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AN EMPIRICAL ANALYSIS OF MOBILE BANKING ADOPTION IN VIETNAM

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ABSTRACT

Mobile phones with banking technology are becoming more readily available in Vietnam. Similarly, many financial institutions and mobile phone service providers are teaming up to provide several banking services to customers via the mobile phone. However, the number of people who choose to adopt or use such technologies is still relatively low. Therefore, there is a need to assess the acceptance of such technologies to establish factors that hinder or promote customer's intention to use mobile banking. Survey data collected from 452 consumers was analyzed to provide evidence. Results from the partial least squares structural equation modeling (PLS-SEM) using the SmartPLS 3.0 program indicated that perceived easy to use, perceived credibility, usefulness, attitude, perceived behavioral control and subjective norm are significant with respect to the customer's intention to use mobile banking services. The results of the data analysis contribute to the body of knowledge by demonstrating that the above factors are critical in intention to use mobile banking in a developing country context. The finding of this study can also help marketers in the banking sector offer more suitable marketing strategies in their field in order to make higher attractiveness with mobile banking services.

Keywords: Perceived usefulness, perceived ease of use, subjective norm, perceived behavioral control, customer's intention to use mobile banking services.

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RESUMO

Telefones celulares com tecnologia bancária estão se tornando mais disponíveis no Vietnã. Da mesma forma, muitas instituições financeiras e provedores de serviços de telefonia móvel estão se unindo para fornecer vários serviços bancários aos clientes via telefone celular. No entanto, o número de pessoas que optam por adotar ou usar essas tecnologias ainda é relativamente baixo. Portanto, é necessário avaliar a aceitação de tais tecnologias para estabelecer fatores que dificultam ou promovem a intenção do cliente de usar o banco móvel. Os dados da pesquisa coletados de 452 consumidores foram analisados para fornecer evidências. Os resultados da modelagem de equações estruturais de mínimos quadrados parciais (PLS-SEM) usando o programa SmartPLS 3.0 indicaram que a percepção de fácil uso, credibilidade, utilidade, atitude, controle comportamental percebido e norma subjetiva são significativas com relação à intenção do cliente de usar dispositivos móveis para serviços bancários. Os resultados da análise de dados contribuem para o corpo de conhecimento, demonstrando que os fatores acima são críticos na intenção de usar o banco móvel em um contexto de país em desenvolvimento. As conclusões deste estudo também podem ajudar os profissionais de marketing do setor bancário a oferecer estratégias de marketing mais adequadas em seu campo, a fim de aumentar a atratividade dos serviços bancários móveis.

Keywords: utilidade percebida, facilidade de uso percebida, norma subjetiva, controle comportamental percebido, intenção do cliente de usar serviços bancários móveis.

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INTRODUCTION

Mobile banking is an innovative service, which has been perpetuated by the development and diffusion of mobile communication technology. Mobile banking is defined as "the financial services delivered via mobile networks and performed on a mobile phone" (Alampay & Moshi, 2018). This service provides much convenience and promptness to the banks' customers along with cost savings. Many banks are interested in expanding their market through mobile services.

Traditionally, the most widespread method of conducting banking transactions has been through offline retail banking. Mobile banking, however, is the recent trend in banking transition and holds a bright future that is promising over and above the one brought by electronic banking (e-banking). Mobile banking provides personalized, anytime - anywhere banking services thus making it the future of banking. In the last several years, several commercial banks in Vietnam have introduced and diffused some mobile banking systems. Nevertheless, with all the laudable benefits of mobile banking, it is yet to gain larger-scale adoption, especially in the emerging economies.

According to the State bank of Vietnam, the development of personal accounts in Vietnam was very high, 30% average growth per year. At 2018, about 59% of Vietnam's population had bank account (66.6 million people). The promotion of mobile banking transaction channel enabled the banks to enhance their operations with cost-cutting effectively and efficiently in order to handle daily banking affairs via mobile and Internet. Customer is convenient by reducing their visits to the banks and they can get their transactions via their mobile instead of personally visiting the branches. Although the usage of mobile banking has been strong growth over the last few years, it is still in its infancy. As the report of General Statistics Vietnam, there was estimate at 135 million mobile subscribers, 64 million Internet users at the end of 2018. This figure is also still very low when compared with developed nations in Asia. It means that mobile banking service in Viet Nam is a potential market in future.

During the last ten years, there were many studies concerning the intention to use mobile banking. However, most of these studies focused on the West and the United States. In Asian region, most studies concentrated on developed Asian countries (e.g., Singapore, Hong Kong, Taiwan, and

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Malaysia) than developing countries like Vietnam, Lao, Cambodia. In Vietnam, mobile banking services are still in the initial stages of development. The commercial banks have a great deal for improvement. Thus, there is a need to study and understand users' acceptance of mobile banking services in order to identify the factors affecting their intention to use mobile banking. On the other hand, previous research for this topic in Vietnam is so limited. So that the topic was chosen to study the factors affecting the adoption of mobile banking services, usefulness for the work and future research. In this study, the authors only focus on researching about the intention to use mobile banking in Viet Nam. The finding of this study can help marketers in the banking sector offer more suitable marketing strategies in their field in order to make higher attractiveness with mobile banking services.

THEORETICAL BACKGROUND

Technology Acceptance Model and the Theory of Planned Behavior are chosen as a basis for this study. The reason for choosing they are, that the models have been successfully used in several previous studies related to retail bank customers. Additionally, similar determinants can be acknowledged to influence the user acceptance and adoption of mobile banking, whether or not these studies have been using Technology Acceptance Model and Theory of Planned Behavior as the framework.

TECHNOLOGY ACCEPTANCE MODEL

There are several models existing that have been used to investigate adoption of technology. Several studies focusing on adoption of mobile services have their roots in Technology Acceptance Model (TAM) originally proposed by Davies in 1986. The model is originally designed to predict user's acceptance of Information Technology and usage in an organizational context.

TAM focuses on the attitude explanations of intention to use a specific technology or service; it has become a widely applied model for user acceptance and usage. TAM, shown in figure 1 was also the first model that established external variables as key factors in studying technology adoption.

