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Financial Inclusion through Mobile Money in developing countries: the case of Vietnam

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Abstract:

The use of mobile technology services in Vietnam has surged, offering convenience and enhancing various aspects of users' lives. This shift towards wireless connectivity has also affected financial transactions and remittances, aligning with goals of a cashless society and financial inclusion. Mobile money, a widely used mobile service, is examined in this study. We focus on the determinants affecting the adoption of mobile money services, which are of interest to mobile money firms, telecom companies, banks, and developers. Factors like price, social influence, and perceived risk are explored as they influence consumer acceptance. To succeed, service providers must lower costs, emphasize benefits, and ensure seamless functionality. User-friendliness, trust, and data security are essential for sustained adoption and financial inclusion. This study provides insights into mobile money adoption in Vietnam, guiding stakeholders in the mobile technology sector to adapt and thrive in this evolving landscape.

Keywords: Mobile money, PLS-SEM, Vietnam, UTAUT

1. Introduction

The implication of globalization has led to the societal challenges in developing countries from unemployment, poverty, illiteracy, crime, pollution, climate change to financial exclusion, etc. However, with a revolutionary development of information and communication technologies, many facets of society have been improving by providing education to disadvantages communities through e-learning, enabling access to healthcare system with web-based services, facilitating commerce to marginalized groups via e-commerce, and especially helping citizens develop their social capital and achieve social equality by using fintech applications.

Financial inclusion is critical for economic development and sustainable poverty reduction for developing countries. World Bank's Global Findex shows that the rate of those who have their own bank account is 21% in 2011 and 31% in both 2014 and 2017. In comparison with other countries in same regions, Vietnam is just higher than Cambodia. As the result, State Bank of Vietnam has cooperated with World Bank to find the solution for improving the financial inclusion in order to achieve both goals that stated in the report Vietnam 2035, namely: reducing poverty and fostering Vietnam economy. Fortunately, the emergence of technological innovation in finance: Fintech has become the best way to promote the financial inclusion not only in Vietnam but in other developing countries [1].

Due to the nature of Fintech ecosystem and nascent stage of Fintech development in Vietnam, most of Fintech companies offer services relating to mobile financial services. It is broadly to accept that mobile money or mobile financial services is highly regarded as the fintech innovation in deepening financial inclusion in developing country. As the result, this study will focus on the mobile money which refers to "a set of applications that enable people to use their mobile telephones to manipulate their bank account, store value in an account linked to their handsets, transfer funds, or even access credit or insurance products" [2]. Mobile payments, mobile money transfer, and mobile banking are three main types of mobile money [3].

In Vietnam, 2020 will be the year of digital transformation and heading to the cashless society with the purpose to reduce the ratio of cash payment to less than 8 percent and improve financial inclusion by 2025. To achieve this target, the Vietnamese government has to approve the mobile money pilot project, allowing the use of telecommunication accounts to pay for small-value goods and services because mobile money is believed to be one of the most popular solutions to non-cash payment and improving financial inclusion. With 43.7 million smartphone users, accounting for 45 percent of population and 65.8 million users, accounting for 70.3 percent population, Vietnam has many advantages to increase the rate of mobile money adoptions. However, only 63 percent of Vietnamese adults (over 15 years old) have bank accounts, lower than the 80 percent in China and 70 percent in Asia Pacific and the ratio of cash in circulation to GDP is up to 20 percent, much higher than other regional countries. Thus, it is important to understand antecedents to actual use of mobile money to improve financial inclusion and reduce cash in circulation.

Almost the research for mobile money as a financial inclusion instrument tends to be conducted in Latin America (e.g. Mexico and Brazil), in sub-Saharan Africa (e.g. Ghana), and South and East Asia (e.g. India, China, Indonesia) while there is a limited research in other areas of developing countries such as Vietnam or Laos, Cambodia. Furthermore, some studies relied on technology acceptance model (TAM), which focuses on technological factors [4]–[6], or theory of rational actions (TRA) which focuses on human factors, and the unified theory of acceptance and

use of technology (UTAUT) focuses on both human and technological factors. The ubiquitous use of mobile technology involves a complex interaction among three above factors. However, not many studies take technological, personal, and ecological aspects under consideration. Consequently, this gap would be filled by adding structural assurance, awareness to the UTAUT2 and then classified factors in three groups. Additionally, [7] notes that mobile money users are more concerned with the trust in mobile money providers because of cybercrimes and remotely hacking. While previous studies such as [8]–[11] indicate that mobile money can transform and facilitate access to financial services, particularly in developing countries, the trust element is not integrated into their analyses between adoption and actual use. Using Vietnam, as a developing country who has higher cybercrimes in recent years, this study intends to fill this gap by establishing the mediating effect of trust in the relationship between mobile money adoption and usage and financial inclusion.

Theoretically, this research adds to the current literature on mobile money by demonstrating that confidence substantially and positively mediates the relationship between the adoption and use of mobile money to increase the degree of financial inclusion. This research also contributes alternative perspectives to the debate on fintech innovation and financial inclusion by providing insights from both behavioral, technological and ecological lenses to policy makers and service providers. Socially, this study also identifies the effect of both drivers and inhibitors in the use of fintech innovation in Vietnam.

2. Literature review

2.1 Previous studies on mobile money innovation

In the larger mobile payment literature, mobile money research is considered relatively recent. A closer look at the current literature on mobile money shows two main concerns that require attention from study. By uniquely capturing theoretical positions, backgrounds and constructs to figure out the complexities of the gaps in current literature. Table 1 presents a review of the selected previous studies about mobile payment and mobile money.

