.

We used a seven-point Likert scale (from 1 = totally disagree to 7 = totally agree) to measure the responses. The questionnaire was assessed in a group setting by five finance professionals. The questionnaire was also evaluated with mobile banking users both offline (13 users) and online (21 users) by an interactive format. This was followed by an offline pre-test (5 respondents) and an online pre-test (3 respondents) to administer the questionnaire in a non-interactive format. All three evaluations and pre-tests were aimed to improve the questionnare with regard to the measurement scales and the question wordings, and the resulting final instrument is included in ⟨Appendix 1⟩.

4.2 Data Collection

We applied the virtual snowball sampling technique in collecting data [Bhutta, 2012] from July to September 2016 via a social network. We provided a clear set of instructions and ensured the reliability of the data by asking respondents to answer a set of three questions in the beginning of the questionnaire, whether (1) the respondent pos-

sessed a bank account, (2) the respondent was aware of fintech services, especially mobile banking, and (3) the respondent was using mobile devices (e.g., smartphone or a tablet) to access banking services.

We applied the single common method factor approach to examine the method biases at the measurement level [Podsakoff et al., 2003; Huang, 2015]. The results of model with all the items loaded on a single factor showed a significantly poor fit (Chi-square = 6405.118, df = 152, Chi- square/df = 42.139 〉 3, TLI = 0.377, CFI = 0.446, IFI = 0.447, RMSEA = 0.228) than the measurement model. Given this test result, common method bias is not a significant issue in this study.

The number of valid responses was 783. Most respondents were 18-39 years old (90.7%), with roughly half of them being young people of 18-27 years old (46%) and the remainder being adults of 28-39 years old (44.7%). This general age group (between 15-49 years old) is the main user group for mobile devices in Vietnam [eMarketer, 2016]. Prior studies also found that this general age group (between 21-39 years old) were the most likely to adopt mobiles [Thusi and Maduka, 2020]. The geographical location of most respondents was the capital of the country, that is, Hanoi (83.7%). Ho Chi Minh City and other cities accounted for 7.7% and 8.6% respectively. There was an approximate gender balance among respondents. Particurlarly, the proportion of female respondents was slightly higher (57.3% compared to 42.7%).

5. Data Analysis and Result

Based on the two-step approach proposed by Anderson and Gerbing [1988], we started with confirmatory factor analysis to assess the measurement model. In the second step, we utilized structural equation modeling to test the research hypotheses. Both models were evaluated using the maximum likelihood method in Amos 23. In addition, because of testing two reciprocal relationships between two pair of constructs in the research model (OK and SK, TRU and RIS), we applied the nonrecursive approach for block-recursive model as suggested by previous authors [e.g., Berry, 1984]. As the data collected in this research was of sufficient amount (N〉500), we were able to use the more stringent criteria for model fit (chi-square/df〈3, RMSEA〈0.07, CFI, TLI and IFI 〉0.95).

5.1 Measurement Model Analysis

First, we evaluated the reliability and validity of measurement scales by checking item loadings, composite reliability and the average variance extraction (AVE) [Fornell and Larcker, 1981; Hair et al., 2018; Kline, 2015]. As shown in 〈Table 1〉, all item loadings are bigger than 0.5, CR is above 0.7 and AVE is higher than 0.5. Thus, that the study passes the convergent validity check [Kline, 2015]. In addition, based on the results of CFA, the measurement model fit is accepted, particularly χ^2 = 618.975, df = 142, χ^2/df = 4.359 〉 3, TLI = 0.949, CFI = 0.958, IFI = 0.958, RMSEA = 0.066 〈 0.07.

To check whether constructs are related to each other, we measured discriminant validity by comparing the numbers. in bold type for each construct and the factor correlation coefficients for other constructs. The discriminant validity is satisfied as can be seen from the 〈Table 2〉 [Fornell and Larcker, 1981; Hair et al., 2018].