TAM model which deals with perceptions as opposed to real usage, suggests that when users are present with new technology, two important factors influence their decision about how and when they will use it (Davis, 1989). These key factors are: (1) Perceived usefulness: It refers to "the degree to which a person believes that using a particular

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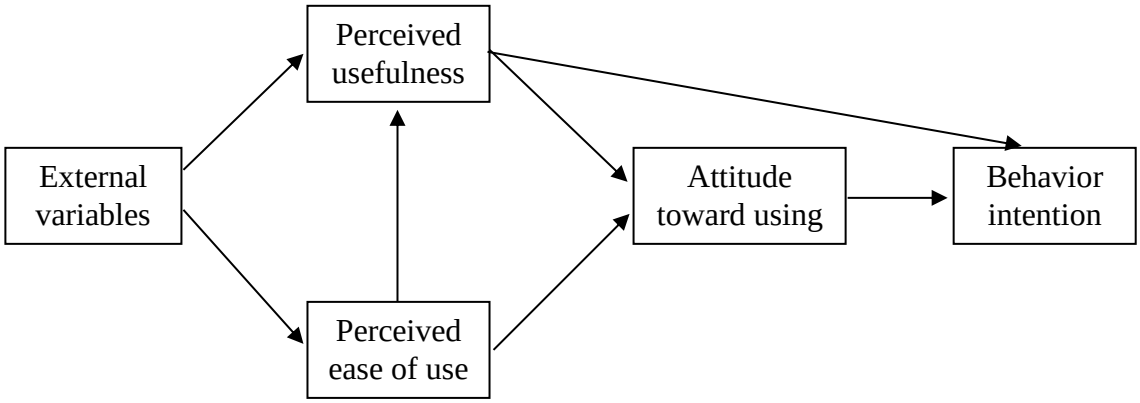
system would enhance his or her job performance". (2) Perceived ease of use: It mentions "the degree to which a person believes that using a particular system would be free from effort".

Figure 1: Technology Acceptance Model



Source: Davis (1989).

THEORY OF PLANNED BEHAVIOR

The theory of planned behavior (TPB) was developed from the theory of reasoned action (TRA) by Ajzen and Fishbein (1980). This theory is considered to be pioneering in the field of psychosocial research and is widely applied in scientific research to learn about human behavior. The main content is shown in the studies of (Ajzen, 1985, 1991, 2002). The relationship between intention and behavior has been empirically tested in numerous studies in many areas (Sheppard, Hartwick, & Warshaw, 1988).

Theory of reasoned action (TRA) focuses on understanding the motivational factor of personal behavior consisting of two main components: attitude towards behavior (AT) and subjective norms (SN). Although the TRA is widely accepted in literature, the theory is still limited. Inability due to lack of opportunities or resources such as time, capital, skills ...To overcome these limitations, Ajzen (2002) added another variable to the original TRA model, perceived behavioral control (PBC) and this led to the theory of planned behavior (TPB).

Perceived behavioral control reflects the ease or difficulty of performing the behavior

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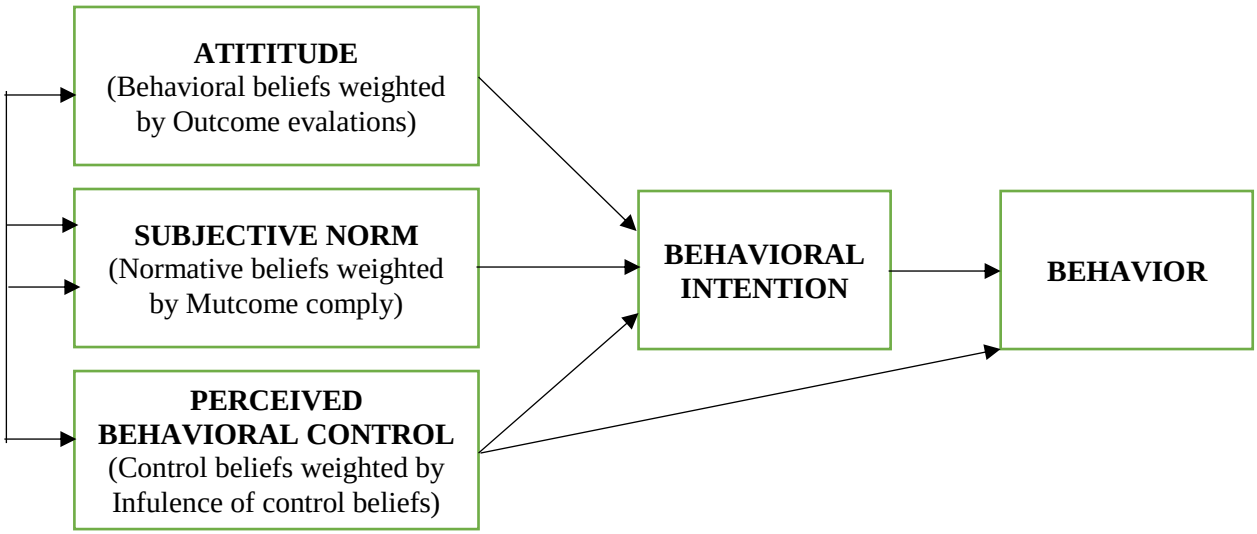
and whether the behavior is controlled or restricted (Ajzen, 1991). The TPB model is shown in Figure 2.

Figure 2: The theory of planned behavior



Source: Ajzen (1991)

According to the theory of planned behavior (TPB), perceived behavioral control (PBC) can affect behaviors in two ways: PBC may affect intentions of behavior and PBC can directly influence behavior. Both of these controlling effects may be related to the course of action of investors. In addition, other factors that affect investors' actions are internal factors and external factors. Internal factors include feelings, personal knowledge, experiences, and skills. External factors include financial resources, time or partner (Ajzen & Fishbein, 2005). In TPB theory, the three main factors are behavioral attitudes, subjective norms, and perceived behavioral control. These factors have been proven and confirmed in numerous researches.

BEHAVIORAL INTENTION TO USE MOBILE BANKING

Consumers' self-reported intentions are measured similarly in many other studies. Warshaw and Davis (1985) defined intention to be "the degree to which a person has formulated conscious plans to perform or not

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to perform some specified future behavior". Behavioral intention to use in this study is defined in a rather similar way as in previous studies as "the individual's likelihood of using mobile service" (Ajzen & Fishbein, 1980; Forenbacher et al., 2019; Parasuraman et al., 2017; Venkatesh et al., 2003). The prediction of intention has interested scientists for a long time. As in many other acceptance papers in the field, this study also assumes that behavioral intention will have a positive effect on system usage in the future.

HYPOTHESES DEVELOPMENT

Based on the literature review, such as Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB), this research proposes the research model with the seven factors that have an impact on intention to use mobile banking (Figure 3). These factors are perceived usefulness, perceived ease of use, attitude, subjective norm, perceived credibility, and perceived behavioral control. There are also four control variables (gender, age, income, education), using to analyze the influencing to the dependent variable.