Table 1: Previous studies

Studies	Theoretical position	Sample	Constructs
[12]	DOI & TAM	Ghana	Perceived usefulness (PU) Perceived ease of use (PEOU) Compatibility Complexity (CC) Perceived trust (PT) Perceived risk (PR)
[13]	TAM	India	System quality (SQ) Task-technology fit (TF) Monetary value (MV) Connectivity (CO) Personal innovativeness (PI) Discomfort (DI) Absorptive capacity (AC) Structural assurance (SA) PU, PEOU Use intention (BI)
[14]	TAM	Vietnam	Mobility (MO) CC M-Payment knowledge

			Trust (TR) Risk (R) PEOU PU Safe to Use (SU)
[15]	TAM	Uganda	Performance expectancy (PE) Self-efficacy (SE) SA Behavioral intention (BI) TR PR
[16]	UTAUT2	Pakistan	EE PE SI FC Hedonic motivation (HM); Habit (HA) TR Perceived value (PV) PR
[17]	General extended UTAUT	Oman	EE PE SI BI PT SE PR PC
[5]	Expanded TAM	Germany	Data securities Value added User design interface Customer trust Fintech promotion Intention
[4]	Mixed among TAM, UTAUT, UTAUT2	India	Innovativeness (INO) Stress (STR) PEOU PR PS PU PT
[18]	UTAUT2 with cultural factor of Uncertainty avoidance moderator between social influence and intention	Jordan	EE PE SI HM HA TR PV PR AW UA BI

Firstly, most prior mobile payment studies (Al-Okaily et al, 2020; Al-Seadi et al. 2020; Stewart and Jürgen's, 2017; Baganzi and Lau, 2017; Liu and Tai, 2016) have largely focused on technological factors, human factors, and ecological factors separately that not provide clearly understanding the drivers and inhibitors of adoption. As the result, the awareness, structural assurance and adoption readiness are not studied at the same time and underexplored.

Secondly, previous studies [13], [14], [16]–[19] focused on intention to use mobile money based on trust as an antecedent while knowledge on trust as the mediator between intention and actual use to improve financial inclusion remain unknown. For an example, in investigating mobile money adoption in Uganda, Baganzi and Lau (2017) focus on factors including trust belief that predict intention to use mobile money services. Similarly, Liu and Tai (2016) and Osei-Assibey (2015) also figured out factors with trust and perceived trust as antecedents influencing the intention to adopt mobile money in Vietnam and Ghana respectively. However, they did not step further to examine the actual use

of mobile money service to make deepening financial inclusion through trust. Thus, there is a need to understand trust as a mediator to clarify this gap in the literature.

2.2 Conceptual model and hypothesis development

Based on eight competing technology acceptance model, namely the TRA and TAM (the original models and theories); the TPB (the motivational model); the TAM and the TBP model (a cumulative model); the PC utilization model; the innovation diffusion theory and the social cognitive theory model, [20] introduced and developed the UTAUT model two decades ago.

Four key constructs, namely success expectation, effort expectation, social impact and conditions of facilitation constitute the original UTAUT. The theory suggests that performance expectation, effort expectation, and social influence effect directly affect behavioral intention, while circumstances are a direct determinant of behavioral intention and use actions [21]. By incorporating three new constructs, namely habit, hedonic motivation, and price worth, [22] revised the original UTAUT into UTAUT2 to make the principle relevant in organizational and consumer contexts. In addition, as opposed to UTAUT, the UTAUT2 allows for more variation in behavioral purpose and use of technology.

While the UTAUT2 has been widely used in research on technology adoption and usage (e.g., [23], [24]), it is more inclined to drivers and does not take into account other technology use deterrents [25]. In addition, Venkatesh et al. (2003) subsequent validation of the UTAUT found that there is heterogeneity in the difference accounted for in behavioral intention and actual use of a technology. Therefore, the use of a technology to underpin the antecedents of the actual use of an invention is important for studies to move beyond investigating purpose. This research adopts the UTAUT2 as one of its theoretical lenses because it is more detailed and ideal for the use of mobile money to uncover antecedents. However, UTAUT2 used the variance explained in behavioral intention and technology use without ecological factors. Therefore, 2 factors awareness, assurance structure will be added to UTAUT2 for the main investigation. The factors for adoption readiness will be grouped. Along with that, the factors namely: hedonic motivation, self-efficacy will be excluded. Additionally, the mediator-trust-will be added between adoption and financial inclusion to investigate the actual use.

2.2.1 Performance expectancy (PE)

Performance expectancy refers to the extent to which using mobile money provide benefit or enhance user's performance for doing certain activities (Venkatesh et al., 2012). People will have a tendency toward using a technology that offer numerous benefits, the higher the usefulness of mobile money, the higher rate of adoption. Al-Seadi et al. (2020) and Senyo & Osabutey (2019) found down the significant positive effect of PE on the behavioral intention to use mobile money services ($\beta = 0.248$; $\beta = 0.660$). Moreover, [26] also indicated that PE is the most predictor variable to the behavioral intention for both users and non-users. Following the previous studies, it is expected that if users think of usefulness and benefit of mobile payment, they are more expected to adopt the service, which leads to the following hypothesis:

H1: There is a positive relationship between performance expectancy and intention to use mobile money in Vietnam.

2.2.2 Effort expectancy (EE)

Effort expectancy can be defined how users' easy to use mobile money (Venkatesh et al., 2012). In the first stage of mobile money adoption, if consumer finds that the mobile money is really easy to use, he/she will have more intention to use it. Previous studies founded the significant relationship between EE and behavioral intention. Cabanillas et al. (2019) found that NFC's intention to use is affected by EE when paying public transport fee. Al-Seadi et al. (2020) and Senyo & Osabutey (2019) found down the significant positive effect of PE on the behavioral intention to use mobile money services ($\beta = 0.159$; $\beta = 0.273$). Based on the previous studies, the higher the easiness of mobile money services, the greater is the behavioral intention to use such services, which leads to the following hypothesis:

H2: There is a positive relationship between effort expectancy and intention to use mobile money in Vietnam.