⟨Table 1⟩ Reliability and Convergent Validity of Measurement Scales

Constructs/ Items	Factor loading (λ)	Composite Reliability (ρ)	AVE
INT1	0.849		
INT2	0.930	0.918	0.788
INT3	0.883		
OK1	0.772		
OK2	0.830		
OK3	0.867	0.915	0.669
OK4	0.799		
OK5	0.770		
SK1	0.896		
SK2	0.926	0.897	0.746
SK3	0.751		
TRU1	0.787		
TRU2	0.816		
TRU3	0.827	0.916	0.686
TRU4	0.848		
TRU5	0.860		
RIS1	0.796		
RIS2	0.901	0.916	0.785
RIS3	0.954		

⟨Table 2⟩ Squared Correlation Matrix and Discriminant Validity

	Mean	S.D	INT	TRU	RIS	SK	OK
INT	5.365	1.414	0.888[*]	0.585	0.029	0.441	0.589
TRU	4.676	1.243		0.828[*]	0.266	0.408	0.359
RIS	3.592	1.600			0.886[*]	0.136	−0.025
SK	3.912	1.528				0.863[*]	0.623
OK	5.220	1.449					0.818[*]

Note: [*]Square root of AVE of each construct.

5.2 Structural Model

Next, we used a structural model to test the hypotheses. We performed bootstrapping with 1000 samples. The outcome is an adequate fit represented by x^2 = 651.282, df = 141, x^2/df = 4.619, TLI = 0.945, CFI = 0.955, IFI = 0.955, RMSEA = 0.068). ⟨Table 2⟩ and ⟨Figure 2⟩ show the results of the hypothesis test.

First, OK was found to have negative impact on RIS (β=-0.378, p⟨ 0.000) (H1a was supported) and positive impact on TRU (β=0.165, p= 0.016) (H2a: supported). SK impact significantly and negatively on TRU (β=0.291, p⟨ 0.000) (H2b: supported) but positively on RIS (β=0.266, p⟨ 0.000) (H1b: not supported).

Next, the association between OK and INT was positive and significant (β=435, p⟨0.000) (H3a: supported). However, the relationship

〈Table 3〉 Hypothesis Test Results

Hypotheses	Relationships			Std. Beta	Critical ratio	p-value	Accepted or not
H1a	OK	→	RIS	-0.378	-6.037	***	Accepted
H1b	SK	→	RIS	0.266	3.968	***	**Not accepted**
H2a	OK	→	TRU	0.165	2.420	0.016	Accepted
H2b	SK	→	TRU	0.291	4.344	***	Accepted
H3a	OK	→	INT	0.435	8.371	***	Accepted
H3b	SK	→	INT	-0.030	-0.620	0.536	**Not Accepted**
H4a	OK	→	SK	0.509	7.532	***	Accepted
H4b	SK	→	OK	0.301	4.434	***	Accepted
H5	TRU	→	INT	0.463	11.604	***	Accepted
H6	PRI	→	INT	-0.080	-2.280	0.023	Accepted
H7a	TRU	→	PRI	0.381	3.138	0.002	**Not Accepted**
H7b	PRI	→	TRU	0.014	0.137	0.891	**Not Accepted**

Note: ***$p < 0.001$, **$p < 0.05$; → non-significant path.
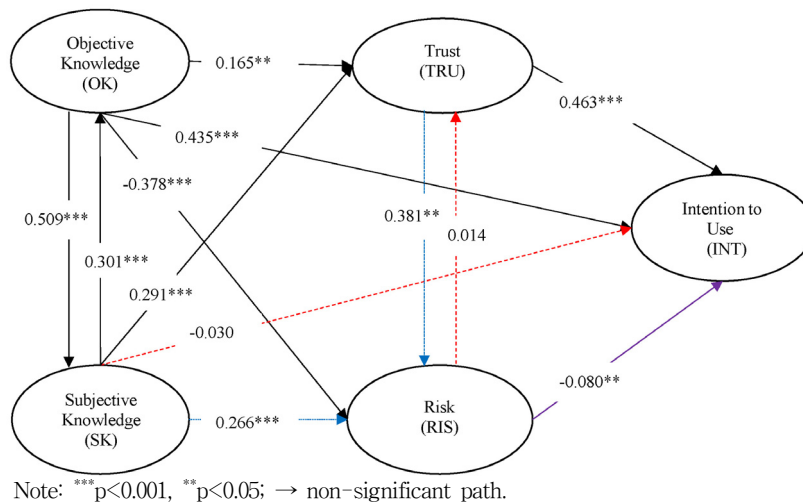
〈Figure 2〉 Research Model Results

between SK to INT was found not significant ($\beta = -.030$, $p = 0.536$) (H3b: not supported).