PERCEIVED USEFULNESS

The elements perceived usefulness, perceived ease of use and attitude toward adoption of mobile banking were adapted from TAM (Davis, 1989). These elements have also been maintained for studying the adoption of mobile banking services where results fairly well comply with the findings from TAM studies. Perceived usefulness refers to the degree to which an individual believes that the usage of technology will enhance his or her performance (Davis, 1989). Previous research findings have shown the positive influence of perceived usefulness toward the adoption and usage of mobile banking (Akturan, 2012; Mostafa & Eneizan, 2018; Saji & Paul, 2018). Thus, the following hypothesis is proposed:

H1: Perceived usefulness positively affects intention to use mobile banking.

PERCEIVED EASE OF USE

Perceived ease of use refers to the degree to which one believes that using an information system is free from effort (Davis, 1989). Previous research works have found that perceived ease of use has positively influenced on intention to use of technology (Baabdullah Abdullah, 2019; Davis, 1989; Luarn & Lin, 2005). Individuals will adopt and use mobile banking services if they perceive it as easy to learn and use. Thus, they will affect user's attitude. Some prior studies (e.g., Mostafa & Eneizan, 2018; Saji & Paul,

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2018; Yoon & Occeña, 2014) found that perceived ease of use was significant in determining intention to use mobile banking. Hence, the following hypotheses are proposed:

H2: Perceived ease of use positively affects intention to use mobile banking.

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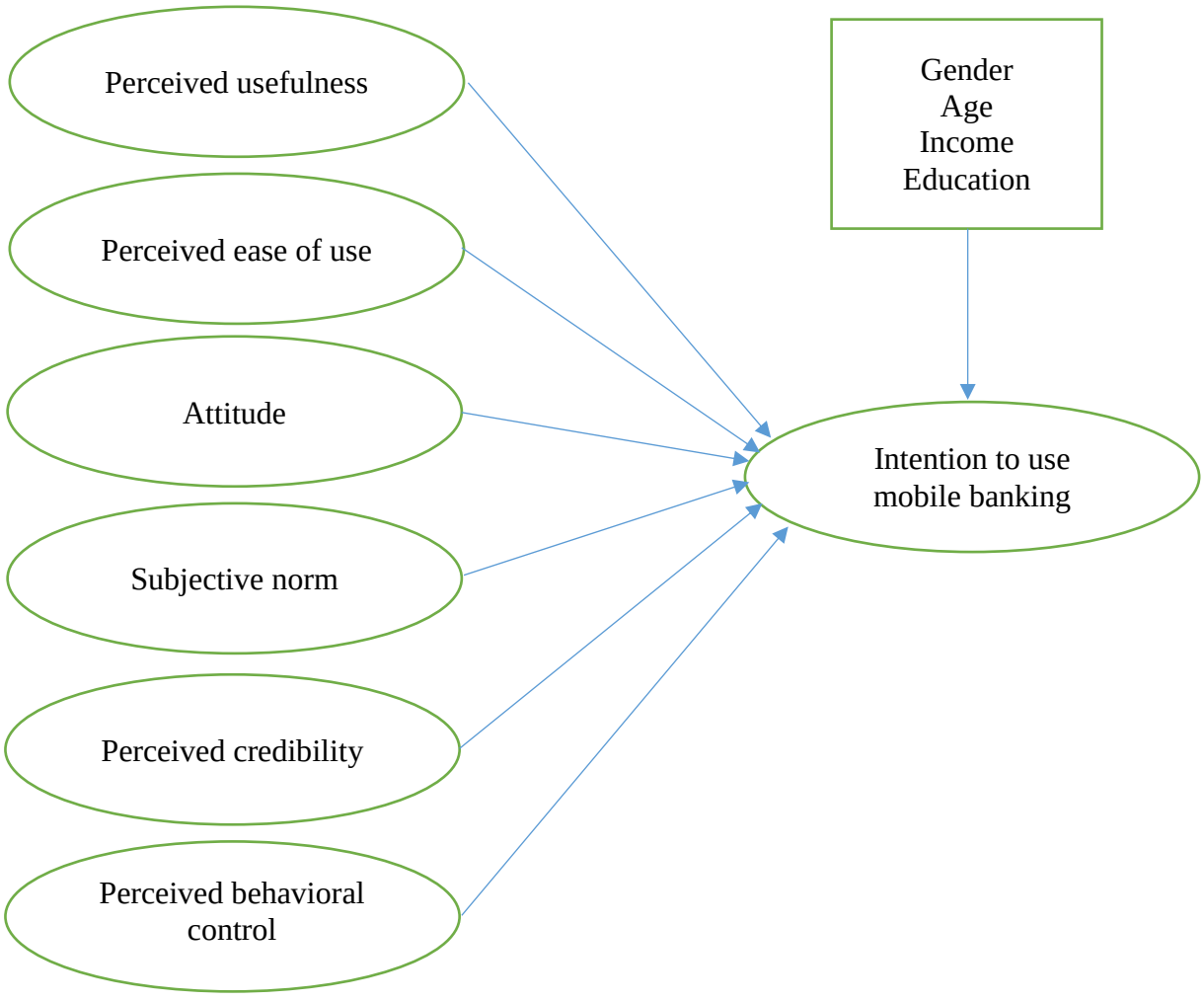
Figure 3: Conceptual model



Source: Author's own elaboration.

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ATTITUDE

Attitude toward behavior refers to "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question" (Ajzen, 1991). Attitude was populated to be the first antecedent of behavioral intention. It is an individual's positive or negative belief about performing a specific behavior. An individual will intend to perform a certain behavior when he or she evaluates it positively. It has been demonstrated that attitude has a strong effect, direct and positive, on the real individual intentions to use a new system or technology (Michelle Bobbitt, 2001; Muñoz-Leiva, Climent-Climent, & Liébana-Cabanillas, 2017). In this research, attitude is hypothesized to influences the intention toward using mobile banking services and is defined as the degree to which an individual's attitude is favorably or unfavorably disposed toward using mobile banking services. In prior research, the link between attitude and intention to use mobile banking was investigated. Some researchers found that there was a significant relationship between them (Akturan, 2012; Muñoz-Leiva et al., 2017). The impact of attitude on intention to use mobile banking is captured in the next hypothesis.

H3: There is a significant positive relationship between attitude and intention to use mobile banking.

SUBJECTIVE NORM

This construct was promoted by Fishbein and Ajzen (1975) and was developed by Mathieson (1991). Subjective norm refers to the perceived social pressure to perform a behavior; according to what others say or do is important (Mathieson, 1991). Accordingly, subjective norm is a social force and relates to the normative beliefs about the expectation from relevant persons. In this research, subjective norm is defined as customers consider the normative expectations of others they view as important, such as family, friends, and colleague, to decide if whether they use mobile banking services. Particularly the people who are important to an individual play an important role in the considerations of whether or not to use a new technological system. Some scholars (e.g., Perdigoto & Picoto, 2012; Ting et al., 2016) found the subjective norm is an important driver for mobile chatting usage. Thus, the following hypothesis is proposed:

H4: Subjective norm positively affects intention to use mobile banking.