2.2.3 Social influence (SI)

Social influence (SI) refers to the extent to which friends and family believe they should use mobile money (Venkatesh et al., 2012). Mobile money users have interpersonal relationships with others and that leads to their

choices influenced by people within social ties. The positive or negative perception of their influencers may affect their behavioral intention. Kang (2019) pointed out that the social influence positively affects non-user($\beta=0.259$) than user($\beta=0.098$) in term of mobile payment's BI. Al-Seadi et al. (2020) asserted that social influence has positive significant on BI ($\beta=0.216$). However, Senyo & Osabutey (2019) saw there is no relationship between SI and BI in mobile money. In the context of Vietnam's mobile money, there is an increasing case of losing money when using mobile money apps in the third party like Momo and the people who lost money will have negative perception in recommend or using the mobile money. So, the hypothesis is:

H3: There is a negative relationship between social influence and intention to use mobile money in Vietnam.

2.2.4 Facilitating condition (FC)

Facilitating conditions is defined as the perception of available and resources for customers in using a mobile money service (Venkatesh et al., 2012). Facilitating condition is also a great predictor of behavioral intention and adoption and actual use of mobile money (Venkatesh et al., 2012; Senyo & Osabutey, 2019). The customer needs both a smart phone, internet access and skills to manipulate the mobile phone to use mobile money services. In prior studies, facilitating condition will have a positive relationship between FC and technological innovation's intention to use such as [22], [27]. However, [18], [28] showed there is no relationship between them. In a developing country like Vietnam, the technological and financial literacy is not really high among mobile user and there is a need available support for them to adopt and use the mobile money to improve financial inclusion. So, the hypothesis is:

H4: There is a positive relationship between facilitating condition and intention to use mobile money in Vietnam.

2.2.5 Perceived risk (PR)

Perceived risk in the context of technology-based services refers to the perception of losses when using a service (Pavlou, 2013). According to Abubakar et al. (2019), most technologies have inherent risks. When innovative technologies are introduced and used, users recognize the risks and form their attitude and intentions with reference to them and users are naturally hesitant about using mobile money services in this study. Some prior studies have found the negative relationship between perceived risk and behavioral intention to use mobile money services like Kang (2019) with $\beta=-0.162$ for non-users and $\beta=-0.162$ for users; Giovanis and Sarmanitos (2018) with $\beta=-0.156$. So, the higher the perceived risk, the smaller is intention to use, which lead to the hypothesis:

H5: There is a negative relationship between perceived risk and intention to use mobile money in Vietnam.

2.2.6 Habit (HA)

Habit reflects the past experiences (Venkatesh et al., 2012) and the frequency of past behavior will affect the present behavior [29]. There are many previous studies confirming the positive relationship between habit and intention to use and actual use. For example, Chopdar et al. (2018) showed the $\beta=0.237$ between habit and behavioral intention, Senyo (2020) had the $\beta=0.230$ between habit and mobile money use, [30] had $\beta=0.401$ with behavioral intention and $\beta=0.527$ with mobile banking use. Repeated transaction with mobile money services may become a habit and lead to behavioral intention and actual use of mobile money in long term. This study hypothesis that:

H6: There is a positive relationship between habit and intention to use mobile money in Vietnam.

2.2.7 Awareness (AW)

Awareness is defined as the extent to which customers know a system to facilitate the transaction of money. When a person knows about the existence of a new technological innovation, he/she might have insufficient information about it. [31] indicated that awareness is an important antecedent driving mobile banking adoption. [32] also investigated the positive relationship between awareness with adoption of mobile money and showed that the higher awareness will lead to the higher intention to use mobile money. In the case of mobile money, few studies explored the relationship between awareness and mobile money's intention to use, so the hypothesis will be formulated:

H7: There is a positive relationship between awareness and intention to use mobile money in Vietnam

2.2.8 Structural Assurance (SA)

Structural assurance is defined as the individual's belief in structures namely "guarantees, regulations, promises, legal recourse, or other procedures to promote success" (McKnight, Choudhury, & Kacmar, 2002). In the case of mobile banking, legal and technological resources will protect users from losing their data and money (McKnight et al., 2002). So, structural assurance also covers the perceived security and perceived risk, if the structural assurance is higher will lead to the greater behavioral intention and adoption of mobile money. As the result, the hypothesis will be formulated:

H8: There is a positive relationship between structural assurance and intention to use mobile money in Vietnam

2.2.9 Price value (PV)

Price value is the cognitive trade-off between benefit and cost associated with using a technology innovation (Venkatesh et al., 2012). If the cost using a product and service is higher than received benefit, users will be hesitant to use. Macdo (2017) and Oliveira et al. (2016) indicated no relationship between price value and technological innovation adoption. However, Venkatesh et al., (2012) confirmed the positive relationship between price value and intention to use a technological innovation. In the case of mobile money in Vietnam, the understanding between relationship between PV and intention is unknown. But the mobile money services providers also use the promotion to attract customers. Additionally, in the developing countries, mobile money is not only a viable solution beside traditional banking and users might care about the tradeoff between benefits and cost if their transaction payment has done effectively. For this study, the hypothesis based on the above discussion is:

H9: There is a negative relationship between price value and intention to use mobile money in Vietnam.

2.2.10 Behavioral Intention (BI)

BI refers to the possibility of users engaging in a specific behavior (Ajzen, 2002). A higher behavioral aim for a technology may lead to increased usage. Several studies [4], [30], [33], [34] have identified a positive relationship between behavioral purpose and actual usage in previous literature on technology adoption. For example, [34] shows that behavioral intention has a positive impact on user behavior in investing in the use of ICT among older adults. However, most studies [13], [35]–[37] have viewed behavioral intention as a primary variable outcome in the mobile money literature. As a result, the relationship between mobile money services' behavior intention and actual usage is not known. In reality, Venkatesh et al. (2012) say that there is a substantial difference between a technology's behavioral purpose and its actual use. From the discussion, the hypothesis is:

H10: There is a positive relationship between behavioral intention and actual use of mobile money services