With regard to the hypotheses on the bidirectional relationship between OK on SK, we found that OK had positive impact on SK ($\beta = 0.509$, $p < 0.000$) and vice versus SK impact positively on OK ($\beta = 0.301$, $p < 0.000$). Therefore, both hypotheses H4a and H4b were supported.

Regarding the association between TRU and INT, the result was positive and significant ($\beta = 0.463$, $p < 0.000$). Thus, the hyphothesis H5 was supported. The hyphothesis H6 about PRI and INT was also supported ($\beta = -0.080$, $p = 0.023$).

In term of the bidirectional relationship between TRU and RIS, TRU was found to have significant impact on PRI. More specifically,

the path coefficient ($\beta = 0.381$, $p < 0.001$) showed that TRU impacted PRI positively, which was contrary to our assumption. Therefore, H7a was not supported. In adition, the estimates showed that PRI did not have significantly positive impact on TRU ($\beta = 0.014$, $p = 0.891$). Therefore, H7b was also not accepted.

5.3 Direct, Indirect and Total Effects

The intention to use mobile banking is not only directly impacted by trust but also by objective knowledge (〈Figure 1〉). Direct, indirect and total impacts were estimated using bootstrapping with 1000 replications. 〈Table 4〉 below shows the direct, indirect, and composite factor effects on mobile banking. Objective knowledge has the highest total effect, following by trust, subjective knowledge and lastly risk.

〈Table 4〉 Result of Direct, Indirect, and Total Effects

Dependent	Effect	OK	SK	TRU	RIS
OK	Direct		0.301		
	Indirect		0.054		
	Total		**0.355**		
SK	Direct	0.509			
	Indirect	0.092			
	Total	**0.601**			
TRU	Direct	0.165	0.291		*0.014*[*]
	Indirect	0.202	0.116		
	Total	**0.367**	**0.407**		
RIS	Direct	−0.378	0.266	0.381	
	Indirect	0.232	0.069	0.002	
	Total	**−0.146**	**0.335**	**0.383**	
INT	Direct	0.435	−0.03[*]	0.463	−0.08
	Indirect	0.242	0.310	−0.028	0.006
	Total	**0.677**	**0.310**	**0.435**	**−0.074**

Note: [*]effect not significant.

5.4 Post-hoc Analysis (moderating roles of gender and usage experience)

As objective knowledge is one of the most important factors for mobile banking adoption, we conducted post-hoc analyses on linkages between OK and RIS (H1a), OK and TRU (H2a), and OK and INT (H3a). A multi-group SEM analysis was alternately performed to test the differences between the pathways with gender and usage experience as moderating variables.

With regard to the test of moderating of gender, the goodness-of-fit indices for both the unconstrained ($\chi^2 = 884.463$, df = 282, χ^2/df = 3.136, TLI = 0.936, CFI = 0.947, IFI = 0.947, RMSEA = 0.068) and the constrained ($\chi^2 = 891.582$, df = 285, χ^2/df = 3.128, TLI = 0.936, CFI = 0.947, IFI = 0.947, RMSEA = 0.052) models were satisfactory. However, the chi-square (χ^2) difference test also showed non-significance between the unconstrained and the constrained models ($\Delta\chi^2$ (3) = 7.119, p = 0.068 > 0.05). This test result means the moderating role of gender on the influence of objective knowledge on usage intention (OK→ INT), on perceived risk (OK→RIS) and on trust (OK→TRU) is insignificant in our study.

Similarly, the test of moderating of user experience, which is measured in the amount of time the individual has been using mobile banking, reveals that user experience has no impact on the relationship between OK and INT, OK and PRI, and OK and TRU. The goodness-of-fit indices for both the unconstrained ($\chi^2 = 685.337$, df = 282, χ^2/df = 2.430, TLI = 0.920, CFI = 0.934, IFI = 0.935, RMSEA = 0.055) and the constrained ($\chi^2 = 688.612$, df = 285, χ^2/df = 2.416, TLI = 0.921, CFI = 0.934, IFI = 0.935, RMSEA = 0.055) models were satisfactory. However, the chi-square (χ^2)

difference test also showed non-significance be-tween the unconstrained and the constrained models ($\Delta\chi^2$ (3) = 3.275, p = 0.351〉0.05).