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PERCEIVED CREDIBILITY

Perceived credibility, is defined as the degree to which an individual believes mobile banking as trustworthy and secure (Yeow et al., 2008). Perceived credibility is an important predictor of behavioral intention to use mobile banking services. An increase in the perceived credibility will subsequently improve users' mobile banking acceptance (Giao, Vuong, & Quan, 2020). Therefore, creating customer trust is an essential way to retain existing bank customers (Kumar & Polonsky, 2019). As the literature reveals that different scholars employ different perspectives to assess the concern of security, risk, trust, and credibility, the concern has been conceptualized and assessed from a variety of ways that fully depends on which discipline researchers interpret the concern (Amin et al., 2012). Given that perceived credibility has been empirically supported and used in mobile banking adoption studies (Al Khasawneh, 2015; Saji & Paul, 2018). Accordingly, this study hypothesizes:

H5: Perceived credibility positively affects intention to use mobile banking.

PERCEIVED BEHAVIORAL CONTROL

Perceived behavioral control refers to the constraints of technology usage (Taylor & Todd, 1995). It refers to people's perceptions of their ability to perform a given behavior. Drawing an analogy to the expectancy-value model of attitude, it is assumed that perceived behavioral control is determined by the total set of accessible control beliefs, i.e., beliefs about the presence of factors that may facilitate or impede the performance of the behavior. Specifically, the strength of each control belief is weighted by the perceived power of the control factor, and the products are aggregated, as shown in the following equation. To the extent that it is an accurate reflection of actual behavioral control, perceived behavioral control can, together with intention, be used to predict behavior (Abadi, Ranjbarian, & Zade, 2012; Ting et al., 2016). Thus, the following hypothesis is proposed:

H6: Perceived behavioral control positively affects intention to use mobile banking.

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RESEARCH METHODOLOGY

PROCEDURE AND SAMPLING SIZE

This study used two research methods. The first phase, qualitative research identifies the models, factors, suitable measurement variables for research in Vietnam. Through the previous relevant researches, the questionnaire was built. These researches were conducted in different culture, the level of economic development and selected respondents. Therefore, a pilot study was conducted through qualitative research method. The purpose is to gather information and adjust variables in these scales. The wording Vietnamese language for these scales is also doing to study. So that, respondents can understand the question, to avoid confusion.

The second phase, a quantitative survey was the main approach of this study. The goal is to identify the factors affecting customers' intention to use mobile banking services. To conduct qualitative research, the quantitative pilot test was conducted. The 50 questionnaires were sent to customers for answering. After two weeks, the forms have been returned for the quantitative pilot test (Table 1). The purpose of this stage was not only to assure the appropriateness of the used instruments in the context of Vietnam but also to be well prepared for the final measurement, which was subsequently used in the main survey.

Table 1: Results of the quantitative pilot study analysis of 50 respondents

Factors	Number of items	Cronbach's Alpha	The minimum value of corrected item-total correlation
Perceived Usefulness	6	0.862	0.429
Perceived Ease of Use	5	0.893	0.630
Attitude	3	0.822	0.609
Subjective norm	4	0.815	0.556
Perceived credibility	4	0.796	0.431
Perceived Behavior Control	4	0.915	0.787
Intention to adopt mobile banking	4	0.920	0.718

Source: Author's own elaboration.

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The reliability of the data was verified by Cronbach's Alpha coefficient to ensure the internal consistency reliability for item scales. The indicator normally ranged between zero and one and the rates for comparison are the Cronbach's Alpha index, which can be acceptable if it is equal to or above 0.7 (Giao & Vuong, 2019). In addition, Brzoska and Razum (2010) suggested that the corrected item-total correlation should be more than 0.3. As shown in the table above (Table 1), the results of each construct's reliability test with the value of Cronbach's Alpha coefficients of all scales ranging from 0.796 to 0.920 and the minimum value of corrected Item-total correlation coefficients was 0.429 which was higher than 0.3. Therefore, the reliability of the scales is sufficiently good, and this measurement is used to test the main survey.

Table 2: Descriptive Statistics

N=452		Frequency	Percent
Gender	Female	194	42.9
	Male	258	57.1
Age group	< 25 years old	134	29.6
	25 - 35 years old	161	35.6
	35 - 45 years old	110	24.3
	> 45 years old	47	10.4
Income	Under 7 million VND	150	33.2
	7-15 million VND	208	46.0
	15-20 million VND	76	16.8
	Above 20 million VND	18	4.0
Level of education	Below than bachelor's degree	191	42.3
	Bachelor's Degree	220	48.7
	Master's Degree	34	7.5
	Higher than master's degree	7	1.5
Note: 1 million VND ≈ 44 US dollars			

Source: Author's own elaboration

After translating and revising the final set of questionnaires, the authors designed the questionnaire on Google Docs and printed a hard copy for convenient responses. The

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questionnaires were distributed to the banking customers who are using individual account, but not signed up for mobile banking services. Specifically, 109 hard copy questionnaires were collected directly from friends and colleagues of the authors and 355 questionnaires were collected via Google Docs. After data collection, a total of 464 questionnaires were collected. However, only 452 responses were qualified for the data analysis process. A total of 12 responses were deleted because they chose only one option for all the questions or their answers were implausible. Finally, 452 responses were used for this research. Table 2 above shows the diverse information about the demographic profile of the respondents.

VARIABLE MEASUREMENTS

All variables in the model were measured with multiple items and each item was scored on a five-point Likert scale examining how strongly respondents agree or disagree with the statement, with 1 = "strongly disagree" and 5 = "strongly agree". This scale was developed by prior researchers to adequately capture the domain of the constructs. Specifically, the perceived usefulness scale was measured by five items of Perdigoto and Picoto (2012). Sample items included (e.g., "Performing transactions anywhere, anytime, via m-banking brings convenience to me"). The perceived ease of use scale was measured by five items of Perdigoto and Picoto (2012). Sample items included (e.g., "It would be easy to find out how to use m-banking"). The attitude scale was measured by three items of Akturan (2012). Sample items included (e.g., "I think that using mobile banking for financial transactions would be a wise idea"). The subjective norm scale was measured by four items of Sripalawat, Thongmak, and Ngramyarn (2011). Sample items included (e.g., "Mobile banking use could be considered as a symbol of status among my group"). Perceived credibility was adapted from four items of Saji and Paul (2018) and Yoon and Occeña (2014). Sample items included (e.g., "Mobile banking ensures secure bank transactions"). The Perceived behavior control scale was measured by four items of Shen et al. (2010). Sample items included (e.g., "I would be able to operate mobile banking"). The Intention to adopt mobile banking scale was measured by four items of Akturan (2012). Sample items included (e.g., "I plan to use mobile banking in the future").