2.2.11 Mobile money adoption and usage and financial inclusion

Financial inclusion, according to the World Bank, ensures that individuals and companies alike have access, in a sustainable and responsible way, to affordable financial products and services that meet their needs. [38] noted that the mobile cash platform provides a wide variety of financial services such as deposits, credit, transfers, remittances, and insurance at a reduced cost and at their convenience. [39] results showed that mobile money helped women save money from their male counterparts' intervention and vice versa. In addition, [40] have found that Kenya's M-Pesa users were better able to handle their financial shocks by obtaining more remittances because of the versatility, ease of access, and lower transaction costs over the mobile money platform. Hence, the hypothesis is

H11: There is a significant relationship between mobile money adoption and usage and financial inclusion in Vietnam

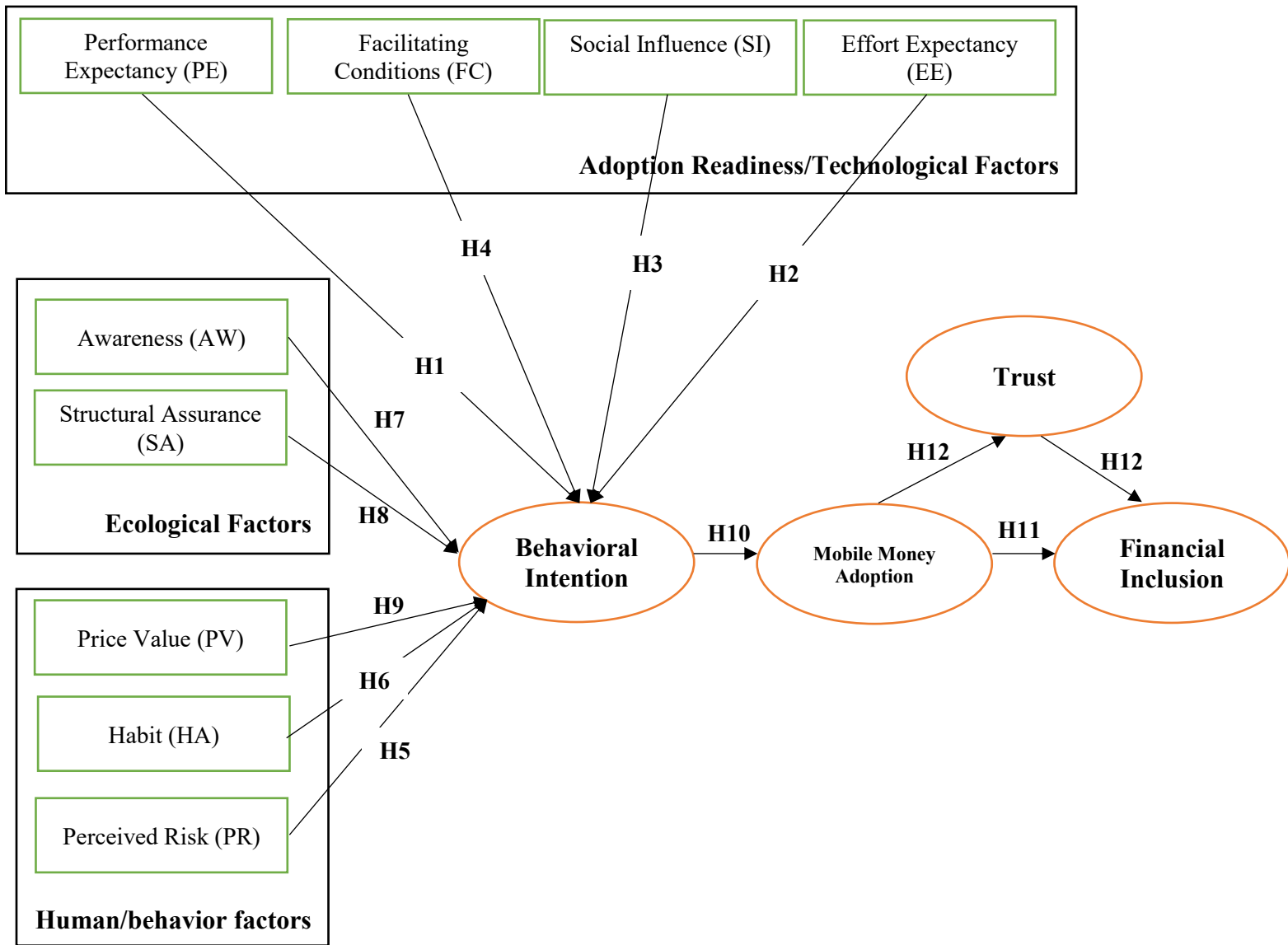
2.2.12 Mobile money adoption and usage and financial inclusion: Trust as a mediator

[41] note that trust is crucial because it decreases the worries and doubts of users regarding mobile money transactions. The 2018 Global Findex Survey shows that skepticism is one of the many variables that contribute to low financial inclusion and individuals' access to financial services. This is because of a lack of faith in the providers of financial services. Baganzi and Lau (2017) also indicate that providers of financial services can maintain the security of customer information across the mobile money network by maintaining discretion over what information

they want to share. In order to build trust in the continued adoption and use of the mobile money system, consumers should be in control of whether, where, to whom and for what reason they share their data. In addition, [42] also argue that mobile money services should be structured to encourage customer trust, minimize uncertainties and perceived risks in order to increase the probability of wider acceptance and use by customers. Providers of mobile money services and mobile network operators should be assured the privacy and protection of customers over the mobile money platform.