6. Discussion

6.1 Subjective Knowledge (SK) and Objective Knowledge (OK)

6.1.1 Bidirectional Perspective and Intention to Use

Our study confirmed the existence of the bidirectional perspective between SK and OK. However, the attenuation effect [Chaiken et al., 1989; Zhang et al., 2014] dominates influ-ence on the co- occurrence of the two process modes for two reasons. First, the mean value of OK is 5.22, while the mean value of SK is only 3.912, being lower than the mean value of the measurement scale (〈Table 3〉), which means that users are not confident of their SK about mobile banking. Second, the impact from OK to SK (β = 0.509) is stronger than from SK to OK (β = 0.301) (〈Table 4〉). When the attenuation effect happens, the system-atic mode of information processing (OK) weakens the influence of the heuristic mode of information processing (SK) on intention to use.

As a result of the attenuation, the influence of OK on INT is positive and significant where-as SK does not have an effect on INT. This phenomenon could be explained by the expect-ation of profit or loss. While investment activ-ities entail the possibility of substantial fu-ture profits, mobile banking does not entail such significant future profits. Rather, there is a possibility of losses due to weakness in the technology, falling prey to hacking. Therefore, mobile banking might emphasize OK whereas investment activities emphasize

SK [Hadar et al., 2013; Fan, 2021; Xiao et al., 2011].

In addition, previous studies have recog-nized the impact of gender differences and user experience on technology adoption. Particularly, the more experienced users are, the more familiar with and more knowledge-able about the technology of interest they are. As a result, usage experience could moderate the relationship of behavioral intention and its antecedents such as perceived usefulness and subjective norm [Liebana-Cabanillas et al., 2018; Sun and Zhang, 2006]. Despite these findings from prior literature, our test result implies that there is no difference between experienced and non-experienced user groups regarding the impact of their knowledge levels to mobile service adoption intention.

Regarding gender, our data suggests that gender differences appear to play no role in the relationship among user knowledge and mobile service adoption intention. This latter finding is particularly interesting as it contra-dicts prior understanding which emphasizes the stereotype that males are more comfort-able with computers and the Internet and have more positive attitudes toward these technologies [Kalinic et al., 2019; Liebana-Cabanillas et al., 2018]. This stereotype is es-pecially entrenched in the developing country context [Singh, 2017]. Our finding may be due to youngsters' longer-term exposure to mobile banking, which has been found to reduce gen-der differences [Faqih and Jaradat, 2015]. Recent research in Vietnam has played down this gender gap [Duong, 2022], especially in urban contexts [Nguyen et al., 2022].

6.1.2 With Trust and Risk

First, our study found that both SK and OK

could enhance the trust of customers in mobile banking services. In other words, when both SK and OK levels of customers are improved, customers will show higher levels of trust to mobile banking services provided by financial organizations. These findings are consistent with the results of previous studies in public services [Nunkoo et al., 2018], tourism [Pagliara et al., 2021] and financial services [Hansen, 2012; van der Cruijsen et al., 2021]. A negative link between OK and PRI was also found in our study, which is supported by previous studies [Hadar et al., 2013; Munnukka et al., 2017].

Surprisingly, the relationship between SK and perceived risk was positive in our study. In other words, lower SK will lead to lower perceived risk level, and this is reflected in our sample when both the level of SK and perceived risk are low (Appendix). This could be explained by the fact that when people feel confident about their knowledge (a higher level of SK) regarding mobile banking, this leads them to think that the service is risky (a higher level of perceived risk). Such a situation makes sense and is consistent with overconfidence resulting from the Dunning-Krueger Effect [Woodyard et al., 2017].