PARTIAL LEAST SQUARES REGRESSION

This research employed partial least square-structural equation modeling (PLS-SEM) via

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the SmartPLS program to test a model hypothesis. Giao and Vuong (2019) stated that PLS is an approach which can contribute much utility for causal analysis in behavioral research. In addition, PLS is also a powerful multivariate technique which scrutinizes complex research problems that include unobserved variables and multifaceted interaction of different variables. PLS has the capability to calculate p-values through a bootstrapping technique if samples are independent and if the data is not required to be normally distributed (Kline, 2005). Ringle, Wende, and Will (2005) developed SmartPLS software which is one of the outstanding applications for PLS-SEM analysis. It is also well recognized for its ability to work well with small sample sizes (100-200) (Giao & Vuong, 2019). By considering all the above strengths, the authors used SmartPLS 3.0 to analyze data in this research.

RESEARCH RESULT

RELIABILITY AND VALIDITY OF THE CONSTRUCTS

The reliability of the constructs is determined by indicator reliability and internal consistency reliability. Wong (2013) defined indicator reliability as the square of the loadings for each indicator. The study also recommended that when it is higher than 0.4, the data will satisfy indicator reliability (Vuong & Giao, 2019). As shown in Table 3, most of indicator reliability values were higher than 0.4. Thus, indicator reliability was ensured. However, indicator reliability value of PBC1 was 0.215 (lower than 0.4), this item was deleted.

In addition, internal consistency reliability for all of the latent variables was assessed by using Cronbach's Alpha and composite reliability (CR) (Fornell & Bookstein, 1982). Mitchell and Jolley (2010) posited that a score of at least 0.7 is necessary in order to say that a measure is internally consistent.

According to Giao and Vuong (2019), the composite reliability is more suitable to PLS modeling than Cronbach's Alpha. Thus, researchers can use composite reliability to replace Cronbach's alpha coefficient. As shown in Table 3 below, the composite reliability score for each of the constructs was greater than 0.7. For example, composite reliability score for Perceived usefulness = 0.902, Perceived Ease of use = 0.894, Attitude = 0.809, Subjective norm = 0.860, Perceived credibility = 0.896, Perceived behavior control = 0.860 and Intention to adopt mobile banking = 0.909. Therefore, it demonstrated good internal consistency

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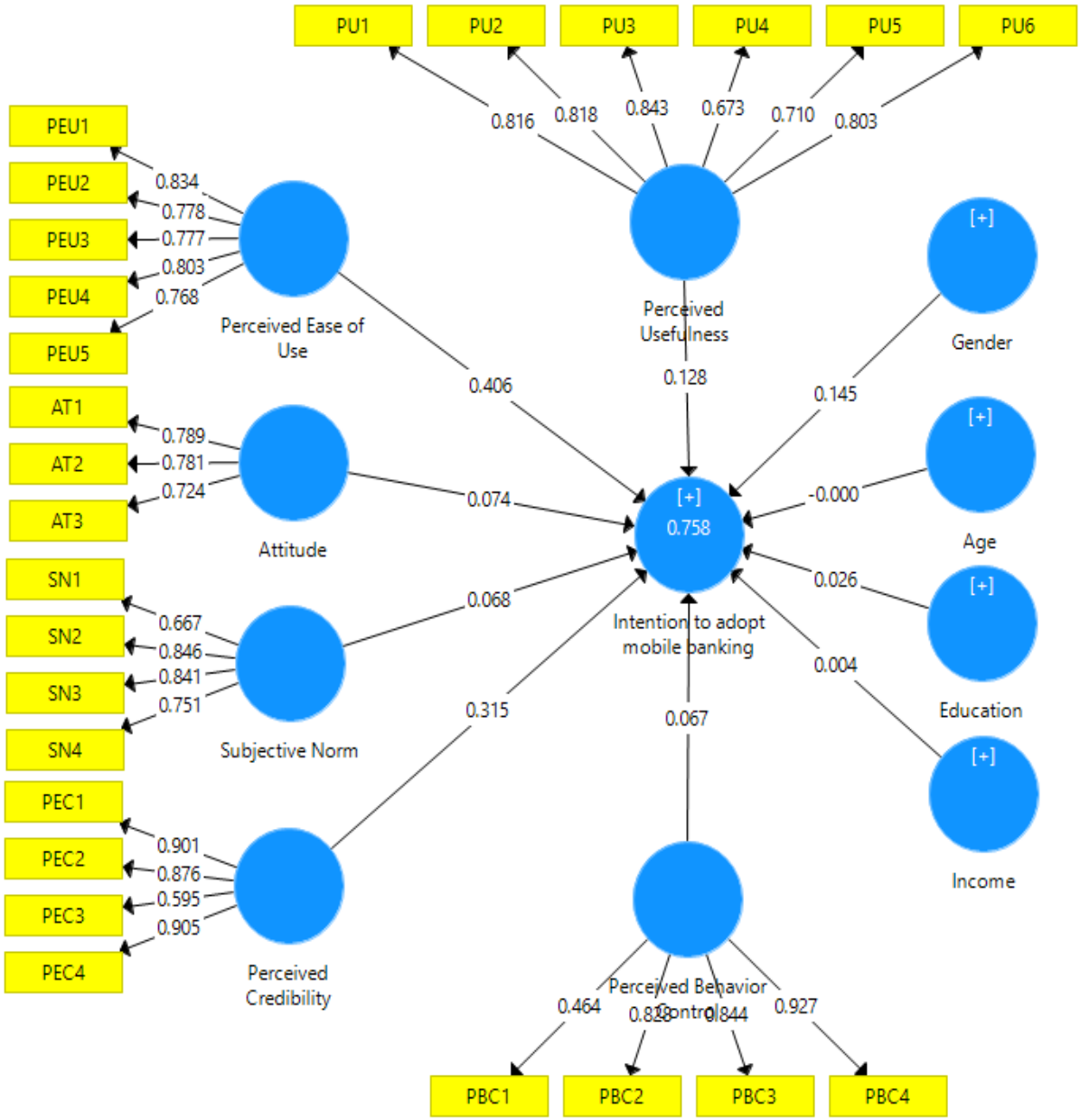
reliability. Also, Vuong and Giao (2019) stated that the rho_A coefficient is the important reliability measure for the partial least squares. Vuong and Sid (2020) recommended that the value of this coefficient should be higher than 0.7. As shown in Table 3, the values of rho_A coefficients range from 0.742 to 0.875. Based on this evidence, the author can confirm that the reliability of the scales is sufficient.