H12: Trust significant mediates the relationship between mobile money adoption and usage and financial inclusion

Figure 1: Conceptual model



3. Research methodology

3.1 Research context

This study was conducted in Vietnam, a fast-developing country in Southeast Asia. Solidiance predicted that Vietnam’s fintech market in 2020 may have value of \$7.8 billion (it was \$4.4 billion in 2017). Digital payment solutions now make up 89 percent of the fintech market in Vietnam. The Vietnamese mobile money ecosystem comprises key actors, namely mobile network operators, commercial banks, State Bank of Vietnam, merchants, users and agents. Currently, Viettel, MobiFone and VNPT are mobile network operators that also offer mobile money services. SBV is the central bank and regulator of Vietnam’s mobile money ecosystem. Merchants are firms that

accept mobile money payment. Users are including individuals and firms. Agents are diversified with crowdfunding (e.g., FundStart, Comicola, Betado, and Firststep), online lending (e.g., Loan Vi, Tima, Trust, and Circle), personal financial data management (e.g., MoneyLover, Mobivi, and Kiu), customer data management (e.g., CircleBi, and Trusting Social), digital banking (Timo), financial service (Bankgo and GoBear), and online mortgage (F88).

3.2 Measurement

Based on the extended UTAUT, the items in this research adapted from previous researches that validate empirically. Performance expectancy, Effort expectancy, Social influence, Facilitating condition, Perceived risk, Habit, Price value and Behavior Intention are adapted from [22], [30], [43]. Awareness adapted from [44]. Structural assurance adapted from [45]. Mobile money adoption and usage, trust, and financial inclusion are adapted from [46], [47]. In order to collect data, a questionnaire survey was used and divided into two sections. Demographic information of respondents and the perception toward mobile money are in the first section. The second section used five-point Likert scale in which "1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree" to assess the constructs' statements in the research model.

3.3 Data collection

The population included adults in Vietnam. We used sample size of 10 times the largest number of functional paths directed at a specific construct in the functional model. The largest number of upward and downward paths directed a particular construct is 12. It is calculated that a sample size of 120 (i.e. $12 \times 10=120$) is good enough in determining the success or failure of the experiment. The main objective of this study was to gather adequate amount of applicable data that is representative of the population. Because of my requirements, I selected convenience sampling technique. We used this method for two reasons. The convenience sample is effectively used for sampling for generalization when a large sample is required [48]–[50]. First, convenience sampling enables group analysis through point of contact in an expedient and practical way.

After pilot testing the questionnaire, the survey data were collected. Firstly, we collected 46 responses. Based on this pilot test, we made improvements to some of the questions. Data collection occurred after a period of 3 months in September 2020 (September 2020 to December 2020). We surveyed cross-sectional people living in Vietnam through an online survey system, Google form. There were about 425 responses from which 391 were deemed suitable in this study. The amount of responses collected is adequate for a study. By testing for bias between pilot and main, the Kolmogorov–Smirnov test was used. The result shows that there is no statistically significant difference between the two data sets. We also examined for common method bias using Harman's one-factor test [51], [52]. The database was relatively error free.

The sample of the data was analyzed in three steps: descriptive, measurement and structural equation method. The demographic information of respondents is presented in section 5.1. The research used the multiple linear regression analysis (PLS- SEM). Here we utilize the Smart-PLS version 3.3.2. This choice was made because the study was an exploratory research. The use of PLS-SEM in this case due to its capacity to handle complex relationships, skewed density distribution and small sample size as compared with other techniques such as EQS, AMOS, and LISREL [53]. The results are reported in section 4.2 and 4.3.

4. Results and Discussion

4.1 Demographic perspective

From the demographic perspective, most of mobile money users is female as compared to the male. This means that female usually use mobile money for payment or shopping online. It is easy to understand because during the time of conducting data collection, e-commerce activities are booming with many promotional campaigns. The results also revealed that the average age of the responders was between 18-25 years as compared to other age bracket. This means that the mobile money users who participated in this study were youthful and are willing to adopt high technology to reduce cash payment. Besides, most of mobile money users has bachelor degrees and they are likely to have knowledge self-efficacy to know every aspect relating to the mobile money ecosystem. Conclusively, 82.10% of respondents use mobile money for transaction and most of them use for payments or money remittances. This shows the strength in the use of mobile money to reduce cash transaction and then improve the financial inclusion. The demographic profiles of the respondents are indicated in Table 2.

Table 2: Demographic profiles

Distribution	Frequency (total: 391)	Percentage
<i>Gender</i>		
Male	140	35.81%
Female	251	64.19%
<i>Age</i>		
18-25 years	225	57.55%
26-33 years	68	17.39%
34-41 years	51	13.04%
42-49 years	47	12.02%
<i>Education</i>		
Students	102	26.09%
Bachelor degree	204	52.17%
Post graduate	85	21.74%
<i>Mobile money use for transaction</i>		
Yes	321	82.10%
No	70	17.90%
<i>Most common use of mobile money</i>		
Payments	235	60.10%
Borrowings	4	1%
Remittances	119	30.43%
Withdraws	30	7.67%
Others	3	0.7%

Note: n= 391

4.2 Measurement model

Measurement model (outer model)'s evaluation should be conducted to assess the usefulness and suitability of this model before using the structural model (inner model) to test the hypotheses. The statistical analyses for evaluation outer model were performed relating to reliability and validity assessment to test for internal consistency reliability, indicator reliability, convergent validity and discriminant validity.

For testing internal consistency reliability, Cronbach's Alpha and Composite reliability should be higher than the threshold value of 0.7. The results in the table revealed that the value of Cronbach's Alpha and Composite reliability were all higher than 0.7[54], [55]. Therefore, the internal consistency reliability is confirmed. Moreover, convergent validity-the degree to which measures of constructs are similar to each other in concept will be examined by using factor loading and average variance extracted. For factor loading, just only indicators have scores higher than 0.7 will be kept and below will be removed from the final model (FC2, FI4, MM3, MM4, PR3, PV1, PV4) to assess the good fit. As a result, the results in the Table 3 of factor loading indicate a good indicator of reliability. Table shows that all

factor loadings were above 0.7. The averages above showed that the AVE values are within the recommended range of 0.5. Lastly, discriminant validity was evaluated according to Fornell-Larcker criteria and cross-loadings criteria [56]–[58]. The square root of AVE should be greater than all correlations between each pair of constructs [53]. From Table 3, we can see that all diagonal values (square root of AVE) are larger than off-diagonal values (correlations between the construct). According to the cross-loading criterion, the loading of each indicator should be higher than the loading of all other indicators [59]. All the loadings in Table 4 are much greater than the cross-loadings. These scores are comparable for both variables because they both take on the same criteria of discriminant validity.