We also analyzed the impact of gender and experience on the relationship between OK and PRI and TRU. There are some indications in the literature that men have a lower threshold for risk-taking in mobile payment use [Kalinic et al., 2019], and inexperienced users could perceive risk higher than experienced ones [Liebana-Cabanillas et al., 2018]. However, in our study, there is no difference between gender and experience level regarding the influence of users' OK on PRI and TRU in mobile banking. These results could be due to bridging of the digital

gap among men and women as we explained in the section above.

6.2 Risk and Trust on Mobile Services

6.2.1 Bidirectional Perspective

Neither of the two related hypotheses (trust negatively impact on RIS and vice versus) were supported by our data. Particularly, we found that RIS did not have significantly negative impact on TRU while TRU had a positive (not negative as hypothesized) impact on PRI (i.e., higher trust goes together with higher perceived risk). Hence, our results are different from the study of Kim and Koo [2016] which supports the bidirectional view. However, our study is also not consistent with the findings of Chin et al. [2018] who did not find the existence of the bidirectional model.

In our empirical research context, similar to Chin et al. [2018], users experienced low risk (RIS mean=3.592 〈 evarage (i.e., 4), see 〈Table 2〉) at the same time as high trust (mean of TRU = 4.676, see 〈Table 3〉). In the situation of low risk perceptions, Aldas-Manzano et al. [2011] stated that trust becomes less important and it is possible to observe a positive relationship between risk and trust.

6.2.2 With Intention to Use

The results of the study reveal that trust has a strong and significant positive relationship with mobile banking adoption, which is consistent with previous studies [Alkhowaiter, 2020; Giovanis et al., 2019; Karjaluoto et al., 2020; Sharma and Sharma, 2019; Shaw, 2014; Thusi and Maduku, 2020]. In our research, trust is one of the most important factors which encourage customers to adopt mobile banking services, only after objective knowl-

edge, as shown in 〈Table 4〉.

Additionally, perceived risk was also an an-tecedent of behavioral intention toward mo-bile banking in our research; however, its ef-fect was weak (β=-0.08). This may be due to two factors: the security in mobile banking is much improved recently, and our sample was mainly (90%) comprised of younger peo-ple, who are comfortable with technology [Chin et al., 2018]. Young people are also less risk-averse in general [Riley and Chow, 1992; Hallahan et al., 2004] as evidenced by the low level of perceived risk in our sample.

7. Implications

7.1 Theoretical Contribution

First, a literature review by Tam and Oliveira [2017], which focuses on analyzing and synthesizing existing studies of mobile banking, suggests that future research should consider other theories than only TAM, TRA and TPB to provide deeper insight into mobile banking research. Our study answers this call by being the first applying the heuristic‐sys-tematic model to investigate mobile banking acceptance. HSM assists us in understanding how customer knowledge could lead to mobile banking adoption and explains why OK could play a more important role than SK in the adoption process.

Second, to our knowledge, our study is the first to confirm the bidirectional linkage be-tween SK and OK, as previous studies [e.g., Carlson et al., 2009; Brucks, 1985; Nejad and Javid, 2018] mainly concentrated in testing the correlation between these constructs or the unidirectional relationship as in the study of Tang and Baker [2016] (from OK to SK). Our result further confirms the co-occurrence

of heuristic and systematic processing which was proposed by Chaiken [1980] and Eagly and Chaiken [1993]. Particularly, the attenu-ation effect is evident, so OK plays a more important role than SK in promoting mobile banking adoption.

7.2 Practical Contribution

The result of this study shows that increase in OK could contribute to increase in mobile banking adoption either directly or via trust. Thus, this research emphasizes the provision of information about products and services re-lating to mobile banking, such as features, advantages, pricing, availability, contact and support service channels that will become cus-tomers' OK.

It should also be noted that OK is related to financial literacy. Thus, banks should pro-mote OK and financial literacy to encourage mobile banking and lower operational costs. To promote financial literacy among consum-ers, financial education should be delivered to consumers at the time when people are most receptive to it. A curriculum should be devel-oped to help consumers gain sufficient in-formation to make sound decisions. Therefore, financial institutions should form partner-ships with other stakeholders, particularly educational organizations to deliver efficient financial education and training programs.

Previous research has suggested that banks' consumer education and marketing strategies should be informed by gender [Glavee-Geo et al., 2017]. A contradictory re-sult was given by our study – gender had no effect on objective knowledge for mobile bank-ing adoption. This implies that banks could develop a uniform education and marketing strategy for customers of both genders.