Figure 2: Measurement model



Source: Author's own elaboration.

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Table 3: Reliability and convergent validity

Construct	Indicator	Indicator loading	Indicator Reliability (Loadings^2)	Cronbach's Alpha	rho_A	Composite Reliability (CR)	AVE	R^2
Perceived Usefulness	PU1	0.816	0.666	0.869	0.875	0.902	0.608	
	PU2	0.818	0.669					
	PU3	0.843	0.711					
	PU4	0.673	0.453					
	PU5	0.710	0.504					
	PU6	0.803	0.645					
Perceived Ease of Use	PEU1	0.834	0.696	0.852	0.853	0.894	0.628	
	PEU2	0.778	0.605					
	PEU3	0.777	0.604					
	PEU4	0.803	0.645					
	PEU5	0.768	0.590					
Attitude	AT1	0.789	0.623	0.746	0.742	0.809	0.585	
	AT2	0.781	0.610					
	AT3	0.724	0.524					
Subjective norm	SN1	0.667	0.445	0.781	0.792	0.860	0.608	
	SN2	0.846	0.716					
	SN3	0.841	0.707					
	SN4	0.751	0.564					
Perceived credibility	PEC1	0.901	0.812	0.840	0.872	0.896	0.688	
	PEC2	0.876	0.767					
	PEC3	0.595	0.354					
	PEC4	0.905	0.819					
Perceived Behavior Control	PBC1	**0.464**	**0.215**	This item was deleted due to low factor loading				
	PBC2	0.828	0.686	0.768	0.797	0.860	0.618	
	PBC3	0.844	0.712					
	PBC4	0.927	0.859					
Intention to adopt mobile banking	IAMB1	0.823	0.677	0.866	0.866	0.909	0.714	0.758
	IAMB2	0.820	0.672					
	IAMB3	0.869	0.755					
	IAMB4	0.867	0.752					

Source: Author's own elaboration.

On the other hand, Fornell and Larcker (1981) stated that the average variance extracted (AVE) scores should be used to assess the convergent validity of the latent variables. Convergent validity will be confirmed when AVE for each of the constructs is higher than 0.5 (Wong, 2013). As shown in Table 3 above, AVE scores were reported for each of the

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variables. All variables were higher than 0.5 for AVE; Perceived usefulness = 0.608, Perceived Ease of use = 0.628, Attitude = 0.585, Subjective norm = 0.608, Perceived credibility = 0.688, Perceived behavior control = 0.618 and Intention to adopt mobile banking = 0.714. Thus, each of the constructs indicated good convergent validity.

Table 4: Discriminant Validity (Fornell-Larcker criterion)

	AT	IAMB	PBC	PC	PEU	PU	SN
AT	0.765						
IAMB	0.562	0.845					
PBC	0.192	0.241	0.786				
PC	0.438	0.732	0.134	0.829			
PEU	0.591	0.798	0.214	0.701	0.792		
PU	0.378	0.601	0.133	0.452	0.526	0.780	
SN	0.660	0.686	0.269	0.562	0.723	0.509	0.780

Source: Author's own elaboration.

Discriminant validity indicates the uniqueness or distinctness of a construct when compared to others in the model. Vuong and Sid (2020) suggested that the Fornell-Larcker criterion should be used to determine the discriminant validity of latent variables. Fornell and Larcker (1981) recommended that discriminant validity is found when the square root of AVE for each latent variable is higher than other correlation values among any other construct.

As shown in Table 4, this analysis shows (in bold) that adequate discriminant validity has been achieved by the square roots of the AVEs that were higher than the off-diagonal correlations. For example, the variable "Perceived credibility" had an AVE of 0.688 (from Table 3 above), and the square root of the cross-loadings for "Perceived credibility" in the Fornell-Larcker Criterion Analysis (Table 4 below) was 0.829. As stipulated, 0.829 was both higher than the correlation values in its column (0.701, 0.452, 0.562) and its row (0.438, 0.732, and 0.134). Thus, the convergent and discriminant validity were

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meet. Taken together, the evidence indicates the scales had adequate quality for usage in the next stage of analysis.

Assessment of Structural Model

Collinearity assessment is the first step in the structural model analysis. The procedure is necessary to ensure that the path coefficients, which are estimated by regressing endogenous variables on the attached exogenous variables, are not biased. According to Giao and Vuong (2019), collinearity issues exist between the respective exogenous variable and the endogenous variable. If the variance inflation factor (VIF) value is greater than 5 or lesser than 0.2, there are collinearity issues with the latent variables. As shown in Table 5, all VIFs were below the threshold of 5; the maximum value of VIF was 3.194 (less than 5) and the minimum value was 1.087 (more than 0.2) indicating that the latent variables did not have multicollinearity.

Table 5: Collinearity Statistic

Construct	Intention to adopt_mobile banking
Attitude	1.888
Perceived Behavior Control	1.087
Perceived Credibility	2.070
Perceived Ease of Use	3.194
Perceived Usefulness	1.810
Subjective Norm	2.813

Source: Author's own elaboration

Hypotheses Verification

The structural model path coefficients assessment of the model was carried on by means of the bootstrapping procedure. According to Vuong and Giao (2019), bootstrapping is a resampling technique to estimate the standard error without relaying distributional assumptions. The bootstrap result approximates the normality of data. It is used to calculate the significance of the t statistic associated with path coefficients. Table 6 and Figure 4 showed significance values for the path coefficients determined from the bootstrapping process.