Table 3: Quality criterion (AVE, composite reliability, Cronbach’s Alpha) and factor loadings.

	Items	Factors loading	Cronbach's Alpha	Composite Reliability	AVE
Awareness (AW)	AW1	0.775	0.799	0.880	0.788
	AW2	0.988			
Behavioral Intention (BI)	BI1	0.813	0.841	0.904	0.760
	BI2	0.914			
	BI3	0.884			
Effort Expectancy (EE)	EE1	0.833	0.796	0.880	0.710
	EE2	0.890			
	EE3	0.801			
Facilitating Condition (FC)	FC1	0.811	0.830	0.895	0.739
	FC3	0.842			
	FC4	0.923			
Financial Inclusion (FI)	FI1	0.860	0.811	0.888	0.726
	FI2	0.848			
	FI3	0.847			
Habit (HB)	HB1	0.897	0.883	0.928	0.810
	HB2	0.882			
	HB3	0.921			
Mobile Money Adoption (MM)	MM1	0.841	0.754	0.860	0.674
	MM2	0.890			
	MM5	0.723			
Perceived Risk (PR)	PR1	0.942	0.817	0.876	0.704
	PR2	0.796			
	PR4	0.770			
Performance Expectancy (PE)	PE1	0.852	0.754	0.853	0.660
	PE2	0.797			
	PE3	0.786			
Price Value (PV)	PV2	0.933	0.860	0.934	0.877
	PV3	0.939			
Social Influence (SI)	SI1	0.840	0.844	0.905	0.761
	SI2	0.901			
	SI3	0.875			
Structural Assurance (SA)	SA1	0.784	0.787	0.875	0.700
	SA2	0.842			

	SA3	0.882			
Trust (TR)	TR1	0.796	0.846	0.891	0.620
	TR2	0.791			
	TR3	0.835			
	TR4	0.717			
	TR5	0.795			

Table 4: Fornell and Larcker discriminant validity criterion.

	AW	BI	EE	FC	FI	HA	MM	PR	PE	PV	SI	SA	TR
AW	0.888												
BI	-0.026	0.872											
EE	0.008	0.536	0.842										
FC	0.032	0.365	0.411	0.860									
FI	0.022	0.470	0.429	0.405	0.852								
HA	0.023	0.627	0.506	0.438	0.514	0.900							
MM	0.032	0.738	0.527	0.406	0.523	0.703	0.821						
PR	0.065	-0.065	-0.229	0.016	-0.134	-0.031	0.047	0.839					
PE	-0.047	-0.211	-0.307	-0.097	-0.104	-0.156	-0.099	0.768	0.812				
PV	-0.017	0.620	0.504	0.493	0.465	0.597	0.635	-0.080	-0.176	0.936			
SI	0.028	0.535	0.440	0.562	0.380	0.481	0.496	-0.110	-0.151	0.574	0.872		
SA	0.006	0.631	0.525	0.509	0.449	0.674	0.636	-0.019	-0.066	0.543	0.523	0.837	
TR	0.008	0.461	0.446	0.395	0.802	0.546	0.558	-0.250	-0.210	0.474	0.454	0.539	0.788