Similarly, our research implies that consumer education and marketing strategies require less hand-on training for consumers, as experience appeared not to be a significant contributor to mobile banking adoption.

8. Conclusion

The research model and hypotheses in our study highlight the co-occurrence of systematic and heuristic information processing in HSM. Examining these information routes in relationship to customer knowledges will enable us to derive more insights regarding how and why customer knowledge affects customers' decision-making in a complex manner. While this study provides meaningful information for financial organizations to incraese the adoption of mobile banking services through understanding the role of customer knowledge, perceived risk requires more attention. Higher subjective knowledge will lead to higher perceived risk. Similarly, higher trust will cause higher perceived risk. Hence, future research is recommended to understand this construct more deeply.

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〈Appendix 1〉 Questionnaire

Constructs	Items	References
Intention to Use (INT)	I think I will use (continue to use) mobile banking in the future	Akturan and Tezcan [2012]
	I predict I would (continue to use) mobile banking in the future	
	I plan to use (continue to use) mobile banking in the future	
Objective Knowledge (OK)	Mobile banking is a type of e-banking service on mobile devices	Self-developed
	User can use account infomation inquiry service with mobile banking	
	Mobile banking allows the transfer of money between two bank accounts within the same bank or in two separate banks	
	Mobile banking user can pay bills for electricity, water, Internet services and other services.	
	Mobile banking allows customer to recharge top-up phone credit or game cards.	
Subjective Knowledge (SK)	I know quite much about mobile banking	Flynn and Goldsmith [1999] Nejad and Javid [2018]
	I feel very knowledgeable about mobile banking	
	Among my circle of friends, I'm one of the "experts" on mobile banking	
	Compared to most other people, I know less about mobile banking	
Trust on Mobile Services (TMB)	The bank has enough safeguards to make me feel comfortable in using mobile banking	Zhou et al. [2011] Malaquias and Hwang, [2016]
	I feel assured that legal and technological structures adequately protect me from problems on the mobile banking	
	In general, the mobile platform is robust and safe for using mobile banking	
	I feel confident that encryption and other technological advances on mobile phone technology and the Internet make it safe for me to use mobile banking	
	In general, mobile banking is trustworthy	
Perceived Risk (PRI)	I am suspicious that someone else may access my bank account in case my banking account information is stolen	Malaquias and Hwang [2016]
	I am worried that somebody can access my account if I lost or forgot my mobile devices	
	I am worried that I may not be able to cancel incorrectly entered transactions	

■ Author Profile

Hai Nguyen Thi Thanh

Hai Nguyen Thi Thanh obtained her bachelor's degree from the National Economics University of Hanoi, Master of Commerce from the Sydney University, and PhD from the Waseda University, Japan. She is currently Lecturer in MBA Global in the University of South Wales and working in different international research projects regarding information systems management. Her research focuses on information system adoption, dynamic capabilities and strategies and e-health. Together with her colleagues, her work has appeared in the Computers in Human Behavior, Information Processing and Management, International Journal of Medical Informatics, and Journal of Information Systems for Developing Countries.

Tommi Tapanainen

Tommi Tapanainen is Associate Professor at the Department of Global Studies at Pusan National University. His work has been published in the Journal of the Association for Information Systems, European Journal of Information Systems, Computers in Human Behavior, and other journals and conference proceedings.

Yen Nguyen Thi Hoang

Yen Nguyen Thi Hoang is Associate Professor in marketing at Posts & Telecommunications Institute of Technology, Hanoi, Vietnam. She obtained her PhD in management science (marketing) at Paris Est Creteil University (Paris 12 University) in France. Before that, she did her DEA (master of research) in management science at Pantheon-Assas University (Paris 2 University), France and MBA at The French-Vietnamese Center for Management Education (CFVG) in Vietnam. Her research interests include corporate/brand image, customer commitment and trust, organizational transformation. Her articles have appeared in International Journal of Bank Marketing, Asia Pacific Journal of Marketing and Logistics, Journal of Entrepreneurship and Innovation in Emerging Economies, Journal of Economics and Development.