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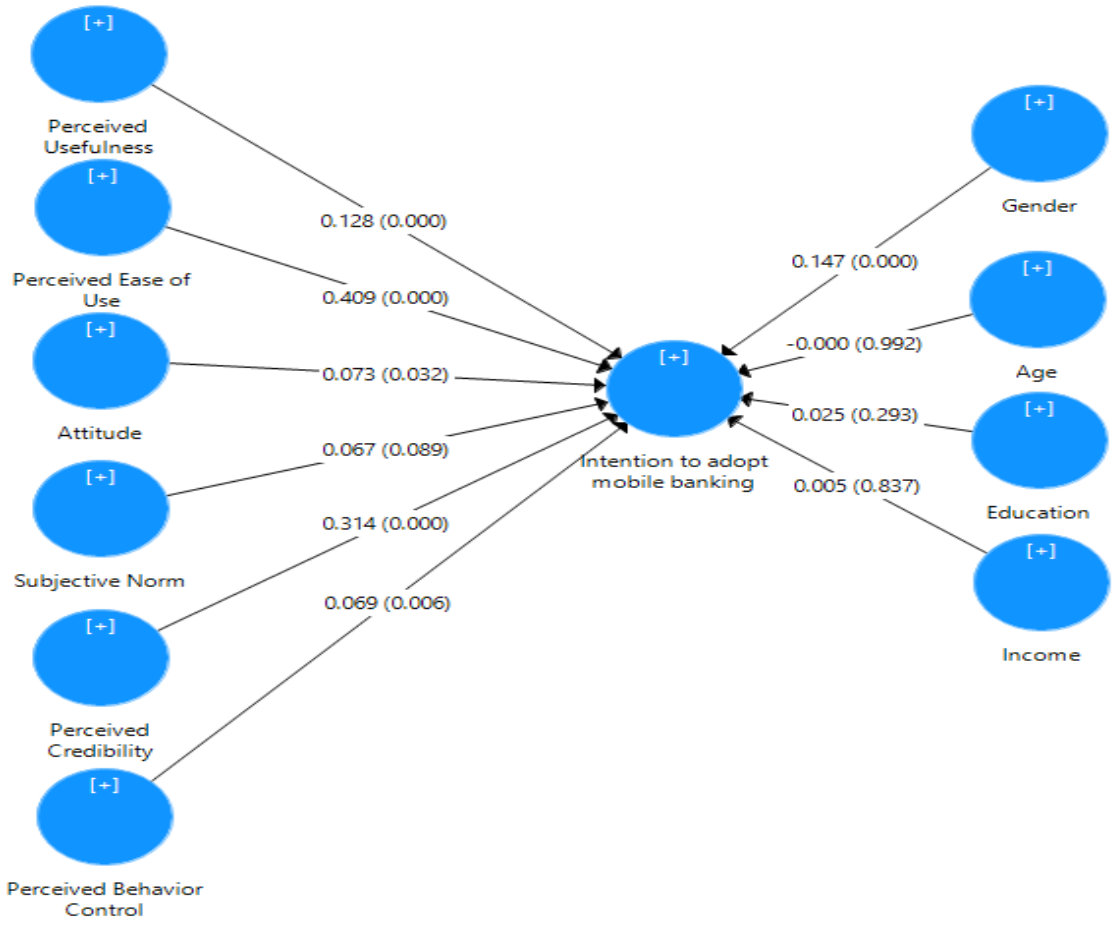
Based on what was found in the PLS access, the results of all hypotheses and model connection were shown.

Hypothesis 1: the result showed that perceived usefulness had a positive and significant relationship with the intention to use mobile banking, (p-value = 0.000 < 0.05 and beta coefficient = 0.409). This was supported by previous researches of Mostafa and Eneizan (2018), and Saji and Paul (2018). The result indicated that the higher perceived usefulness, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 1 was supported.

Figure 4: Hypothesis summary model



Source: Author's own elaboration

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Hypothesis 2: the result showed that perceived ease of use had a positive and significant relationship with the intention to use mobile banking, (p-value = 0.000 < 0.05 and beta coefficient = 0.128). This was supported by previous researches of Mostafa and Eneizan (2018), and Saji and Paul (2018). The result indicated that the higher perceived ease of use, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 2 was supported. Furthermore, perceived ease of use made the largest contribution in explaining the dependent variable.

Hypothesis 3: the result showed that Attitude had a positive and significant relationship with intention to use mobile banking, (p-value = 0.032 < 0.05 and beta coefficient = 0.073). This was supported by previous researches of Akturan (2012), and Muñoz-Leiva et al. (2017). The result indicated that the higher attitude, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 3 was supported.

Hypothesis 4: the result showed that Subjective norm had a positive and significant relationship with the intention to use mobile banking, (p-value = 0.089 < 0.1 and beta coefficient = 0.067). This was supported by previous researches of Perdigoto and Picoto (2012), and Ting et al. (2016). The result indicated that the higher subjective norm, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 4 was supported. Hence, banking customers tend to choose and use mobile banking services by the introduction of relatives and friends.

Hypothesis 5: the result showed that Perceived credibility had a positive and significant relationship with the intention to use mobile banking, (p-value = 0.000 < 0.05 and beta coefficient = 0.314). This was supported by previous researches of Al Khasawneh (2015), and Saji and Paul (2018). The result indicated that the higher Perceived credibility, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 5 was supported.

Hypothesis 6: the result showed that Perceived behavioral control had a positive and significant relationship with the intention to use mobile banking, (p-value = 0.006 < 0.05 and beta coefficient = 0.069). This was supported by previous researches of Abadi et al. (2012), and Ting et al. (2016). The result indicated that the higher Perceived behavioral control, the greater is the possibility that buyers will use mobile banking. Thus, hypothesis 4 was supported.

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Table 6: Final results of the relationship checking of model's constructs

Hypothesis	Relationship			Regression Weight	Standard Deviation	T-Statistics	P-Values	Result
H_1	PU	→	IAMB	0.128	0.035	3.699	0.000	Supported
H_2	PEU	→	IAMB	0.409	0.040	10.238	0.000	Supported
H_3	AT	→	IAMB	0.073	0.034	2.156	0.032	Supported
H_4	SN	→	IAMB	0.067	0.039	1.705	0.089	Supported
H_5	PC	→	IAMB	0.314	0.033	9.414	0.000	Supported
H_6	PBC	→	IAMB	0.069	0.025	2.749	0.006	Supported
Control variables								
	Gender	→	IAMB	0.147	0.030	4.974	0.000	Supported
	Age	→	IAMB	-0.0001	0.025	0.010	0.992	Not Supported
	Income	→	IAMB	0.005	0.024	0.205	0.837	Not Supported
	Education	→	IAMB	0.025	0.024	1.052	0.293	Not Supported

Source: Author's own elaboration.

CONTROL VARIABLES

For control variables, as shown in Figure 4 and Table 6, P-value of gender was 0.000 and beta coefficient was 0.147. Thus, the results show that difference was found in terms of banking customer's gender on the intention to use mobile banking. In other words, male has stronger intention to use mobile banking than female.

On the other hand, the significance level of control variables such as age, income, and education, specifically, 0.992, 0.837, and 0.293, was greater than 0.05. Therefore, they were not statistically significant on the relationship between these control variables and intention to use mobile banking. In other words, the intention to use mobile banking is not influenced by customer's age, income and education.