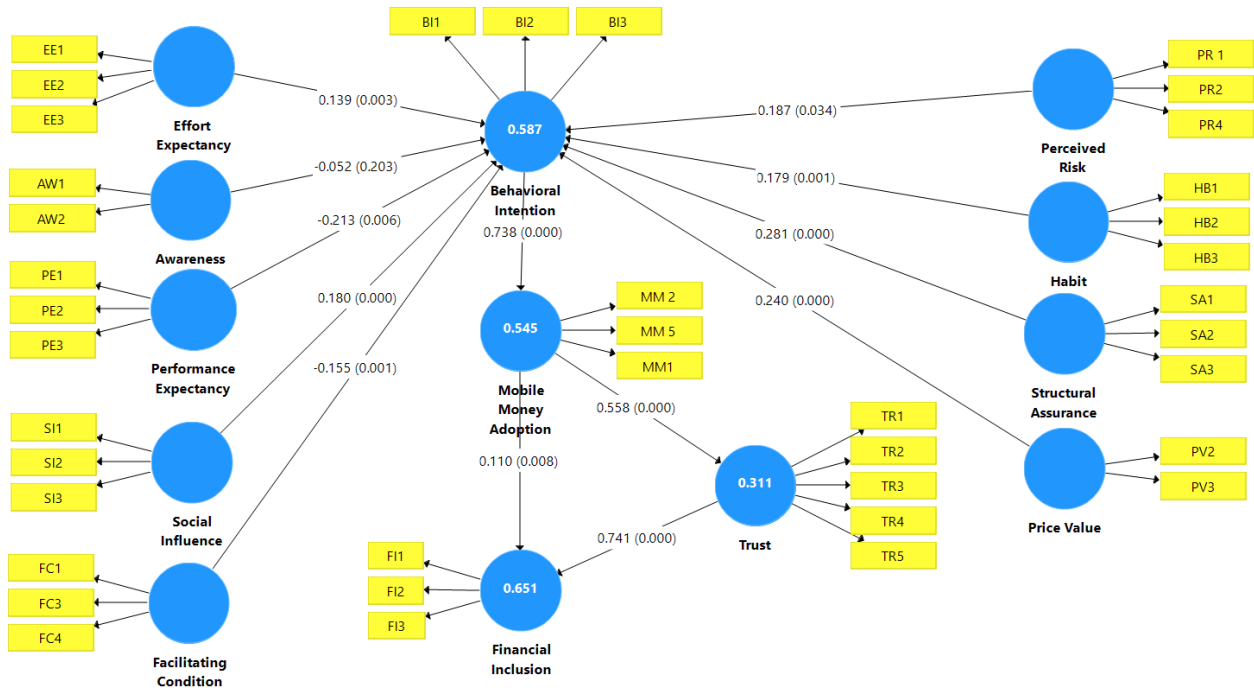
4.3 Structural model

The structure of the model has been revised after validating the measures model. This requires calculations of coefficient of determination, path coefficients and bootstrapping 5000 samples [60]. As shown in table 5 and figure 2, the hypothesis testing has been assessed. The findings indicated that awareness has an insignificant relationship with behavioral intention. Thus H7 ($\beta=-0.052$, $p=0.203$) is rejected. Moreover, performance expectancy, facilitating condition are new findings in this study because the result contradict to previous researches. Thus H1 ($\beta=-0.213$, $p=0.06$) and H4 ($\beta=-0.155$, $p=0.001$) are supported but in negative sign. Additionally, social influence, perceived risk, and price value have significant negative effect on mobile money user's behavioral intention to use mobile money. Hence, H3 ($\beta=0.18$, $p=0.000$), H5 ($\beta=0.187$, $p=0.034$), H9 ($\beta=0.24$, $p=0.000$), are supported. Furthermore, the result revealed that habit, and effort expectancy have significant positive relationship with behavioral intention to use mobile money. Therefore, H1($\beta=-0.201$), H2 ($\beta=0.139$), H4 ($\beta=-0.155$), H6 ($\beta=0.178$), and H7 ($\beta=0.278$) are supported. Moreover, the relationship between behavioral intention and mobile money adoption; between mobile money adoption with financial inclusion are significantly positive. Thus, H10 ($\beta=0.738$), H11 ($\beta=0.11$) are supported. Similarly, the results of structural model also revealed that there is a significant and positive mediating effect of trust ($\beta=0.413$, $p=0$) in the relationship between mobile money adoption and usage and financial inclusion. So, H12 is supported.

Table 5: Hypothesis testing results

Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Decision
H1 Performance Expectancy -> Behavioral Intention	-0.213	-0.185	0.077	2.763	0.006	Supported
H2 Effort Expectancy -> Behavioral Intention	0.139	0.135	0.047	2.972	0.003	Supported
H3 Social Influence -> Behavioral Intention	0.18	0.169	0.048	3.72	0.000	Supported
H4 Facilitating Condition -> Behavioral Intention	-0.155	-0.143	0.049	3.184	0.001	Supported
H5 Perceived Risk -> Behavioral Intention	0.187	0.155	0.088	2.126	0.034	Supported
H6 Habit -> Behavioral Intention	0.179	0.189	0.052	3.45	0.001	Supported
H7 Awareness -> Behavioral Intention	-0.052	-0.052	0.041	1.273	0.203	Rejected
H8 Structural Assurance -> Behavioral Intention	0.281	0.273	0.05	5.664	0.000	Supported
H9 Price Value -> Behavioral Intention	0.24	0.246	0.046	5.185	0.000	Supported
H10 Behavioral Intention -> Mobile Money Adoption	0.738	0.739	0.024	30.675	0.000	Supported
H11 Mobile Money Adoption -> Financial Inclusion	0.11	0.111	0.042	2.643	0.008	Supported
H12 Mobile Money Adoption -> Trust -> Financial Inclusion	0.413	0.413	0.033	12.484	0.000	Supported

Figure 2: Results of the structural model



4.4 Discussion

Previous research on mobile money as the fintech application has not explored the importance of trust as the mediators between mobile money adoption and financial inclusion in developing countries like Vietnam. Moreover, not many previous researches have taken the technological factors, psychological factors, and ecological factors as the same time to identify the drivers and inhibitors of behavioral intention to use. This study has filled all these gaps.

The insignificant effect of awareness on behavioral intention

In conclusion, researchers discovered that there was no positive effect of awareness of Vietnamese users regarding mobile money. Based on results of the present study, there is no significant relationship between awareness and intention to use mobile money. This is due to the comparatively high weight of variables related to awareness such as social influence, perceived risk, and structural assurance on the intention to use these payment systems.

The negative effect of performance expectancy on behavioral intention

When it came to performance expectancy, this study has the negative impact and it is not in agreement with the aforementioned studies, one of which indicated that the greater the usefulness of mobile money, the greater the intention to use those systems. In Vietnam, most users use mobile money to make payment or transfer cash in small amount. They don't put a lot of money in the apps due to the risks of losing money. Moreover, the limit transferring or payment through mobile money is around \$1,200 a month. For that reason, the mobile money system does not improve the performance as much as they think. In this way, the developers of mobile money apps should concentrate on application programs that can improve the performance of transactions and government needs to raise the amount of money spend each month.

The positive effect of effort expectancy on behavioral intention

Effort expectancy plays a large role in the intention to use the mobile money. This result is in agreement with previous studies and could be explained by the notion that the easier is the mobile money, the more will people get the ability to use such systems. The mobile money developers should strive to develop applications that are easy for users to understand and manageable in order to bolster the positive intent of users of mobile money in Vietnam.

The negative effect of facilitating condition on behavioral intention

Facilitating condition is also a great predictor of behavioral intention and adoption and actual use of mobile money (Venkatesh et al., 2012; Senyo & Osabutey, 2019). The customer needs both a smart phone, internet access and skills to manipulate the mobile phone to use mobile money services. In prior studies, facilitating condition will have a positive relationship between FC and technological innovation's intention to use such as [22], [27]. However, [18], [28] showed there is no relationship between them. In a developing country like Vietnam, the technological and financial literacy is not really high among mobile user and there is a need available support for them to adopt and use the mobile money to improve financial inclusion. In this study, the facilitating condition has negative impact on the behavioral intention. In Vietnam, not many people received useful guidance when log in or register the mobile money applications. Even they use the mobile money, they are hesitant to put their banking account in to the app due to the complicated process. The identification of users also makes users unable to use the mobile money. In this way, the mobile money developers need to design human interface that help users easy to use to increase the intention or adoption to use mobile money.

The positive effect of habit on behavioral intention

The study found that using mobile money was affected by habit. Consumers using the mobile money are likely to continue using them due to the promotion or game activities offered by application developers. Consumers' use of mobile money is growing as a more popular payment method (Venkatesh et al., 2012). This finding validates the result of Harsono and Suryana's (2014) in Bandung.

The negative effect of perceived risk on behavioral intention

In this research, perceived risk is defined as a significant factor influencing mobile money use, consistent with studies conducted by [61]–[63]. [64] pointed out that when service providers should offer secured, user-friendly, and user-satisfying services, the mobile money would be commonly utilized by users.

The negative effect of social influence on behavioral intention

It confirms that there is an effect between social influence and the use of mobile money. Social influence has been conceptualized as a global construct derived from the subjective norm and peer influence. It was also observed that social influence score was very important in explaining the variance in accepting mobile money. This means that users who have high social influence tend to use mobile money system. This means that if more influential people support the system, then there is higher chance that others will as well. People's opinions are very influential to adopt mobile money system. In Vietnam, the scam happened with higher degree in mobile and internet payment, it leads to the hesitance to use the mobile money. As the result, if someone important distressed after using mobile money, they will tell the other not to use. The mobile money developers need to create the after-sale services to take care their customers immediately when problems occur to increase their good experience when using mobile money.

The negative effect of price value on behavioral intention

The results of this study show that there is a significant and negative relationship between price value and intention to use mobile money. This model exposes how behavior influenced price value. There are several reasons which have negative impact on the whole action, the main reason is that Vietnamese use services of mobile money system because of perception of benefits but the benefits are really low value in comparison with costs. In order to make payment through mobile money apps, users have to incur the cost around 1.5% if they use credit card. Because of this low level of interest, the users are less likely to respond to the mobile money.

Trust significant mediates the relationship between mobile money adoption and usage and financial inclusion

Researchers discovered that there is a clear positive link between mobile money acceptance and use and financial inclusion through trust. The found result supports the hypothesis developed in this study. Indeed, there is a vast number of concerns from consumers in regards to personal information privacy of mobile money. More people will trust the mobile payment system if they see that it's reliable and secure. Folk and colleagues believe that to achieve a successful implementation of mobile payment technologies, consumers must appreciate and understand mobile payment technologies. Mobile-based financial system depends on the reliability, security, and trustworthiness of the system contractor to attract and achieve users' compliance with the system. It can be seen that financial institutions or providers should ensure customer's information stay anonymous by restricting whatever information they wish to share. The consumer should be in control of data sharing and how their information can benefit the entire society. Mobile money remittances providers' competence, honesty, and benevolence can contribute to the increased adoption and use of mobile money among population engaged in money transaction.

There is a significant relationship between mobile money adoption and usage and financial inclusion in Vietnam

There is a strong link between mobile money use and financial inclusion. [65] says that technological advancement of mobile money has driven much of the progress in financial inclusion (see also Global System for Mobile Association-GSMA, 2017). According to [65] mobile money has brought significant progress to financial access to the overall population due to broad coverage and usage. Other scholars observe that mobile money is beneficial to people with many financial services such as savings, credit, payments, remittances, and insurance. Furthermore, [66] claims that mobile money system has high potential to support microenterprise owners financially by reducing waiting time, transaction cost and leakage and improving security (see also [67]). Moreover, findings of [39] who discovered that mobile money helped women to avoid interference from their male counterparts. The study found that mobile money adoption and usage help enhance financial inclusion.

5. Conclusions and Limitations

There has been a growing usage of mobile technology services in Vietnam. Available features from GPS to games have been installed easily in smartphones that make users 'life better and convenient. Users today are choosing wireless connectivity and media over physical medium including money transaction or remittances. Moreover, with the objectives to cashless society and financial inclusion, these emerging services in the information technology sector deliver improved purchase functionality and widespread availability in Vietnam. Mobile money is one of the services dependents on mobile phones that are really used much. Thus, they are highly useful and easy to use for those in the region.

The analysis of mobile money focuses on determinants of use of such technologies. Mobile money firms, telecommunication companies, merchants, banks, and application developers would significantly profit and the study of their value is crucial to their growth.

From a realistic point of view, this study offers evidence as to factors which designers of mobile payment systems should recognize. Factors including price value, social influence, perceived risk can assess consumer acceptance. Therefore, service providers ought to keep up with attempts to eliminate the cost and promote benefits to improve behavioral intention. For instance, when the users use the mobile money to make payment for their bills or transfer money to their friends, the cost of making these activities higher than other available services or the payment or transferring is not successful, the users will immediately delete the app and would talk badly about their experiences to other people. Furthermore, the creators of mobile payment systems must make sure they are user-friendly and provide benefits that are beneficial to consumers. Along with that, the trust will make users continue to use mobile money in very long time and lead to the financial inclusion. The mobile money must protect the information relating to the users to let them feel secured and safe during their use.

The study has some drawbacks that may contribute to more studies. Firstly, the sample size for this analysis was not adequate to validate the reliability or validity of the test model to represent for the whole Vietnamese population. This study was cross-sectional and would not enable examination of behavioral shifts in consumers over a span of time. A long-term approach would strengthen the long-term partnerships. Secondly, according to the findings of this study, further researches should be performed in order to validate the impact of socio-demographic factors such as gender, age, work occupation and cultural dimension. The Vietnamese community offers ample field for potential studies on the culture of Vietnam. Thirdly, perceived risk plays a major role in mobile money acceptance. Future studies can differentiate between various types of risk (e.g., social risk, performance risk, and psychological risk). Future surveys will often find other causes citizens would not utilize the services. One will profit tremendously in devising stronger and more intelligent tactics.

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