MODEL FIT

Giao and Vuong (2019) recommended that the quality of a PLS model should be assessed by redundancy, communality, and goodness of fit. This research employed the effect size index, and communality to evaluate the model fit for the structure model. The effect

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size measures the influence of a specific exogenous latent variable on an endogenous variable when the exogenous variable is eliminated from the model (Giao & Vuong, 2019). Cohen (1988) classified effect size into three groups including a large effect size at f values above 0.40, a medium effect size at f values ranging from 0.25 to 0.4; a small effect size at f values less than 0.10. Vuong and Giao (2019) highlighted Cohen's f index as being equivalent to R^2 of above 0.26 for a larger effect; ranging from 0.13 to 0.26 for a medium effect, and under 0.02 for a small effect. As shown in Table 3, the R^2 coefficients of consumers' purchase intention were 0.758, which was greater than 0.26. Moreover, the R square value 0.758 implies that the model accounts for 75.8% (expressed as percentage) of the variance in intention to use mobile banking. To better depict a true estimate the Adjusted R Square indicates that the model explains 75.8% of the variance in the dependent variable. This is very good model when compared to findings reported in past journal articles (Vuong & Giao, 2019). Thus, it had a larger effect on the model.

In addition, Vuong and Giao (2019) employed communality to assess overall validation of the PLS model. They also stated that communality is equivalent to the AVE in the PLS model and should have an average of 0.5 (Fornell & Larcker, 1981) for good-fit. As shown in Table 3, the structural model indicated an AVE of at least 0.5 for all of the constructs. Therefore, the global structural model of this study proved the model-data fit. From all of the evidence above, this study proved that the PLS model is validated globally with a very good effect for the goodness of model-data fit.

CONCLUSION

Mobile banking was evolved from mobile technologies. Although mobile banking is available and ready to use by individuals, there is a tendency that mobile banking unnoticed by customers or is under-used. Thus, there is a need to explore the level of acceptance among banking customers. Additionally, this study is a pioneering effort in applying Technology Acceptance Model (TAM) and Theory Planned Behavior (TPB) to the newly emerging context of mobile banking, which has become available in Vietnam. The findings of this study strongly support the suitability of using TAM and TPB model to understand the factors affecting intention to use mobile banking.

The aim of this study was to develop a modified version of TAM and TBP that can

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explain the banking customers' behavioral intention to use mobile banking. The study added attitude, subjective norm, perceived credibility and perceived behavioral control to TAM, with two factors (perceived usefulness and perceived ease of use).

Interestingly, the proposed model measures significantly determine behavioral intention. This model is unique because it investigates consumer acceptance for mobile banking. The study also leads to several contributions. First, it successfully confirms the applicability of the TAM and TBP to mobile banking. In line with this statement, perceived usefulness, perceived ease of use, attitude, subjective norm, perceived credibility, perceived behavior control was found to be significant factors of the behavioral intention to use mobile banking. Second, this study supported and were consistent with the previous studies of Mostafa and Eneizan (2018), Saji and Paul (2018), Akturan (2012), Muñoz-Leiva et al. (2017), Perdigoto and Picoto (2012), Ting et al. (2016), Al Khasawneh (2015), Saji and Paul (2018), and Abadi et al. (2012).

MANAGERIAL IMPLICATIONS

This study provides meaningful implications that can be benchmarked by many banks in Vietnam. The banks may implement management policies in general and marketing policies in particular to increase levels of easy to use, perceived credibility, usefulness, attitude, perceived behavioral control and subjective norm by customers. The bank could do these solutions:

First, research results showed that "perceived ease of use" was the most influential factor behavioral intention to use mobile banking. Enhancing the way to use mobile banking, make it easier to use. Banks can invest in the design interface of mobile banking, make it become more friendly. The apps should auto-translate into many languages that suit with many foreign customers. Besides, the bank should also organize training courses for mobile banking for free, and surely available at the bank branches anywhere.

Second, the results showed that "perceived credibility" was the second most important factor. Banks in Vietnam should construct their information system that fosters credibility-building mechanisms. Furthermore, in efforts to calm the inherent security concerns, effective trust-building strategies carried out by the banks should embrace guarantees to customers to counter any fraudulent transaction. It is strongly

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believed that the bank's customers are very likely to be more willing to absorb the perceived risk if they are confident that their bank always stands behind the service. Simple statements and graphic and a concise and well-presented privacy policy clearly indicating that transactions are guaranteed might reduce risk concerns significantly. By increasing trust, the banks in Vietnam will be able to transform a potential customer from a curious observer to one who is willing to conduct mobile banking transactions. Such an understanding of customers' trust will provide the bank managers with a toolkit of manageable, strategic levers in attempts to nurture the customer trust which is strongly believed to elevate higher acceptance of mobile banking.

Third, the results showed that "perceived usefulness" factor was ranked No. 3. Increasing the utilities of mobile banking to enhance its usefulness, the bank can invest more suitable in high technology software. This solution makes customers rely on the convenience of using mobile banking for example: increase the maximum amount of money for each transaction, reduce online transaction fee, connect to many payment channels, reduce the time for solute each transaction, etc.

Fourth, the results showed that "attitude" factor was ranked No. 4. To improve customer's attitude toward using mobile banking. Banks should design their apps as effective delivery channels and offer information beyond banking services. The information should include references to "time-saving", "convenience" at anywhere anytime, "low costs", and "information availability". Moreover, regular surveying of customers' responses and opinions of the services should be conducted to ensure continuous improvement.

Fifth, the study also found that the "perceived behavioral control" is the fifth influential factor to affect an individual behavioral intention to use mobile banking. In response to this concern, it is encouraged for the bank management should pay attention to the direct consultancy activities to attract customers to use mobile banking. Indeed, the author believes people with higher information on mobile banking will have a positive knowledge and skills on mobile banking system, thus impact for intention to use mobile banking.

Finally, improving perceived ease of use and perceived usefulness can foster the subjective norm. Furthermore, banks need to make many campaigns to use mobile banking

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at supermarket, festival, fair... or advertising on the internet, television, social network (Facebook, Twitter, Zalo, Skype...). Besides, it is encouraged for the bank management should pay attention to the direct consultancy activities to attract customers to mobile banking.

LIMITATIONS

In this study, there are some limitations. The most outstanding one is the representative of the sample. The sample is selected conveniently, so it is not representative of the population. To make the sample more representative, future research should increase the sample size and use a probability sampling technique- simple random sampling, hence this future research would be more generalizable. The second limitation is a relation to the additional independent variables. So that, depending on the banking environment, further research considers adding different constructs such as perceived self-efficacy, and transaction cost.

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